

# EARLY SOCIAL COGNITION IN THREE CULTURAL CONTEXTS

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## **ABSTRACT**

The influence of culture on cognitive development is well established for school age and older children. But almost nothing is known about how different parenting and socialization practices in different cultures affect infants' and young children's earliest emerging cognitive and social-cognitive skills. In the current monograph, we report a series of eight studies in which we systematically assessed the social-cognitive skills of 1- to 3-year-old children in three diverse cultural settings. One group of children was from a Western, middle-class cultural setting in rural Canada and the other two groups were from traditional, small-scale cultural settings in rural Peru and India.

In a first group of studies, we assessed 1-year-old children's most basic social-cognitive skills for understanding the intentions and attention of others: imitation, helping, gaze following, and communicative pointing. Children's performance in these tasks was mostly similar across cultural settings. In a second group of studies, we assessed 1-year-old children's skills in participating in interactive episodes of collaboration and joint attention. Again in these studies the general finding was one of cross-cultural similarity. In a final pair of studies, we assessed 2- to 3-year-old children's skills within two symbolic systems (pretense and pictorial). Here we found that the Canadian children who had much more experience with such symbols showed skills at an earlier age.

Our overall conclusion is that young children in all cultural settings get sufficient amounts of the right kinds of social experience to develop their most basic social-cognitive skills for interacting with others and participating in culture at around the same age. In contrast, children's acquisition of more culturally specific skills for use in practices involving artifacts and symbols is more dependent on specific learning experiences.



## I. INTRODUCTION

Unlike their nearest great ape relatives, who all live in the general vicinity of the equator, human beings have come to inhabit ecological niches all over the globe, from the tropics to the arctic. In each unique locality, cultural groups invent and pass along to their children a unique set of material and symbolic artifacts and social practices for dealing with their particular adaptive challenges. Developing children must be adapted for learning and using these artifacts and practices if they are to navigate successfully the local environment into which they are born. Although some animal species also construct “artifacts” to which successive generations must adapt, the human case is special. Whereas ants are adapted for living in ant-constructed anthills, and beavers for operating in beaver-constructed dams, humans can only be adapted in more general and flexible ways for living and operating in cultural groups in general. Humans are adapted for cultural construction and cultural learning in general (Cole & Hatano, 2007; Tomasello, 1999a).

Importantly, human artifacts and cultural practices are typically invented and used not by individuals but by groups of individuals. Indeed, all of humans’ most impressive cognitive achievements—from complex technologies to linguistic and mathematical symbols to complex social institutions—are not the products of individuals but rather of groups of individuals cooperating together and creating artifacts and practices that accumulate improvements (ratchet up in complexity) across generations over cultural-historical time (Cole & Cagigas, 2010; Tomasello, Kruger, & Ratner, 1993; Vygotsky, 1978). To become functioning members of a cultural group, developing children must be born with a certain set of social-cognitive skills for participating in this group-think, or at least have the ability to construct such skills during early ontogeny. They must be able to do such things as understand and imitate the intentional actions of others, locate and identify the attentional focus of others, direct the attention of others to outside entities communicatively, collaborate with others by forming joint goals and attention with them, and use the shared symbols of the group.

Our focus in this monograph is on the nature of the ontogenetic processes that give rise to these basic social-cognitive skills for living and cooperating with others in cultural groups. We have learned much about these skills in young children in the past few decades, but we know much less about the ontogenetic processes involved, in particular how biological and cultural forces interact over the course of early development. One reason for this ignorance is that we have studied these skills almost exclusively in children developing in Western, middle-class cultures. Although the influence of diverse cultural practices on developmental outcome has been a basic assumption of many contrasting theoretical accounts of childhood cognition (Cole, 1996; Greenfield, Keller, Fuligni, & Maynard, 2003; Rogoff, 2003; Shweder et al., 2006; Tomasello, 1999a), there are few empirical tests.

We know a fair amount about cultural influences on cognitive development in older children, especially with a focus on the influence of literacy and schooling on fairly sophisticated cognitive outcomes (e.g., Cole, 1996; Olson & Torrance, 1996; Wagner, 2010), but we know very little about cultural influences on the cognitive development of younger children. Although there has been a steady increase in the past decade in the literature on the role of parenting practices, socialization, and peers on the cultural environments and development of children (for a review of these and other topics, see handbook chapters by Bornstein & Lansford; Gauvain & Parke; Rubin, Cheah, & Menzer, in Bornstein, 2010), we know almost nothing about how different cultural practices influence infants' and young children's earliest emerging and most basic skills for collaborating with, communicating with, and learning from others.

In the current monograph, we attempt to fill this gap by looking at the early social-cognitive development of children growing up in three very different cultural contexts in a series of experimental studies. We examine a number of skills that are candidates for cultural universals, and a couple that are less so, across cultural settings that differ in practices that are relevant for cognitive development. As such, our view is grounded in the sociocultural approach to human development (Cole & Hatano, 2007; Tomasello, 1999a) that has roots in Vygotsky's (1977) cultural-historical activity theory (see Goodnow, 2010, and Markus & Hamedani, 2007, for summaries of contrasting views). Clearly, the importance of cultural practices that are a part of the lives of infants and young children is integral to this approach; children will not develop along a path that is not supported by the agents of socialization in their culture. Equally crucial to a balanced view of human ontogeny are the skills that children bring to their cultural settings from their biological heritage; children have evolved a set of capacities that are enlisted, refined, and reformulated as they engage with others in their social group.

In this introduction we set the stage for our studies by reviewing, first, what is known about the social-cognitive and social learning skills that young children bring to the process of enculturation (mostly from studies of

Western, middle-class children) and, second, what is known, in general, about cultural influences on early cognitive development.

## EARLY SOCIAL-COGNITIVE DEVELOPMENT

Wherever they go, human beings create physical and symbolic artifacts and cultural practices. As Vygotsky (1978) was first to articulate, developing children interact with the world mostly through—as mediated by—these physical and symbolic artifacts and cultural practices. This interactive process then helps to either shape or create new cognitive skills.

### *Cultural Learning*

Vygotsky's (1978) main concern was to explicate the role of cultural artifacts in the process of cognitive development. He noted that tools and symbols (and, we might add, cultural practices) are, in an important sense, defined by their functions—by what they are “for.” A pencil is for writing, the linguistic symbol *pencil* is for directing the attention of others to pencils, and following the complex procedure called “baking a cake” is for creating cakes. There are always other persons behind these artifacts—those who invented or used them for their conventional functions previously—so that cultural artifacts have what Tomasello (1999b) called “intentional affordances.” A pencil may be banged or chewed as a physical object, but to use it conventionally for writing one must, in a sense, follow into the intentions of the previous creators and users of pencils.

Vygotsky (1978) went on to elaborate how children's cognitive skills are transformed as they internalize the process of interacting with other persons and their cultural artifacts. He was much less concerned with the foundational cognitive and learning abilities that young children must bring to the process in order to participate in human culture in the first place, the abilities they must have to appropriate (to use Rogoff's, 1990, felicitous term) in the use of the physical and symbolic artifacts and in the routines and practices of their culture.

Bruner (e.g., 1971, 1983, 1990) was much more concerned with the prerequisite cognitive and learning skills involved. For example, Bruner (1971) zeroed in on imitation as a skill at which humans seemed especially adept, compared with other primates, and that had obvious implications for the acquisition of cultural tools of all kinds. Bruner (1983) focused on young children's skills of joint attention as instrumental to their communication with others, including most especially the acquisition of conventional linguistic symbols. Bruner (1971, 1993) also noted that humans instruct their young—and the young respond to this instruction—in seemingly species-unique ways as well.

Tomasello et al. (1993) explicitly compared human children with their nearest primate relatives in an attempt to identify the skills of cultural learning and creation that lead to humans' uniquely cultural lifeways. Following Bruner's general lead, they singled out (1) imitative learning (as opposed to other forms of social learning) as an especially powerful human skill for appropriating the skills of more competent others; (2) instructed learning as involving an ability to, in a sense, read the mind of the adult/expert instructor; and (3) collaborative learning as a way of exchanging perspectives on things in interaction mainly with peers. Their hypothesis was that all three of these forms of cultural learning took their species-unique shape from humans' especially powerful ability to "read" the intentions and mental states of others. Tomasello, Carpenter, Call, Behne, and Moll (2005) stressed that over and above simply understanding the intentions and mental states of others, humans also have unique abilities and motivations for creating shared intentions and mental states with others, such things as joint goals, joint attention, and mutual knowledge. Herrmann, Call, Lloreda, Hare, and Tomasello (2007) provided empirical support for this general hypothesis by showing that 2-year-old children have cognitive skills for dealing with the physical world that are basically identical to those of their nearest primate relatives, whereas even at this young age they already have social-cognitive skills for dealing with their social/cultural worlds that are unique to the species.

In the past several decades, much empirical work has investigated young children's skills and motivations both for (1) understanding the intentions and mental states of others (e.g., by following their gaze direction or imitating their actions on objects) and also for (2) sharing the intentions and mental states of others in various forms of collaborative activities. In the current context, the main importance of these two sets of skills and motivations—which, importantly, are a main area of weakness for children with autism based on their atypical biology (Hobson, 1993)—is that they enable children to participate in and to internalize all kinds of cultural interactions and artifacts. We look at each of these two aspects of early social cognition in turn.

### *Understanding Intentions and Attention*

If artifacts have intentional affordances and social practices prototypically are aimed at desired outcomes, then being able to understand the goal-directed actions and intentions of others is key to becoming a member of a cultural group. Relatedly, and in addition, a key aspect of understanding the intentional actions of others is understanding, and attempting to control through communication, the perception and attentional focus of others as they perceive and act in the world.

Human infants begin to understand the goals underlying behavior sometime in the second half of the first year of life. In looking time experiments designed to detect when infants discriminate goal-directed action from nonintentional action, different paradigms suggest a range in the age of emergence between 9 and 12 months of age (see Woodward, 2009, for a review). Similarly, when infants are placed in a situation in which they must react to the intentional versus nonintentional actions of others, 9-month-olds react differently to these two different types of action, whereas 6-month-olds do not (Behne, Carpenter, Call, & Tomasello, 2005). It is noteworthy that some species of nonhuman primates in this same experimental paradigm also react differently to intentional versus nonintentional actions (chimpanzees: Call, Hare, Carpenter, & Tomasello, 2004; capuchin monkeys: Phillips, Barnes, Mahajan, Yamaguchi, & Santos, 2009), suggesting deep evolutionary roots for this very basic social-cognitive skill.

Two overt behaviors that emerge spontaneously in human infants at the end of the first year of life and that depend on the ability to read the goals and intentions of others are instrumental imitation and instrumental helping. Although both of these behaviors have noninstrumental forms as well (e.g., neonatal mimicking of facial movements and the comforting of others in emotional distress), imitation of goal-directed actions and helping others attain their goals suggest, obviously, some rudimentary understanding of the goals of others. First, although even 6-month-old infants may be influenced in their manipulation of objects by the previous manipulations of others (e.g., von Hofsten & Siddiqui, 1993), actually imitating the actions of others leading to a desired external result first emerges at around 12 months of age (Carpenter, Nagell, & Tomasello, 1998). Children demonstrate this understanding of the intentional dimension of actions most clearly between 12 and 18 months of age, as they reproduce the intended, rather than the actual, end result of an adult's action (Bellagamba & Tomasello, 1999; Johnson, Booth, & O'Hearn, 2001; Meltzoff, 1995) and also discriminate and preferentially imitate an adult's intended rather than accidental action on an object (Carpenter, Nagell et al., 1998). Human-raised chimpanzees also imitate intended rather than actual end results and preferentially imitate intended rather than actual actions (Tomasello & Carpenter, 2005).

Second, instrumental helping is most often studied for its relevance to issues of altruism and prosociality, but to help someone achieve their goal, obviously one must be able to determine what their goal is. In looking time experiments, infants show an ability to discriminate helping from hindering behaviors (in animated figures on a TV screen) during the second half of the first year of life (Hamlin, Wynn, & Bloom, 2007; Kuhlmeier, Wynn, & Bloom, 2003). In their own overt behavior, infants actually help others do such things as fetch out-of-reach objects and open

cabinet doors (not doing so in various control conditions) from at least 14 months of age (Warneken & Tomasello, 2006, 2007). Again, our nearest primate relatives, chimpanzees, also show an ability to determine the goals of others' actions in instrumental helping situations as well (Warneken, Chen, & Tomasello, 2006; Warneken & Tomasello, 2006).

Understanding intentional action also involves understanding that the actor is perceiving and attending to things in the external world. It is thus no surprise that infants begin to understand the directedness of perception and attention during this same developmental period as well—from the middle of the first to the middle of the second year of life. In looking time experiments, 14–16-month-old infants discriminate situations in which an actor can and cannot see an object she likes (e.g., Luo & Beck, 2010; Sodian, Thoermer, & Metz, 2007). In experiments requiring infants to actually single out from an array of potential referents, the one that an adult is actually attending to (because it is due to the situation and she is acting excited), again it is around 12–14 months of age that the first skills emerge (e.g., Moll & Tomasello, 2007; Tomasello & Haberl, 2003).

Two overt behaviors that emerge spontaneously at around this same time and that depend on the ability to locate or manipulate the focus of another person's attention are following the gaze direction of others to locations behind barriers and directing the attention of others communicatively by pointing. First, infants follow the gaze direction of others to external objects from 3 to 6 months of age (D'Entremont, Hains, & Muir, 1997; Scaife & Bruner, 1975). But this may be based on some very simple predispositions for co-orienting and learning to find interesting things in the head or eye direction of others. These simple mechanisms cannot account for 12-month-old infants actually crawling a few meters to look behind a barrier an adult was just gazing behind (Moll & Tomasello, 2004). If they were simply co-orienting or randomly looking in the direction, there would be no need for them to change their angle of viewing. Following the gaze direction of others to hidden locations behind barriers thus indicates selectivity in locating precisely what others are attending to. Interestingly, again, chimpanzees also follow the gaze direction of others to locations behind barriers (Tomasello, Hare, & Agnetta, 1999).

Second, human infants not only follow the gaze direction of others to external entities, but they also attempt to direct the attention of others to external entities, prototypically through the use of pointing gestures. Infants first begin to point communicatively at around 12 months of age (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Butterworth, 2003; Carpenter, Akhtar, & Tomasello, 1998; Leung & Rheingold, 1981; Murphy & Messer, 1977), and from the beginning they point with referential intentions for various social reasons, such as sharing attitudes and helping by informing (Tomasello, Carpenter, & Lizskowski, 2007).

Although chimpanzees and other great apes sometimes point for humans (not for one another), they always do so for selfish motives, and they cannot refer to absent entities in the same way as 12-month-olds do (Liszkowski, Schäfer, Carpenter, & Tomasello, 2009). Indeed their pointing behavior may be closely related to reaching for out-of-reach objects (Tomasello, 2006). In contrast, human infants point with the index finger to direct others' attention to specific objects and events in an attempt to express and share their interest (expressive declarative pointing; Liszkowski, Carpenter, Henning, Striano, & Tomasello, 2004; Liszkowski, Carpenter, & Tomasello, 2007a, 2007b). Such pointing may thus be considered the earliest form of referential, prelinguistic communication.

In summary, the most basic social-cognitive skills for understanding what others in the culture are doing, and for becoming like them, are those involved in the understanding of intentional action and perception. The most basic forms of these skills emerge in spontaneous and overt behaviors at around, or soon after, the first birthday, although in all cases more complex forms emerge somewhat later. As noted, of particular importance for the current study are the overt behaviors of (1) instrumental imitation and (2) instrumental helping, as indicators of an understanding of intentional action, and (3) gaze following behind barriers and (4) declarative pointing, as indicators of an understanding of intentional perception (attention). The fact that our nearest primate relatives also show many of these same behaviors (perhaps with some slightly different characteristics in some cases) attests to their deep evolutionary roots.

### *Sharing Intentions and Attention*

Understanding others as intentional agents who act toward goals and perceive and attend to the world is a necessary prerequisite for appropriating the various artifacts and social practices of a human culture. But it is not sufficient. To become a humanlike cultural being one must in addition be capable of actively *sharing* intentions and attention with other persons in such things as collaborative and joint attentional activities (Tomasello et al., 2005).

A key piece of evidence for this proposal is that for almost all of the behaviors enumerated in the previous section chimpanzees and other nonhuman primates also showed an understanding of intentional action and perception (see Call & Tomasello, 2008, for a thorough review of evidence that chimpanzees understand others through a kind of perception-goal psychology). But they have not created and they cannot acquire many of the most important features of a human culture. In their natural behavior in the wild, chimpanzees in particular do show some features of cultural transmission of behaviors, but it differs from human cultural organization precisely because it is based only on the understanding of others as inten-

tional actors and so supports only the exploitation of the skills and behaviors of others through some forms of social learning, gaze following, and the like. What is missing is any kind of shared intentionality as expressed in truly collaborative and joint attentional activities.

In terms of overt behavior, the key expression of shared intentionality is collaborative activities in which the participants have a joint goal and joint attention (Bratman, 1992). Beginning with joint goals, whereas many animal species engage in social activities that are generally cooperative—all social life, almost by definition, is cooperative—truly collaborative activities with joint goals have some special characteristics. Most importantly, the participants have some kind of joint commitment to one another in pursuing their joint goal, such that breaking the commitment is some kind of social breach. Thus, Warneken and Tomasello (2006) engaged 18- and 24-month-old children in several different collaborative activities. But then the adult stopped interacting in the middle of the activity. Virtually all of the children at least once made active attempts to reengage the adult in the activity. Graefenhein, Behne, Carpenter, and Tomasello (2009) found that they did this even when the child on her own could easily continue the activity. Moreover, from about 3 years of age if the child herself wanted to opt out of the activity, she engaged in some kind of “leave taking” as a direct acknowledgment that she wished to break her commitment to the joint goal. Although chimpanzees and other nonhuman primates engage in various kinds of group activities, Warneken et al. (2006) directly tested whether they attempt to reengage a recalcitrant partner, and the answer is that they do not—presumably because their social interaction with the other is not structured by a joint goal.

As individuals engage in collaborative activities with a joint goal, they also monitor one another’s attention. Indeed, in truly collaborative activities joint attention is an integral part, as adjusting one’s behavior to the partner involves comprehending and anticipating her actions—based in large part on what she is attending to. But joint attention is more than just each partner monitoring the other’s attention; it is truly shared attention, recursively structured so that each knows the other is monitoring her attention also, and monitoring her monitoring their attention, and so on *ad infinitum* (Tomasello, 1995). Joint attention may also arise from the bottom up, as it were, as two individuals spy some interesting site and share interest and attention to it. Young children first engage in joint attention with others beginning at around 9–12 months of age (Bakeman & Adamson, 1984; Carpenter, Akhtar et al., 1998), and it structures not only their collaborative activities but also their early skills of communication and language (Tomasello, 2003). Although chimpanzees and other nonhuman primates follow the gaze direction of others to external targets, they do not, as best we can tell, engage in true joint attention (Tomasello & Carpenter, 2005).

The basic motives for shared intentionality may be uniquely human as well, especially the motives to collaborate with others for its own sake and to share experience with others for its own sake as well. Of all the activities discussed so far, the motive behind expressive declarative pointing and joint attentional interactions—to simply share experience with others—would seem to be the purest expressions of this motive. For the current study, then, the key expressions of shared intentionality are participation in joint attention to external entities (including expressive declarative pointing) to simply share attention and participation in collaborative activities with joint goals (including child reengagement attempts toward a recalcitrant partner).

### *Comprehending and Using Symbols*

It is highly likely that coming to understand others as intentional agents, and coming to engage in various kinds of shared intentionality with others, depends on infants participating from birth in a social environment with all of its emotional and behavioral interchanges. It is also likely that infants growing up in all kinds of cultural environments are getting enough of the right kinds of social and emotional interchanges to foster the growth of these very basic social-cognitive skills and motivations. The kinds of things that vary cross-culturally in young children's social environments may not affect these foundation skills.

However, other important and early emerging social-cognitive skills are things that children learn from adults directly, and development of these skills may vary substantially cross-culturally. A clear exemplar is the use of symbols of various kinds. Most obviously, different cultures have different repertoires of linguistic symbols/conventions for communicating with others in the group. Children must get specific kinds and amounts of exposure to adults using linguistic symbols to acquire these symbolic artifacts. This means that if there is significant cultural variation in children's exposure to linguistic symbols, it could conceivably have some kind of an effect on their acquisition. In Western, middle-class cultures young children typically begin producing conventional linguistic symbols within a few months after their first birthdays (Bates, 1979; Carpenter, Akhtar et al., 1998). These and other milestones of early linguistic comprehension and production have been reported to be similar in cross-linguistic research, although the acquisition of more complex strategies for language acquisition may well vary across cultures (see Lieven & Stoll, 2010, for a review of cross-linguistic development research).

Another ubiquitous symbol system introduced in the early environments of children in Western cultures is pretend play, which includes both object substitution (i.e., this stick is a horse) and role play (i.e., I am an alien

invader). In some theories of early pretense, children simply exercise some kind of individual imaginative faculty to treat some objects or behaviors as symbolic of others (e.g., Leslie, 1987; Piaget, 1962). But in other theories, children's initial use of pretense symbols comes from their experiencing others using objects and behaviors as symbolic of one another in play directed toward the child (even though later they may come to engage in symbolic pretense on their own), and their early pretense acts are exercised in some sense for others in a social context (Rakoczy, Striano, & Tomasello, 2005; Rakoczy, Tomasello, & Striano, 2005). Early use of pretense symbols may rely heavily on the models of others, whereas later use may be based on a true understanding, and creative application, of the symbolic function. Again this means that if there is significant cultural variation in children's exposure to social interactions that include pretend symbols, it could conceivably affect the onset of their early understanding and exercise of this skill. In Western, middle-class cultures young children typically begin comprehending pretense symbols as truly symbolic within a few months after their second birthdays (Harris & Kavanaugh, 1993; Rakoczy & Tomasello, 2006). Across cultures, role play appears during the preschool period across a variety of cultural environments, whereas pretense using object substitution is less common and its universality is less clear (Chick, 2010; Lancy, 1996).

A symbolic skill that might plausibly vary even more across cultures is the ability to comprehend pictorial symbols, as in paintings or drawings on paper. Such pictorial symbols are ubiquitous in the early environments of Western middle-class children, particularly in artifacts designed to foster early learning of language (e.g., baby picture books). When tested using language-based learning games, even 18-month-olds have been found to link pictures with words (Preissler & Bloom, 2007; Preissler & Carey, 2004); however, research controlling for the bootstrapping of pictorial symbol skills with language estimates that true understanding of the symbolic function of pictures per se develops closer to children's third birthdays (Callaghan, 1999, 2000, 2008; Deloache & Burns, 1994). Importantly, previous research has demonstrated that if children get more experience with adults using pictorial symbols to represent external reality, they understand the symbolic function and produce their own symbols at an earlier age (Callaghan & Rankin, 2002). Pictorial symbols are less important in the early development of young children in many other cultural contexts, where children have little, if any, exposure to pictorial symbols before formal schooling begins. There is virtually no cultural research that examines the development of understanding the symbolic function of pictures.

And so in the case of the appropriate use of culturally significant symbols, it would seem that experience with these artifacts themselves, and variations in how this experience comes about cross-culturally, might play a

more significant role than in the acquisition of more basic social-cognitive skills of understanding and sharing intentions. Of particular importance for the current study are understanding pretense symbols and understanding pictorial symbols. Across these two symbolic systems there is variation in the extent of symbolic engagement of young children by adults at different points in children's development within, and across, each of the three cultural settings. This variation provides a strong empirical context to test the core issue of the extent to which culture impacts the acquisition of symbolic skills.

### *Summary*

Our basic question, then, is where do children's most fundamental social-cognitive skills for becoming members of cultures come from? Of the many approaches one might take to this question, in the current monograph we ask the more specific questions of whether children growing up in very different cultural contexts show significant variation in the age of onset or in the levels of these skills. Based on the brief review of three different sets of skills above, we might expect that skills for understanding intentions and attention (many shared with other primates) are not so sensitive to cultural variations in social environment; that the development of skills for sharing intentions and attention, even though uniquely human, are also fairly robust across different social environments; but the use of symbols, because it depends more on exposure to specific symbolic experiences with others, might vary more widely across cultural contexts that differ in the extent to which children are engaged by others in the symbolic systems. But to specify this general hypotheses in more detail we must first look at previous research and hypotheses about the role of culture in cognitive, and especially social-cognitive, development.

## THE ROLE OF CULTURE IN EARLY SOCIAL COGNITION

Developing human beings acquire many specialized cognitive skills for functioning effectively in the cultural environment into which they are born. For adults, these skills may be very different in different cultures, everything from building a kayak to mastering arithmetic to collaborative fishing with nets. But at the same time there are almost certainly very basic cognitive skills that are the same for individuals in all cultures. We cannot review here the voluminous literature on culture and cognition (see recent handbooks on this topic by Bornstein, 2010; Kitayama & Cohen, 2007; Lancy, Bock, & Gaskins, 2010), but what we can do is to provide a general context for our study of culture and early social-cognitive development, as well as a general justification for our specific hypotheses.

## *Culture and Cognitive Development*

Classical cross-cultural psychology investigates differences in (among other things) cognitive skills across cultures (Berry, Poortinga, & Pandey, 1997). A number of initial studies documented cultural differences—typically between traditional and industrialized cultures—but they were often not sensitive to the different ways that people in different cultures might view the tasks or to the different contexts in which these skills might be manifested in everyday life. For example, in some early studies differences in memory skills were found, but later when the content to be memorized was made more relevant to the daily activities of individuals in each culture (e.g., recalling offered items of bridewealth), these differences basically disappeared. This happened again with quantitative skills, which people in traditional societies tended to display mostly, or only, in the contexts in which they used them on a daily basis (e.g., in measuring rice). Supposed differences in basic processes of visual perception disappeared when the testing situation was tailored more effectively to individuals (see Cole, 1996, and Triandis, 2007, for very informative historical accounts).

But of course there are differences. Most obviously, to function effectively in modern, industrialized cultural settings individuals need to acquire both literacy and numeracy, and they must be able to engage in basic forms of scientific and other types of abstract reasoning. They typically acquire these skills in the context of formal schooling. In more traditional small-scale societies, these skills are often not needed, and there is often very little in the way of formal schooling. Instead, developing individuals acquire the skills they need—including expertise in many domains that people in industrialized countries know nothing about—in more informal pedagogical settings. A variety of lines of evidence suggests that literacy/numeracy and schooling lead individuals to develop more decontextualized, abstract modes of thinking and reasoning (Cole, 1996; Wagner, 2010). Recent studies have also suggested that the categories and conceptualizations embodied in particular natural languages (which have developed historically for communication about things important in the particular culture) affect the way that the individuals who learn them categorize and conceptualize the world (e.g., Levinson, 2001; Medin, Ross, & Cox, 2006).

Beyond the effects of literacy, schooling, and language on the categorization, conceptualization, and reasoning of adults in different cultures, there have also been some cross-cultural studies of children themselves (for a review see Wagner, 2010). The most well-known paradigm focuses on the ontogenetic emergence of various kinds of Piagetian concepts, such as conservation, classification, seriation, and so forth (Berry et al., 1986; Dasen, 1977). These types of concepts are very basic but at the same time fairly abstract, and the general finding is that although children in all cultures

acquire skill with these concepts, children in cultures without much in the way of literacy and formal schooling tend to acquire them at a somewhat later age (Dasen, 1977). Children who must master mathematics for specific purposes (e.g., to engage in street commerce), do so quite readily without formal schooling, though of course only for the most basic skills (Saxe, 1985).

Very little is known about cultural differences of young children in the first few years of life in the foundational cognitive and social-cognitive abilities examined in this monograph. Symbolic development has been investigated mostly in the domains of play and language. A number of investigators have documented cultural differences in the way that infants and young children engage in various forms of play, with both adults and peers (e.g., Bornstein, Haynes, Pascual, Painter, & Galperín, 1999; Farver, 1993; Gaskins, Haight, & Lancy, 2007; Göncü, Mistry, & Mosier, 2000; Haight, Wang, Fung, Williams, & Mintz, 1999; Lancy, 1996; Morelli, Rogoff, & Angelillo, 2003; Rogoff, 2003). Of most importance for the current study, various investigators have documented differences in the amount of symbolic play with objects across different cultures (Chick, 2010; Gaskins et al., 2007; Lancy, 2001). In terms of language, several studies have documented the language development of children in various traditional, small-scale societies, and found that children develop the skills they need at the times they need them (e.g., Brown, 2001; De León, 2000; Lieven & Stoll, 2010; Schieffelin & Ochs, 1986). There are almost no quantitative comparisons, however, of the rate of language development (e.g., in terms of vocabulary size or syntactic skills) across different cultural settings (see Lieven & Stoll, 2010, for a review).

In terms of the most basic skills of social cognition outlined in the previous section—those for understanding, imitating, and sharing intentions and attention—and in functioning with pictorial symbols, virtually nothing is known about potential cross-cultural differences.

### *Cultural Contexts for Cognitive Development*

An obvious dimension of variation in cultural contexts for cognitive development is the nature and extent of adult teaching. Industrialized cultures almost always have some type of formal education—outside of everyday contexts, with direct verbal instruction—whereas more traditional, small-scale societies typically rely much more on informal education—in the context in which the skills are actually used in real life, with less direct verbal instruction (e.g., see papers in Greenfield & Lave, 1982; Lancy et al., 2010; Olson & Torrance, 1996). Although direct verbal instruction is near universal with older children in traditional cultures about such culturally critical topics as kinship relations and proper behavior in public (Kruger &

Tomasello, 1996), younger children's education is not explicit but is better characterized as "guided participation" (Rogoff, 1990, 2003; Rogoff, Maturov, & White, 1996). Children watch as adults perform their daily tasks because they will be expected to perform them in a few years. They are sometimes encouraged to watch but seldom overtly instructed. Gaskins (2006; Lancy et al., 2010) provided a particularly apposite characterization of the different educational philosophies involved. In many traditional cultures, the parents are very busy with subsistence activities, and children are simply expected to find their way into the cultural practices surrounding them by watching and learning. The onus is not on parental teaching to create competent children but on the children themselves.

In terms of very young infants and children, the vast majority of research exploring the role of cultural context is on parenting practices (for a review, see Bornstein & Lansford, 2010). The classic work of the Whitings (Whiting & Whiting, 1975), for example, was concerned with the effect of parenting practices (e.g., nursing and toilet training) on developing personality (see also Konner, 1977). More recently, investigators have posited biologically based skills of "intuitive parenting" but with significant cultural variation as well (e.g., Papoušek & Papoušek, 2002). Thus, for example, parents in all cultures will naturally feed and protect their children, but this will be done very differently depending on local conditions. In this view, parents adapt their socialization practices to the conditions of their ecocultural environment involving everything from infant mortality and health to the role of formal education to the nature and role of the public sphere in everyday life.

Within this overall framework, Keller (2007) posited two overarching parenting styles for infants and young children, adapted to the needs of the culture. They represent the overall way the culture structures social relations: *independent* (emphasizing individual agency and autonomy) prevailing in industrialized societies and *interdependent* (emphasizing social connectedness and belonging) prevailing in traditional, small-scale societies (see also Rogoff, 2003). Adapted more for the fostering of independence in infancy in particular are the terms *distal parenting*, with an emphasis on face-to-face contact and object stimulation, and *proximal parenting*, with an emphasis on body contact and body stimulation (Demuth, 2008). Distal parenting is thought to foster the development of the self as a separate and autonomous agent, whereas proximal parenting is thought to foster the development of social cohesion and feelings of relatedness and belonging. As at least partial support for this proposal, Keller (2007) found that children from more industrialized societies (with distal parenting) are quicker to develop skills of personal self-recognition, whereas those from more traditional societies (with proximal parenting) are quicker to develop skills of personal self-regulation.

Of special interest here are potential cultural differences of these types in two reasonably well-documented domains of parent–infant interactions,

which some researchers have posited as especially critical to young children's early social and social-cognitive development. First is parent–infant face-to-face (dyadic) communication in the first year of life. Trevarthen (1979) coined the term protoconversation to describe the kind of back-and-forth exchange characteristic of mother–infant interactions in Western middle-class culture (which he also believed manifest what he called “primary intersubjectivity”). Trevarthen as well as others (Stern, 1985) have tacitly assumed that this pattern of communication is universal, and theorists such as Bruner (1983) and Kaye (1982) have posited that treating infants as intentional agents and competent communicative partners is critical to their social-cognitive development. Even more specifically, researchers such as Gergely and Watson (1996) and Rochat (2001) have posited that within these interactions it is critical for the infant's social-cognitive development that the mother “mirror” many of the infant's behaviors back to her through face-to-face mirroring—as feedback on their similarity as intentional agents but their difference as individuals.

But a number of anthropological researchers have reported ethnographic data to the effect that mothers and infants in many more traditional societies do not communicate often, if at all, in this mode (e.g., Kaluli: Schieffelin & Ochs, 1986; Gussi: LeVine et al., 1994; Mayan: De León, 2000; Gaskins, 2006). Gussi mothers, for example, have mutual eye gaze with their infants during nursing less than one third as much as Western middle-class mothers (LeVine et al., 1994), and Gaskins (2006) reported that Yucatec Mayan mothers seldom make and maintain eye contact with their infants. In the most systematic study to date, Demuth (2008) compared mother–infant communication (of infants age 12 weeks) in a Western middle-class culture with that in a more traditional, rural culture in Africa (the Nso). She summarized her findings as follows:

The general pattern in the [Western, middle class] group is one in which mothers position their infants as quasi-equal partners, engaging them in collaborative negotiations and structuring the interactions in a dyadic turn-taking. . . . The focus is on the individual experience and personal preferences of the child. . . . The general pattern in the Nso group is one in which mothers position their infants as novices who need to learn compliance and subordination. The interactions are lopsidedly structured by the mothers . . . (p. 169)

With regard to mirroring in particular, Demuth found that mothers in both cultures imitated and mirrored the infants on occasion, but

there are major differences in the way they do this: the Nso mothers mirror what the child is doing by referring to the child's outward appearance without further elaborating on it. . . . In contrast, the [Western middle class] mothers mirror the child's behavior by referring not only to the outward appearance

but most prominently by referring to and richly interpreting the assumed intentions and inner experience of the child. They take up on what the child is doing by following the child and giving the child the lead. (p. 171)

And so the existing data relevant to aspects of parenting presumed to be critical to the development of communicative systems suggest that mothers and infants in all cultures very likely communicate with one another regularly. But the structure of that communication may be quite different across cultures. In particular, the kind of infant-centered, psychologically centered, face-to-face social interactions characteristic of Western middle-class mothers and their babies (the classic protoconversations) are not characteristic of many mothers and infants in non-Western, traditional cultures. And the way that some features of their communication take place—for example, mother mirroring infant—are very likely highly variable across cultures as well.

The second domain of parent–infant interactions that researchers have posited as especially critical to young children’s early social and social-cognitive development concerns triadic (joint attentional) social interactions around objects. Although not claiming universality explicitly, many researchers investigating joint attentional processes in Western, middle-class parents and children have tacitly assumed such universality (e.g., Barresi & Moore, 1996; Bruner, 1983; Tomasello, 1999a). For all of these researchers, the opportunity for children during the first 2 years of life to have adults show them objects and share experience around objects plays a critical role in all kinds of later developments, perhaps especially communication and “theory of mind.” Most specifically, Barresi and Moore (1996) claimed that social interactions with adults around objects give infants the opportunity to learn such basic things as first person–third person equivalence, in which infants can see that both they and their partner are experiencing something similar (though perhaps from a different perspective); this is thought to be the fundamental basis of children’s developing “theory of mind.”

But again it seems that researchers have been a bit Eurocentric and that this pattern of adults showing and sharing objects with infants is not universal, at least not in its prototypical Western, middle-class form. For example, Rogoff, Mistry, Göncü, and Mosier (1993) reported significant differences between middle-class cultures, in the United States and Turkey, and more small-scale traditional cultures in rural Mexico and India, in the way adults structure activities for children during the second year of life. Specifically, in the two middle-class cultures parents often structured activities for these 1-year-olds as they played together in various games. In contrast, in the two more traditional cultures, children took the lead in trying out activities in which they had observed adults engaging, with little

or no overt structuring from adults. More generally, Gaskins (1999) reported that whereas Yucatec Mayan 12-month-olds spend as much time in object manipulation as do Western, middle-class infants of the same age, the Mayan infants almost always do this in solitary mode, whereas the Western middle-class infants often do it in social interaction with others. Gaskins (2006) noted that in many traditional cultures parents almost never play with young infants around objects (she cites the Kaluli, the Somoans, the Gussi, and the Mayans)—mainly because adults have very little free time to engage in this kind of “nonproductive” play, and in addition, adult play with children is inappropriate because children are expected to adapt to the adult world, not vice versa. Most often, parents will simply give the infant an object or place it in front of the infant and then go about their business. Gaskins (2006) summarized the cultural differences in this domain as follows:

In all of these cultures, and in many others, the amount of time spent during a child’s first two years with caregivers in social games, pointing and naming, and mutual play with objects is dramatically lower than in Euro-American homes and in some cases virtually nonexistent. (p. 290)

And so, again, the currently existing data suggest that triadic (joint attentional) interaction around objects by parents and their young children is not universal across cultures during the first 2 years of life, at least not in the prototypical form or level in which it is typically characterized in the scientific literature. Parents in more traditional cultures are often too busy for this kind of object play with infants, and they do not view it as something that is particularly useful or necessary for the child. At the very least, then, there is almost certainly significant cultural variation in the extent to which adults and young children interact around objects during the child’s first 2 years of life.

The overall picture in traditional cultures appears to be more proximal parenting in infancy and emphasis on social interdependence in early childhood, with infants experiencing few “protoconversations” and young children experiencing few joint attentional interactions around objects with adults. In contrast, more distal parenting in infancy and an emphasis on autonomy and social independence characterize industrialized cultures in early childhood, with infants experiencing more “protoconversations” and young children experiencing more joint attentional interactions around objects with adults.

## GOALS OF THE STUDY

Clearly the cultural context within which young children develop channels their cognitive development in specific ways, leading to sometimes

dramatic differences in the cognitive skills of adults in different cultures. And these can already be seen along the way in older children in some cognitive domains. But we know much, much less about potential cultural differences in the cognitive skills of infants and young children. Because adults in many traditional cultures interact with their children in very different ways from adults in Western, middle-class cultures, as we have just seen, the question is whether these differences lead to differences in early social cognition. Do the kinds of basic social-cognitive skills outlined in the first part of this introduction—such things as imitation, helping, gaze following, pointing, collaboration, joint attention, symbolic play, and pictorial symbolic competencies—show cross-cultural variation in young children as a result of these different parenting practices? On the basis of current research, the answer is that we simply do not know. Gaskins (2006) stated:

Given the amount of information available about existing *practices* of infant socialization across cultures, it is surprising that comparable information about infant *capacities and behavior* are not available. Ethnographic studies involving early socialization have devoted much more attention to adult behavior than to infant behavior. Thus, we simply lack the most basic descriptive data about infants. We do not know whether children everywhere show the same social behaviors, and at the same ages. (p. 294, emphasis in original)

As Gaskins (2006) went on to argue, it is possible that cultural variation in early parenting practices have no effect on basic cognitive and social-cognitive skills either because (1) the ontogeny of these skills is mainly biologically driven or (2) there is some threshold level of necessary social interaction that is present in all cultures (so that cultural variability in social interactions does not matter, at least in early development). On the other hand, it is also possible that there are indeed different cognitive outcomes in young children in different cultures as a result of different parenting practices, but we simply have not investigated these outcomes systematically. With particular regard to the social-cognitive skills of interest in the current study, there is very little relevant cross-cultural research. Given the basic nature of these skills, we should not expect to see a culture where they are totally absent, but we might expect to see them in a different form, at a different level, or perhaps on some different developmental timetable. If infants' social-cognitive development is somehow facilitated by a more active pedagogical attitude on the part of parents (characteristic of industrialized cultures), then we should see a relatively slower developmental timetable for infants in traditional cultures. If, on the other hand, infants' social-cognitive development is not so much influenced by these different parenting practices, then we should see more uniform developmental trajectories and levels of skill across both more traditional and more industrialized cultures.

For the current study, we identified eight basic social-cognitive skills that infants and young children engage in fairly robustly in Western, middle-class cultural settings. Each skill has been studied intensely enough with experiments for us to have a fairly clear picture of the normal developmental trajectory in these cultural settings. Our focus here is mainly on developmental timing and the presence of any social factors that might be known to affect this developmental timing. We administered these tasks to children in three very different cultural settings, two more traditional, small scale and one Western, middle class. The different social environments for infants and young children in the three cultural settings will be documented ethnographically in the next section.

We begin with the following predictions for the developmental timing of our eight social-cognitive skills in the three cultural settings: (1) very little, if any, cultural variation in onset is expected for the most basic skills involving the ability to understand intentional action and perception, which are measured in the instrumental imitation, instrumental helping, gaze following, and pointing tasks; (2) the developmental trajectories may show slightly more variation in the case of the more interactive skills of collaboration and joint attention, which are actually measured as two individuals actively interact; and (3) the most cultural variability should be seen in children's acquisition of skills of symbolic play and the use of pictorial symbols because these skills would seem to be more directly dependent on particular types of cultural experiences. One way or the other, the current study should provide us with basic information from three diverse cultural settings—two of which are more traditional—about the development of young children's earliest social-cognitive skills. This should help us to specify theoretically the nature of the ontogenetic processes through which these most basic skills of cultural cognition emerge in young children, in particular the interplay of biological heritage and cultural experience.

Methodologically, it is important to note that assessing the cognitive skills across diverse cultural settings of the participants in the current studies—children from around 1 to 3 years of age—does not present the same problems (or at least not to the same degree) as assessing the cognitive skills of adults and older children across cultures. Children this young simply have not developed the kinds of cultural expectations that so confound experimenters trying to create fair and equal procedures for assessing the cognitive skills of adults and older children from different cultural backgrounds. In the current studies we simply create for these young children fairly natural-seeming social scenarios (e.g., a friendly female adult demonstrates actions on objects, invites them to collaborate), and we then record their natural reactions in these controlled social scenarios. Although interacting in these ways with adults may be more familiar for Western, middle-class children, it is nevertheless a reasonable assumption that in the first few

years of life children experience these social scenarios in very similar ways, no matter their cultural background. Support for this assumption is given by the fact that infants and children in our studies were highly engaged in all of the procedures across all cultural contexts, with very low rates of participant loss due to fussiness or refusal to participate.

## II. GENERAL METHODOLOGY

### THE THREE CULTURAL SETTINGS

The ethnographic sketches that follow are based on public records as well as observations and interviews made by the primary experimenter over a 5-year data collection period. The sections are organized according to the country within which these settings are found, but we are by no means suggesting that countries are unicultural entities (see deCastro Ribas, 2010, and Saraswathi & Dutta, 2010, for discussion of the intracultural diversity within India and Central and South America, respectively). Local assistants who facilitated recruitment, tested infants, or were involved in social development project work with mothers and young children served as informants on most occasions. Thus, ethnographies of each cultural setting were built from parental interviews, naturalistic observation, community records, and discussion with community leaders. A summary of the main similarities and differences (along eight categories) across cultural settings is provided in Table 1. Cultural differences relevant to specific procedures were obtained directly from interviews with mothers and are presented in the appropriate method and results sections.

#### *Peru*

The research was conducted in the village of San Pedro de Saño and four villages close by (total population of San Pedro de Saño and all surrounding villages is 4,183). These villages are located in the Montaro Valley, 15–20 km outside of the Andean Central Highlands city of Huancayo (approximate population 480,000). Population of the villages involved in the study ranged from 100 to 1,000 people. The Montaro Valley is located at altitude 3,271 m, in Junin province. Families predominantly practice the Catholic religion (93%), with a minority practicing evangelical Christianity. Typically, livelihood in the villages is gained through agriculture, traditional crafts, service work, or labor. Whereas some mothers work outside of the home, many mothers work in small collaborative groups of women who engage in agriculture or traditional crafts production. This work often supplements income earned by fathers, many of whom work outside of the

TABLE 1  
SUMMARY OF CONTRASTS ACROSS CULTURAL SETTINGS

	India	Peru	Canada
Maternal education or literacy	Most only a few years of schooling Most not literate	Most with some high school Most literate	Most with postsecondary education All literate
Typical livelihood	Seasonal or subsistence agriculture or herding Traditional production (e.g., weaving) Service and labor	Seasonal or subsistence agriculture or herding Traditional crafts (e.g., weaving, knitting, jewelry) Service and labor	Professional Agriculture or aquaculture base Trades Service and labor
Maternal occupation or work	Household work primary responsibility Occasional seasonal work outside home	Household work primary responsibility Subsistence farming herding common Traditional coop craft production common	Most employed outside with shared household responsibility Professional Agricultural Service
Maternal child care practice	Primary caregiver Infant kept close Cosleeping common Most breastfed through infancy	Primary caregiver Infant carried in manta Cosleeping common Most breastfed through infancy	Primary caregiver Father active in caregiving Infant car seat most common Infant backpack less common Cosleeping rare 6 months of breastfeeding typical
Caregiving by others	Only within close extended family network Typically in family home	Only within close extended family network Typically in family home	Typically outside of family home Infant day care Occasionally cared for by relative or professional child care worker
Infant locomotion and independence	Early independent locomotion encouraged around first birthday Interdependence fostered	Early independent locomotion discouraged until second year Interdependence fostered	Early independent locomotion encouraged around first birthday Independence fostered

TABLE 1. (Contd.)

	India	Peru	Canada
Infant inclusiveness in everyday practices	Infants included in most aspects of daily life Specialized infant activities rare	Infants included in most aspects of daily life Specialized infant activities rare	Infants segregated from adult work Specialized infant activities common (e.g., play time, bedtime)
Material possessions or technology	Households sparsely fitted Toys rare, mostly handmade from nature Telephones, TV, computers rare	Households sparsely fitted Toys rare, mostly handmade from nature Telephones, TV, computers rare	Households elaborately fitted Specialized manufactured infant toys, furniture, equipment common Telephones, cell phones, computers, TV common

valley as laborers. From birth until about the third year, a child is typically carried around on his or her mother's back in a traditional "manta" shawl, which is tied over the shoulders with the infant tucked inside. Cosleeping is common during this period. The first few years are traditionally considered to be a very important time in a child's life, and it is believed that during this time the child learns "how to be in the world." Although many mothers who engage in traditional crafts or agricultural work do so with their children in the manta, it is also common for children to be left with an extended family member, often a child's grandmother. Children's environments in the villages are richly steeped in tradition and community gatherings that celebrate those traditions. There was at least one major festival honoring a patron saint or celebrating the founding of one of the villages each month during the testing period of the study. These festivals usually last over a week, with most community members playing some role in the preparation or in the conducting of the festivities. As in other daily activities, infants and young children are typically included in these celebrations. Many extended families live together in the same household in the villages and have electricity and own electronic equipment, such as radios and, less frequently, televisions. It is common for at least one family member to have a prepaid service cell phone. Beyond that, households are very basically outfitted with families, especially children, having few material possessions. Specialized children's toys are uncommon. It is also not common for families to own a computer, although in the past decade some younger members of the families access them through Internet cafés located in Huancayo. Clean drinking water is usually available through neighborhood hand pumps, which are fed by higher altitude springs or

through a network of aqueducts from surrounding hills. Health care is not usually available in the villages; families have to travel to the nearby town of Hunacayo for access to a health care provider and to the country's capital city of Lima (an 8-hr bus ride) for specialist health providers. Travel to these cities is rare because it poses financial challenges for most families.

### *India*

The research was conducted in six villages in the vicinity around the larger village of Srikakulam (population 3,200), located in the Krishna District outside of Vijayawada, the third largest city in Andhra Pradesh. The villages ranged in population size from 900 to 3,200. The villages are located in a river valley that has historically been a vibrant agricultural area but that has recently suffered from alternating cycles of drought and flooding, which have compromised the productivity in the region. Families practice Hindu or Christian religions, with most villages typically dominated by one of these two religions. There is a small minority of Muslim families found in the area. The predominant livelihood in the villages is seasonal agricultural labor or subsistence farming and herding, with some families engaged in traditional occupations (such as weaving or silk production), service provision, or other unskilled labor. When harvest season arrives, most family members all work in the fields, with only the youngest children staying behind, usually with grandparents. Children stay in very close proximity to their mothers and other female members of the extended family in the early years of their lives. It is typical for extended family members to sleep in the same room, with infants sleeping beside their mothers until a new infant is born. They are typically involved in the daily work of the mother from an early age, helping to fetch and assist with household chores as soon as they are mobile. When mothers work outside of the home, which is rare but did occur during harvest in the villages we visited, infants and small children are either left with a grandmother, an older sibling, or an aunt, or they are brought to the field with the mother. As in Peru, children's environments in the Indian villages are richly steeped in traditions that are celebrated with considerable fanfare. Children are not segregated from the lives of their elders; they are included in all of the levels of family and community life. Infants and young children also attend the celebration of family milestones, such as marriages and deaths, and the daily religious ceremonies that are commonly practiced. It is typical for families to live in extended family groups, having a predominantly patriarchal structure. Arranged marriages are common, and social roles are divided along gender lines, with household duties falling to women and girls. Although in recent years social activists have been successful in improving the educational opportunities for girls, over half of the mothers of infants in our

studies had never attended school. Although many homes are equipped with electricity, there are still a significant number of homes that are not. In a typical home, there are very few material possessions. The main item of furniture is usually a sleeping cot for an elder, and often that is the only furniture. Children's toys or other possessions were uncommon; however children did make toys from everyday objects, such as stick dolls or vehicles made from a stick attached to two coconuts. There was only one Internet café in the largest village, and this was only sporadically available due to frequent power outages. Clean drinking water is still a challenge in the area. Most homes obtain water from neighborhood wells operated with a hand pump. Health care in the villages is not typically available and is primarily offered through a variety of special clinics arranged by social activist providers. Families would have to travel a considerable distance to the nearby city for publicly funded hospitals or health clinics, which would be financially challenging for most families.

### *Canada*

The research was conducted in the small, rural university town of Antigonish (population of town 4,235; population of surrounding county, 14,239), located on the northeastern shore of Nova Scotia. The predominant religion in the area is Catholic; however, only a minority of families engage in regular weekly practice. The core professional occupations in the area are found in the regional hospital, schools, university, and law courts. Agriculture and fishing provide a strong resource base. In addition, a large number of people engage in service, trade, and labor jobs. It is common for both parents of infants and young children to be in the workforce, with mothers usually taking advantage of a government funded 15-week paid maternity leave. When mothers work outside of the home, infants and young children are typically cared for in day care centers (from age 2 years) or by private caregivers (infants). Infancy and childhood are periods where the individual child's development is nurtured by parents in a targeted fashion. There are myriads of specialized toys, activities, institutions, and rituals that are devoted to the enhancement of children's social and cognitive development available to parents in this area. It is typical for infants and children to sleep separately from their parents from birth and for the lives of children to be segregated from the responsibilities and the social lives of adults. The family structure is typical of North America: a nuclear family structure with high mobility of families in and out of the region. What is lost in support by the lack of an extended family network is partially gained back through close-knit community ties in this rural town. Homes have the standard amenities and artifacts of the middle-class North American home: many electrical appliances; more than one computer with high-speed

Internet access in the home; specialized toys, media, and games for infants and children; and one or two vehicles for family transport. By the time they are 2 years of age, all the infants in this area already have a collection of material possessions that will continue to expand as they get older. Clean drinking water is readily available in the home, and universally available health care, including specialized care, is easily accessed and subsidized by the government.

## GENERAL PROCEDURES

### *Recruitment*

Mothers and their children, as well as local research assistants, were recruited with the help of partner social agencies in Peru and India and day care coordinators in Canada. In Peru, *Cáritas Huancayo*, a local social agency involved in providing nutritional and health education to families in rural village settings, facilitated recruitment. The primary experimenter attended group meetings with *Cáritas* program facilitators to inform mothers about the study, to answer questions, and to ask for volunteers. Bilingual research assistants or local program facilitators assisted with translation and cross-checked mothers' reports of birthdays with *Cáritas* records kept for the nutritional education program. These records were based on birth registration cards brought by mothers to their first meeting. Appointment times were set at those meetings and program facilitators followed up with reminders before the appointment. In India, our partner organization was *Arthik Samata Mandal (ASM)*, a social development agency based in the city of *Vijayawada (Andhra Pradesh)* with a field station in a large rural village (*Srikakulam*) that served as our field base. In India, the primary experimenter and her local research assistant/interpreter occasionally recruited mothers by attending community meetings that provided mothers with health and nutritional education. More often, they met with the permanent field staff for *ASM* who lived in the surrounding villages. After field-workers were informed about the project, they passed this information on to mothers in their villages and asked for volunteers. One of the social development programs that *ASM* had initiated a few years before our research was a birth registration program to ensure that village families could take advantage of national government programs that required a valid birth certificate before services would be provided. Field-workers used these records to verify dates of birth of infants in the study when they compiled their volunteer lists. A few days before the primary researcher was going to visit their village, field-workers set up appointment times with mothers who had volunteered. In Canada, a subset of potential participants was taken from a master list of all

potential participants for studies with infants and young children. The master list includes birthdays and is compiled from birth announcements in a local weekly paper and from the permission slips returned after recruitment letters are sent home at the beginning of each year to all parents from two day care centers. The parents of potential participants in Canada were contacted by phone and debriefed about the general aims of the study and the details of the procedure for which their infant or child was being recruited. Appointments were scheduled for those who volunteered for the study.

When mothers arrived at the research venue, they met with a bilingual research assistant who obtained general demographic information as well as information regarding special developmental issues for their infant. These demographic sheets contained the infant's name, date of birth, date of the study, mother's name, mother's education level/literacy status, primary caregiver's relationship to infant (and education level/literacy status if not mother), village, place tested, any birth complications (only data from infants who had no reported birth complications were included in the study), and procedure(s) conducted. Infants' dates of birth were obtained from mothers and, in Peru and India, were verified by women in the villages who had dates of birth on record for their nutritional or early child development programs.

After collecting demographic information, the bilingual research assistant told mothers about the general nature of the procedure their infant would participate in. In Peru and India, the primary experimenter was also present to help rephrase the debriefing as necessary and to answer any questions mothers had about the study or their infant's development in general. At the end of the procedure, the primary experimenter explained to the mother through an interpreter the general expectations for children of different ages who participate in the particular procedure that their infant had engaged in and encouraged and responded to questions. In Peru and India, infants and their mothers were given food (biscuits, fruit) and a photo of the mother and infant as a gift of thanks for their participation. The field-workers who had initially recruited the families delivered photos to the mothers. In Canada, infants were given a small toy and a certificate of appreciation (Figures 1–3).

### *Experimental Venues*

In Peru and India, field "labs" were set up in a variety of venues, including village meeting halls, secluded courtyards or patios, abandoned schools, private homes, and, in one case, a large tent on the edge of a fairground. The mandatory requirement for a venue was that a secluded area be available so that infants could be tested individually without



FIGURE 1.—An Indian mother and toddler.

distraction. In all cases there was a greeting area to accommodate the inevitable queue that built up as mothers in the village heard about the arrival of the researchers. As they waited for their turn, a Canadian research assistant and local facilitator helped to keep mothers and infants comfortable. The primary experimenter and the research assistant who conducted procedures stayed in the testing area, where they debriefed mothers and conducted the procedures. Mothers always accompanied their infants and children in the field studies and were encouraged to help to keep their infant oriented to the experimenter and the procedure but not to help them in the procedures.

In Canada, most procedures were conducted in the playroom of a university infant study lab. For the symbolic play procedures only, Canadian children were tested in a quiet space in the child's day care. Mothers accompanied children to the lab and were encouraged to help to keep their



FIGURE 2.—A Peruvian mother with children.

infant oriented to the experimenter and the procedure but not to help them in the procedures. Children who engaged in the pretend procedures sat with a female research assistant who encouraged play.

### *Experimenters*

The primary experimenter trained local and Canadian research assistants on site for 1–2 weeks before beginning testing. She was present for the testing of all Peruvian and Indian infants and children in these studies, operating the camera and coding most of the data at the end of each testing day. The primary experimenter as well as experienced research assistants who were naïve to the hypotheses of the study tested Canadian infants and children. The primary experimenter also coded these data to ensure consistency in coding and in the delivery of procedures across cultures. In Peru,



FIGURE 3.—A Canadian mother and child.

two female Canadian research assistants who were fluently bilingual conducted the procedures with infants and children. The Canadian assistants had substantial travel and study experience in Latin American and prepared for their cross-cultural research experience with cultural sensitivity and ethnographic research methodology workshops over a 2-week period. Both assistants had completed honors undergraduate degrees, one in international development studies and one in psychology. In India, a local female research assistant conducted all of the procedures with infants and children over the 3-year period. This assistant had completed the equivalent of an honors undergraduate degree in English studies. The primary experimenter trained her in general experimental procedures and in the specifics of the procedures for the study over a 2-week preparation period. Refresher training and modification of delivery was provided to all

assistants by the primary experimenter as needed throughout the fieldwork. Assistants served also as interpreters for exchanges between mothers and the primary experimenter.

### *Ethnographic Methods*

#### *Interviews*

In all cultural settings, separate interviews were conducted for imitation, pointing, helping, collaboration, pictorial symbols, and pretend play procedures (see appropriate method and results sections later in this issue). The purpose of the interviews was exploratory. We wanted to tap into parents' beliefs about the skills we were measuring, get a sense of how typical these skills were in the everyday routines of children, and determine whether they differed across the three settings. Research assistants who were fluent in the language of the mother conducted all interviews, which consisted of a set of standard open-ended questions. In Peru and India, these assistants translated responses "online" for the primary researcher, who rephrased questions when it was apparent that the mother did not understand the question or asked follow-up questions to clarify mothers' answers. Although we did not measure language development in this research, we did ask mothers to estimate the age of onset of their infant's language comprehension and production, along with typical words to have a general sense of their communicative level, and this information is included in the participants sections of individual studies. For all interviews we collected data on mother's (or primary caregiver's) education level and literacy status, which is also included in the participants sections of individual studies. For educational level, the number of years completed in school was recorded. Literacy was defined as the ability to read and write in the language of their community. The average number of years in school and percent of mothers reporting literacy is presented for each procedure in the interview results sections.

#### *Naturalistic Observation*

The primary experimenter conducted fieldwork in the Peruvian and Indian field sites over a 7-year span. The data relevant to this monograph were all collected over the last 5 years of this period. Canadian assistants were in the field for at least 6-month placements before the testing period. The primary experimenter conducted research in the field sites for 2–3-month periods in each of the 5 testing years. All researchers kept field notes regarding natural behaviors of the types that were investigated in the

experimental procedures as well as general observations of family life and children's environments. The primary experimenter collated all naturalistic observation data to compile a composite sketch of children's daily lives and environments in the three cultural settings.

### *Community Records*

Local partners in Peru and India who facilitated recruitment of mothers and infants for these studies also helped to obtain demographic information about the communities where they lived. This information was available from the partner agency's own records (India) or was accessible through public records (Peru).

### *Experimental Methods*

In Chapter III, specific information regarding hypotheses, methods, and results is presented for each of the individual studies conducted. Our goal was to deliver standard procedures across cultural settings, within the constraint that the procedures were culturally relevant for the infants of all settings. There was very little need to deviate from the standard procedure, and the only modifications across cultures were in the phrasing of instructions to mothers so as to avoid problems (such as cuing mothers to point in the pointing procedure) that would ensue from direct translation of terms or in the materials used to play with infants (e.g., we used locally available toys for the pretense studies, but they were always of the same category—e.g., cars, dolls).

### *Statistical Analyses*

The main variable of interest throughout all statistical analyses was cultural setting. In some studies, there were experimental and control conditions, and in these cases the patterns across conditions and cultures were of interest. To make sure we were assessing children at the right ages for the particular task at hand, in most studies we included children across a moderately wide age range. In some cases where it was important to document a developmental shift in ability we were able to sample children at more than one age and also to keep children within an age fairly tightly grouped for each of the three cultures. In those cases we conducted ANOVAs, with culture and age (and possibly experimental condition) as variables. In other cases, however, it was not possible to sample children in this way, but rather we had children varying in age more or less continuously across a range (never more than about 1 year). In those cases, we used analysis of

covariance (ANCOVA), with age as covariate, and then we simply assessed the effect of culture (and possibly experimental condition).

For all analyses, if an interaction between variables was significant, then that was the effect interpreted. When there was a nonsignificant interaction involving age ( $p > .10$ ), the effect of culture (and possibly experimental condition) was assessed removing the variance due to the nonsignificant interaction (Engqvist, 2005; Mundry & Nunn, 2009). In the few cases where the data were not normally distributed, they were transformed using a square root transformation (noted in the results section of the appropriate study). We also checked for potential collinearity problems in the ANCOVAs by testing whether age was significantly correlated with any of the factors in the design; it was not in any case. We ran all analyses in R (R Development Core Team, 2009).

In a few cases we performed, in addition, some nonparametric analyses to assess the number of children in each culture fitting in particular pattern of performance. We also in some cases computed regression lines across age to assess, descriptively, the ages at which children in the three cultures met some performance criterion. Finally, to assess whether mothers' education levels were related to performance on the tasks, we also calculated correlations between number of years of schooling and test scores.

### III. INDIVIDUAL STUDIES

Here we report the eight empirical studies assessing the early social-cognitive skills of children from our three cultural contexts. They are, in order: (1) instrumental imitation, (2) instrumental helping, (3) gaze following (behind barriers), (4) declarative pointing, (5) collaboration, (6) joint attention, (7) pretense, and (8) pictorial symbols.

#### INSTRUMENTAL IMITATION

##### *Background and Hypotheses*

Clearly one of the most basic and important skills for becoming a member of a culture is imitation: to become a Roman, one must do what the Romans do. Humans are almost certainly biologically adapted for imitation, as neonates only a few hours old reliably mimic the facial expressions of others (Meltzoff & Moore, 1989). But imitation is a multifarious phenomenon, and as children develop they become capable not just of mimicking familiar actions but also of learning novel actions from others—including instrumental actions aimed at changing the physical state of external objects and symbolic actions aimed at changing the mental states of other people (Tomasello, 1999a).

In our first set of studies, we focused on instrumental imitation: doing as others do with objects. The developmental timeline for instrumental imitation in Western children is as follows. Infants as young as 6 months of age may observe others manipulating objects and then do something similar with them (e.g., von Hofsten & Siddiqui, 1993). But it is not always clear that they are actually imitating the actions of others because they could merely be observing the changes of state of the object (and so learning its affordances) and then using their own behavioral methods for reproducing those changes of state—so-called emulation learning (Tomasello, 1996). Using control conditions to rule out this more individualistic, object-oriented process,

Carpenter, Akhtar et al. (1998) found that young children first imitate the actual instrumental (goal-directed) actions of others at around 12 months of age. Children demonstrate this understanding of the goal-directed dimension of instrumental actions even more clearly between 12 and 18 months of age, as they reproduce the intended, rather than the actual, end result of an adult's failed attempts (Bellagamba & Tomasello, 1999; Johnson et al., 2001; Meltzoff, 1995).

In light of these findings, we conducted three types of studies of instrumental imitation with children in the three cultures. First, as a baseline, we demonstrated for children in each of the three cultural settings actions that should have been familiar to them—indeed that their mothers reported as familiar to them—in their daily lives (Natural Imitation). This procedure used mothers as demonstrators as well, thus emphasizing naturalness for the children, forsaking standardization across cultures. However, we did use one of the most basic control procedures in the current literature in this task, which is to provide objects that easily afford two different actions in the absence of a demonstration, with some children seeing a demonstration of one action and others seeing a demonstration of the other action (the so-called two-action task). This control helps to rule out alternative explanations, such as the child merely producing an action they have already learned to do with the objects. Second, we administered a standardized battery of instrumental imitation tasks with the same set of novel objects for children in all three cultures (Standardized Imitation). In these tasks we also used the two-action control procedure. The novelty of the objects and this two-action procedure rule out that children just see the object and do what comes naturally. Third, we gave children in all three cultures a set of tasks modeled on the behavioral reenactment procedure of Meltzoff (1995; Imitation of Intended Action). That is, some children saw a full demonstration of an instrumental action, others saw only random manipulations, and still others (the key condition) saw a failed attempt toward a goal—the question being whether the children who saw the failed attempt behaved more like the children who saw the full demonstration than the random manipulations. This task thus assesses simultaneously the understanding of goal-directed action and a fairly sophisticated form of instrumental imitation.

Given the foundational nature of intentional understanding and its manifestation in instrumental imitation (and given that some great apes also show some skills in all three of these types of imitation tasks; Tomasello & Carpenter, 2005), we expected that the early forms of imitation—in all three of our tasks—would show a similar developmental trajectory across the three cultural settings. We expected that for all cultural settings the turning point would be sometime around 12 months for the onset of instrumental imitation of novel actions and between 12 and 18 months for intended actions.

*Participants*

A total of 189 infants participated in the Natural Imitation procedure, 101 in Standardized Imitation, and 162 in Imitation of Intended Action. Tables 2–4 present details of age ranges, mean age in months, and number of participants per group for each of the three imitation procedures. There was no overlap of participants in the Standardized Imitation and Imitation of Intended Action procedures. However, we attempted to conduct the Natural Imitation procedure with all participants and were successful, excluding cases where infants became fussy, a parent interfered, or parents had to leave the site before we were finished. Thus, 189/263 infants participated in Natural Imitation and one other imitation procedure. Participation in the Natural Imitation procedure always followed that of the primary imitation procedure the infants were recruited for.

Mothers reported that infants began to comprehend words around the same age (9–10 months) in all cultural settings, but the onset of production varied. Canadian mothers reported that their infants began to produce words around 11.5 months, approximately 3 months earlier than mothers’ reports for infants in Peru, and 4 months earlier than in India. Mother’s education level and literacy status varied across the three cultural settings. Mother’s average education level was 15.8 years in Canada, 8.5 years in Peru, and 4.9 years in India. Literacy was high in Canadian (100%) and Peruvian (88%) settings and low in India (58%).

TABLE 2

NATURAL IMITATION: AGE RANGES IN DAYS, MEAN AGE IN DAYS (MEAN AGE IN MONTHS), AND NUMBER OF PARTICIPANTS ACROSS CULTURAL SETTINGS AND AGE GROUPINGS

Age (Months)	Cultural Setting		
	Canada	India	Peru
10	267–369	269–348	274–351
	309.3	307.6	309.0
	(10.3) 20	(10.3) 16	(10.3) 15
13	356–447	372–448	363–445
	403.4	414.0	400.6
	(13.4) 23	(13.1) 18	(13.4) 8
16	456–537	454–531	455–529
	497.0	486.7	493.1
	(16.6) 21	(16.2) 26	(16.4) 10
19	542–623	540–619	560–673
	574.2	571.8	619.0
	(19.1) 13	(19.1) 12	(20.6) 7

TABLE 3

STANDARDIZED IMITATION: AGE RANGES IN DAYS, MEAN AGE IN DAYS (MEAN AGE IN MONTHS), AND NUMBER OF PARTICIPANTS ACROSS CULTURAL SETTINGS AND AGE GROUPINGS

Age (Months)	Cultural Setting		
	Canada	India	Peru
9	266–321	268–308	253–319
	290.6	288.4	289.8
	(9.7) 13	(9.6) 16	(9.7) 22
12	337–416	329–418	334–419
	373.3	380.8	368.4
	(12.4) 19	(12.7) 20	(12.3) 11

### *Coding and Data Analyses*

For the imitation tasks infants' actions were coded from videotape in the field sites and reliability coded by assistants in the Canadian lab. To assess

TABLE 4

IMITATION OF INTENDED ACTION: AGE RANGES IN DAYS, MEAN AGE IN DAYS (MEAN AGE IN MONTHS), AND NUMBER OF PARTICIPANTS (FEMALE, MALE) ACROSS CULTURAL SETTINGS, CONDITIONS, AND AGE GROUPINGS

Condition	Age (Months)	Cultural Setting		
		Canada	India	Peru
Success	15	434–506	429–496	420–505
		472.6	467.3	469.9
		(15.8) 9	(15.6) 11	(15.7) 8
	18	507–605	501–596	512–681
		539.3	539.9	585.5
		(18.0) 8	(18.0) 10	(19.5) 9
Stimulus Enhancement Control	15	437–504	426–488	399–492
		471.1	462.7	454.7
		(15.7) 9	(15.4) 13	(15.2) 6
	18	526–600	505–588	570–691
		565.9	554.3	630.8
		(18.8) 9	(18.5) 8	(21.0) 6
Failed Attempt	15	431–508	418–488	437–49
		453.0	461.8	466.6
		(15.1) 8	(15.4) 12	(15.6) 8
	18	526–605	509–576	504–673
		566.2	544.8	581.8
		(18.9) 9	(18.2) 9	(19.4) 8

interobserver reliability, Cohen's  $\kappa$  values were separately calculated for Natural Imitation, Standardized Imitation, and Imitation of Intended Action procedures. For each procedure, 25% of the participants, balanced across culture, age, and condition, were coded by an independent research assistant who was unaware of the hypotheses relevant to the conditions of the study. Cohen's  $\kappa$  values ranged between 0.70 and 1.00 across procedures and cultural settings (Canada = 0.70 for Natural Imitation, 0.77 for Standardized Imitation, 0.77 for Imitation of Intended Action; Peru = 1.00 for Natural Imitation, 1.00 for Standardized Imitation, 0.94 for Imitation of Intended Action; India = 0.97 for Natural Imitation, 0.78 for Standardized Imitation, 0.91 for Imitation of Intended Action).

The data in all tasks were first analyzed using analyses of variance on the number of correctly imitated actions. When necessary, we clarified interactions using Tukey's post hoc tests. Following on analyses of variance, we calculated linear regressions using age in months as a variable in order to estimate the approximate age of onset of imitation for natural and standardized imitation tasks across the three settings, with one exception. Indian infants imitated very little for the Standardized Imitation procedure, which is problematic for linear regressions, and thus we did not estimate age of onset for Indian children in this task. We also conducted the Pearson correlation coefficients to assess the relation between mother's education level (number of years of schooling) and scores on the three imitation tasks.

## *Interviews*

### *Interview Method*

A standard set of open-ended questions provided the framework for the interview. General demographic information was obtained (see Participants section) along with specific information on imitation from a majority of mothers of infants who participated in the imitation procedures. The specific questions focused on obtaining mothers' estimates of when their infants began to imitate their actions and examples of typical actions imitated by infants in the home situation.

### *Interview Results*

Across all cultural settings mothers reported that their infants began to imitate around 10 months of age (Peru = 10.6 months, India = 10.8 months, Canada = 10.4 months). All reported actions could be classified as being of one of three types of actions: personal care routines, household chores, and play actions. There was diversity across cultural settings in the

relative proportions of examples coming from these three categories. For Peru and India, the most frequently reported imitations came from the household chore category, whereas for Canada they came from the play action category.

### *Natural Imitation*

#### *Materials*

The aim of the Natural Imitation procedure was to provide infants with familiar items from their home environments and with actions that many parents confirmed their infants had already performed. We tried as much as possible to identify items and actions that were universally available to young children in these three settings, but though we were able to achieve some overlap, we had to employ slightly different materials across settings. In India, the three sets and actions were grass hand broom presented to the child as they stood next to a wall (action A = sweep floor, action B = sweep wall), bucket with cloth presented next to a washing stone (action A = washing the cloth up and down in bucket, action B = slapping cloth on washing stone), and small container with water (action A = splashing water from container onto face, action B = wiggling and washing fingers of one hand while pouring water from container). In Peru, the items and actions were a grass hand broom presented to the child as they stood next to a wall (action A = sweep floor, action B = sweep wall); a bucket with cloth (action A = washing the cloth up and down in bucket, action B = wringing out water from the cloth); and cooking pot with dry beans, bowl, and spoon (action A = scoop beans into bowl, action B = stir beans). In Canada, the three sets and their actions were cell phone (action A = punch in number, action B = talk on phone); cooking pot with dry noodles, bowl, and spoon (action A = scoop noodles into bowl, action B = stir noodles); and dry face-cloth (action A = wipe face, action B = wipe hands). Half of the infants in each cultural setting were presented with the A set of actions on the items, and the remaining half were presented with B actions.

#### *Procedure*

For all imitation procedures, and all cultural settings, we were able to individually conduct the procedures with infants in quiet rooms. In India and Peru, parents (usually mothers) sat on a mat on the floor with infants in front of them, and in Canada infants sat on their mother's lap at a table. In all settings, the experimenters sat with the child and mother for a few minutes, conversing and playing with a small toy in order to ensure that



FIGURE 4.—A Peruvian infant imitates in the Natural Imitation task.

mother and infant were comfortable playing with her. Infants were randomly assigned to the A or B action group for the Natural Imitation procedure. Likewise, the experimenter then demonstrated the target action two times. However, before handing the items to the infants, the experimenter gave the items to the mothers who had previously been instructed to copy the action of the experimenter two times before handing the items to their infant. As they handed the items to their infant, the experimenter said, “Your turn.” This sequence was repeated for each of three actions. The order of presentation of actions was randomized across infants (see Figure 4).

### *Results*

A 3 (cultural setting; Canada, India, Peru)  $\times$  4 (age; 10, 13, 16, 19 months) ANOVA was conducted on the number of correct imitation responses. There was a significant main effect of age,  $F(3,182) = 5.45, p < .001$ , but no main effect of cultural setting and no interaction. Tukey’s tests revealed that the 10-month-olds (mean = 1.10) performed less well on the task as compared with all other age groups (mean = 1.69 for 13-month-olds,  $p < .01$ ; mean = 1.69 for 16-month-old infants,  $p < .01$ ; mean = 1.88 for 19-month-olds,  $p < .005$ ), and there were no differences in performance level among the older age groups. Linear regressions of the data (see Figure 5) revealed that the approximate age at which children passed half of the imitation trials was 13.4 months for Canadian infants, 12.0 months for Indian infants, and 15.2 months for Peruvian infants. Thus, between 12 and 15 months infants from all three cultural settings were imitating the

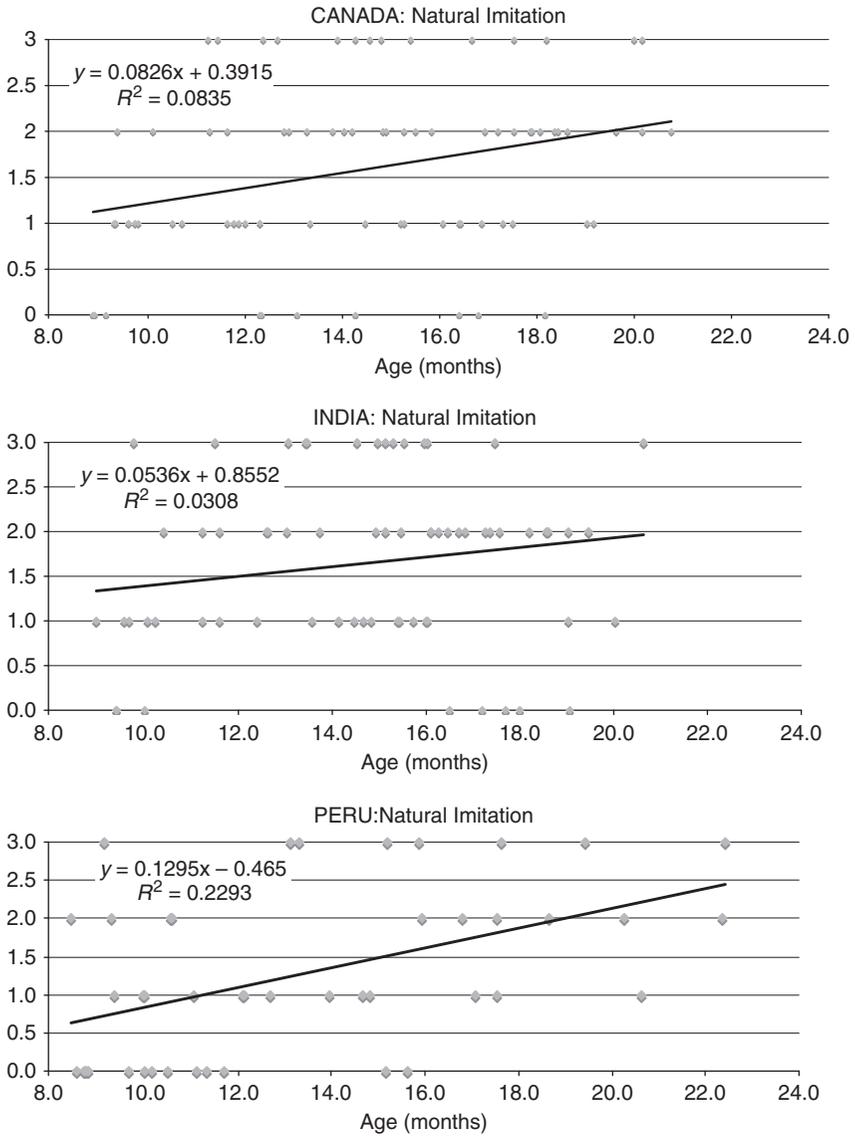


FIGURE 5.—Linear regression plots of the age (months) and number of correct imitation responses for the Natural Imitation procedure for Canadian, Indian, and Peruvian children.

experimenter and mother who demonstrated familiar actions using materials common in the child's environment. Imitation was pervasive across cultures. As indicated in Figure 6, even at the youngest age (10 months),

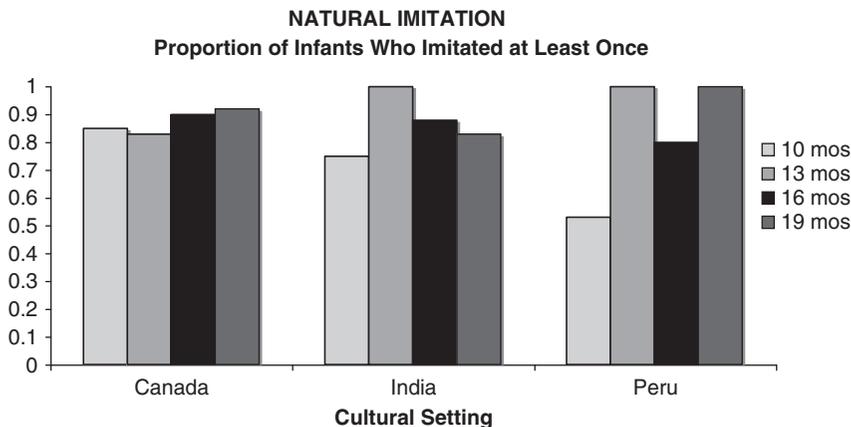


FIGURE 6.—Proportion of infants from each cultural setting and age group who imitated on at least one trial in the natural imitation task.

where there was most variability across cultures, the majority of infants in all three cultures imitated on at least one trial. The correlation between mother’s education level and imitation score was not significant,  $r^2 = .05$ .

### *Standardized Imitation*

#### *Materials*

Three sets of items were chosen for the Standardized Imitation task so that two distinct actions could be performed with each set, Action A and Action B. The items included a clothespin and copper pipe fitting, a soft plastic mesh circle (8 cm diameter, 2 mm thick), and three plastic Velcro curlers (2 cm diameter, 6 cm high). Before conducting the research we tested the actions with a small sample of 9–10-month-old Canadian infants, the youngest ages we would be using across the imitation tasks, to make sure that infants in this age range could perform these actions. For the clothespin and pipe fitting, the actions were hitting the pipe around the surface in front of the infant with the clothespin (A, hockey) or knocking the clothespin and pipe together (B, noise). For the plastic mesh, the experimenter either placed it on top of her head like a hat (A, head) or threw it forward (B, Frisbee). For the curlers, the experimenter either lined them up on end and then knocked each one down with her forefinger (A, knock down), or placed two standing on end about 12 cm apart and then threw the third through the space in between (B, goal). We randomly assigned the actions to an A or B grouping.

### Procedure

Infants were randomly assigned to the A or B action group. The experimenter then demonstrated the target action two times before handing the items to the infants and saying, “Your turn.” This sequence was repeated for each of three actions. The order of presentation of actions was randomized across infants.

### Results

A 3 (cultural setting; Canada, India, Peru)  $\times$  2 (age; 9, 12 months) ANOVA was conducted on the number of correct imitation responses and revealed significant main effects of cultural setting,  $F(2,95) = 10.20$ ,  $p < .001$ , and age,  $F(1,95) = 6.57$ ,  $p < .01$ . A Cultural Setting  $\times$  Age interaction,  $F(2,95) = 2.50$ ,  $p < .09$ , qualified the main effects. Tukey’s tests of the interaction presented in Figure 7 revealed that there were no differences across cultural settings in the performance of 9-month-olds, but 12-month-old Canadian infants outperformed 12-month-old Indian infants ( $p < .001$ ). There were no other significant differences. We did not conduct follow-up linear regressions for standardized imitation data from the Indian sample because of a skewed distribution; however, the regression curves for Peruvian and Canadian children are found in Figure 8. The approximate age at which children passed half of the standardized imitation trials was 12.7 months for Canadian infants, and 14.5 months for Peruvian infants. Mother’s education level did not significantly correlate with score on the imitation task,  $r^2 = .21$ .

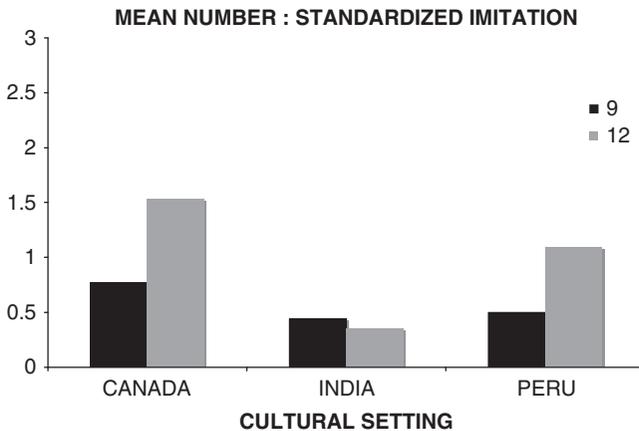


FIGURE 7.—Mean number correct imitation responses across cultural settings and age groups for Standardized Imitation procedure.

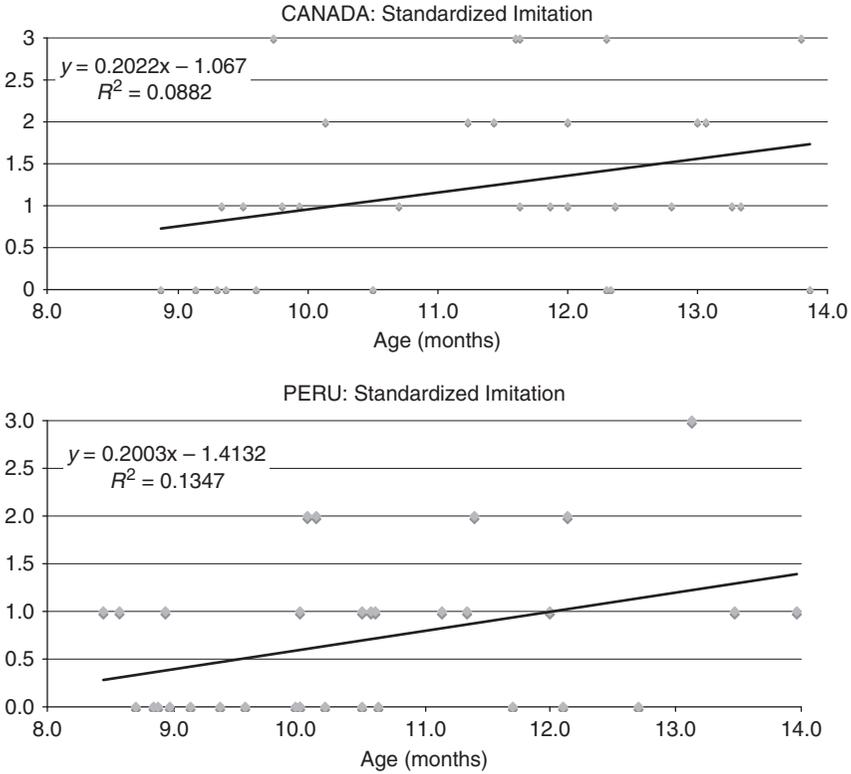


FIGURE 8.—Linear regression plots of the age (months) and number of correct imitation responses for the Standardized Imitation procedure for Canadian and Peruvian children.

Thus, consistent with the natural imitation findings, infants from Canadian and Peruvian cultural settings were selectively imitating the novel actions of the experimenter in the age range between 12 and 15 months. However, in contrast to the natural imitation findings, frequency data indicate that the majority of the youngest infants in the standardized task were not passing at least one trial. The mean proportions of infants who imitated on at least one trial for the standardized and natural imitation tasks are presented in Figure 9. Although we cannot statistically compare the data across the two procedures because the average ages differ by a month (natural imitation: 10 and 13 months; standardized imitation: 9 and 12 months) visual inspection of the data from Figure 9 suggests that the youngest infants in all settings found the natural imitation tasks somewhat easier than the standardized tasks, and this trend appeared to be more pronounced for Indian infants.

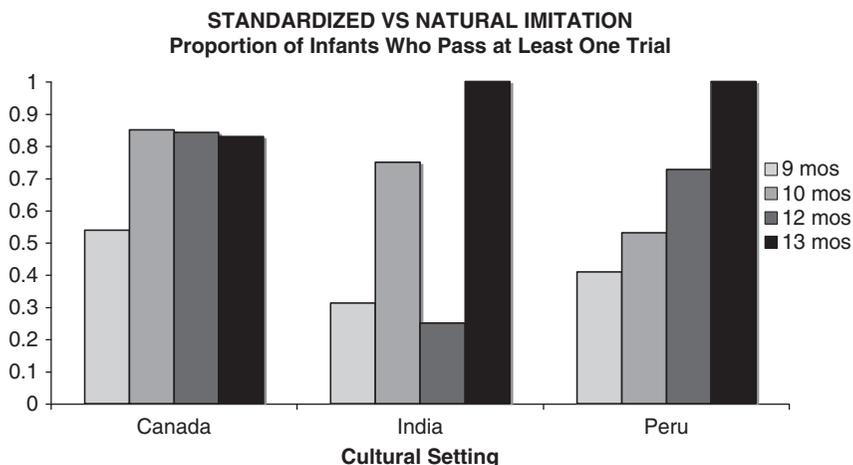


FIGURE 9.—Proportion of infants from each cultural setting who imitated at least once in the standardized (ages 9 and 12 months) as compared with the natural (ages 10 and 13 months) imitation task at the ages indicated.

### *Imitation of Intended Action*

#### *Materials*

As with the other imitation tasks, three sets of novel items and actions were chosen for this procedure. The items included a clothespin and copper pipe fitting, two wooden blocks (4 cm square, 1.5 cm thick), and a small plastic funnel (8 cm diameter) with an oval plastic shower curtain clip. Before conducting the research we tested the actions with a small sample of 15–18-month-old Canadian infants to make sure that infants in this age range could perform these actions. Only one action was chosen for each set because the appropriate controls are achieved through the conditions described below. For the clothespin and pipe fitting, the intended action was placing the head of the clothespin inside the pipe fitting, for the blocks it was stacking one on top of the other, and for the funnel and shower clip it was placing the clip over the small end of the funnel-like horseshoes. These three sets were used in all three cultural settings for all of the experimental conditions as described below.

#### *Procedure*

Infants were randomly assigned to one of three conditions in this procedure, with three trials corresponding to the three sets of items per condition. In the Success condition, the experimenter successfully

demonstrated the target action twice and then handed the items to infants for their turn and repeated this sequence for a total of three trials. In the Stimulus Enhancement (SE) Control, the experimenter held up the items in front of the infant so that the parts of the items that were used in the actions were highlighted. She pulled back the items and presented them a second time before giving them to the infants for their turn. In the Failed Attempt condition, the experimenter tried but failed to perform the target actions on two occasions before handing the items to the infant. For the clothespin and pipe, she aimed for the end of the pipe, but the clothespin slipped off the side. For the blocks, the top block fell over as the experimenter tried to place it on top. For the funnel and shower clip, she tried to put it around the small end of the funnel but it fell off. As in the other imitation procedures, the order of presentation of actions was randomized across infants.

We included the Success condition to ensure that infants could perform the target actions, and the SE Control condition to assess the extent to which the items naturally afforded our target actions. The main condition of interest was the Failed Attempt condition, which we included to examine the extent to which infants can read the intentions of the experimenter. To be sure that infants were reading intentions, and not performing on the basis of affordance properties of the materials, we contrasted performance on the Failed Attempt with the SE Control conditions. Comparison of Failed Attempt with the Success condition allowed us to assess the relative difficulty of reading intentions as compared to imitating clearly demonstrated actions. If infants are fully capable of reading intentions in the experimenter's failed attempts, then performance should be equivalent for Failed Attempt and Success conditions, and there should be very few of the target actions performed in the SE Control condition.

### *Results*

A 3 (cultural setting; Canada, India, Peru)  $\times$  3 (condition; success, SE control, failed attempt)  $\times$  2 (age; 15, 18 months) ANOVA was conducted on the number of correct imitation responses and revealed significant main effects of cultural setting,  $F(2,145) = 9.69$ ,  $p < .001$ , condition,  $F(2,145) = 24.25$ ,  $p < .001$ , and age,  $F(1,145) = 7.95$ ,  $p < .005$ . Older children performed better than younger children overall (means = 1.57 vs. 1.22, respectively). The main effects of cultural setting and condition need to be interpreted in light of the Cultural Setting  $\times$  Condition interaction,  $F(4,140) = 3.62$ ,  $p < .01$ , presented in Figure 10. Tukey's tests revealed that performance was high and equivalent across cultures for the success condition, and low and equivalent across cultures for the SE control condition. For the failed attempt condition, performance was equivalent in

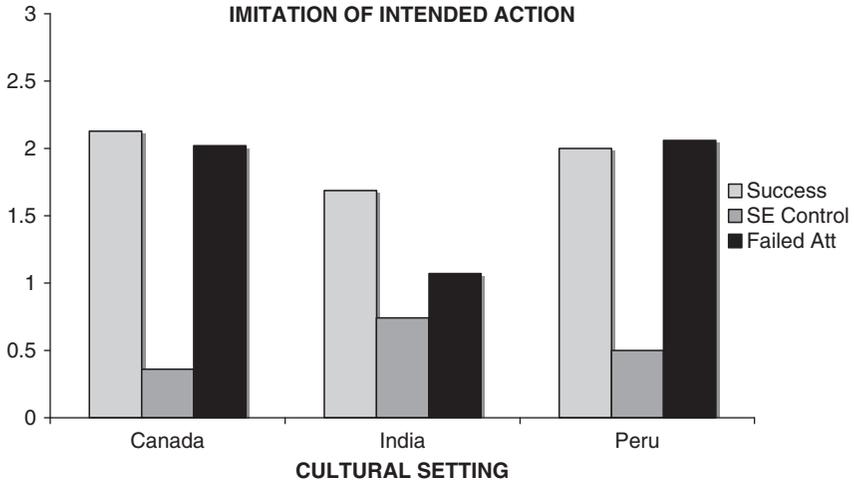


FIGURE 10.—Mean number of correct imitations across cultural settings and conditions for the Imitation of Intended Action procedure.

Canadian and Peruvian settings and lower than both of those in the Indian setting ( $p < .002$ ). To further understand this trend we looked at the proportion of infants who passed 2/3 imitation trials for the failed attempt condition (see Figure 11), which was the main condition of interest. The majority of Canadian and Peruvian infants were imitating on 2/3 trials for the failed attempt condition at both ages, whereas the Indian infants were performing at this level only at 18 months of age.

### Discussion

In general, children in the three cultural settings performed similarly in our three instrumental imitation tasks, and in maternal interviews the reported age of onset of imitation was similar in the three cultures as well. For familiar (Natural Imitation) and novel (Standardized Imitation) actions demonstrated by an adult, infants showed on average at least one successful imitation by 9–12 months in all cultural settings, and their performance improved in the older age groups. For Imitation of Intended Actions, which require inference of the intentions of the adult, the majority of infants in all settings performed well (2/3 correct) by 18 months. The developmental trajectory found here is similar to that reported by Carpenter, Akhtar et al. (1998) in their longitudinal study of the onset of imitation of novel and intended actions with a Western middle-class sample.

Imitation was somewhat less robust, but still within the expected trajectory, in the Indian setting compared with the other cultural settings.

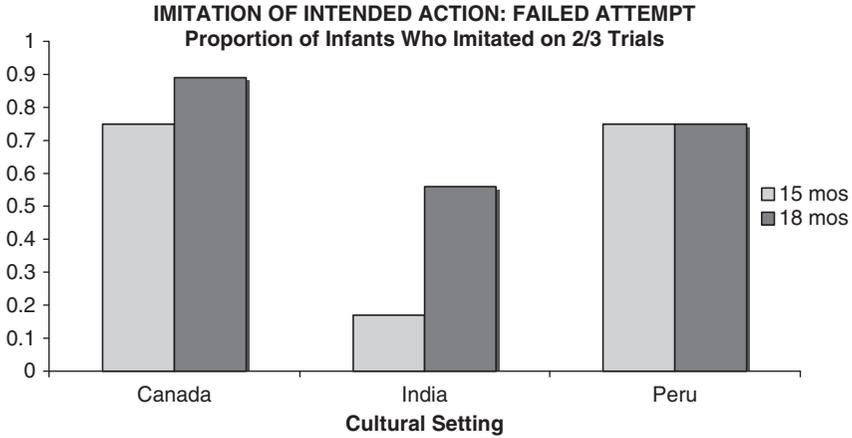


FIGURE 11. — Proportion of infants from each cultural setting, condition, and age group who imitated on 2/3 trials for the Imitation of Intended Action condition.

Indian children were equivalent to the other two groups in the natural imitation tasks at all ages; however, in the two sets of tasks in which novel objects were involved, there were slight differences for some conditions. For the standardized imitation task, 12-month-old Indian infants (older group) performed at lower levels than their same aged peers in Canada and Peru. For the intended imitation task the only differences were found in the failed attempt condition, where Indian infants were again at a lower level. The frequency data suggest that by 18 months of age Indian infants were closing the gap, with the majority of the older infants in all three cultural settings imitating on 2/3 trials in the failed attempt condition. It would have been informative to include a 15-month-old group in the Standardized Imitation task in order to assess whether Indian infants are simply slower off the mark when tested with novel objects. That is, they may manifest slightly lower levels of imitation when tested at the lower end of the age ranges considered typical for the task (from North American studies) but exhibit equivalent levels of performance when tested at the upper end of the age ranges.

## INSTRUMENTAL HELPING

### *Background and Hypotheses*

Unlike imitation, which is present in nascent form during the first year of life, helping others meet their goals is a behavior that emerges only during the second year of life (though there is evidence that infants can distinguish helpers from nonhelpers and prefer helping agents by 6 months

of age; see Hamlin et al., 2007). Active helping obviously requires that the infant understand what goal a person is attempting to achieve and what the obstacles to it might be.

Warneken and Tomasello (2006, 2007) confronted 14- and 18-month-old infants with an adult who had a problem. For example, the adult was grasping for but could not reach an object, or stood puzzled in front of closed cabinet doors with his hands full of books, or was trying to stack books and one kept falling off the top of the pile. In these and similar situations, almost all infants helped at least occasionally—whereas they did not fetch discarded objects or open closed cabinet doors in control conditions in which the adult drew attention to these objects but did not need help. In all, infants helped the adult solve four different kinds of problems: fetching out-of-reach objects, removing obstacles, correcting the adult's mistake, and choosing the correct behavioral means for a task—all of them very likely novel, at least in their particulars, for the infants. It would certainly seem that to help others flexibly in these many different ways, infants must be able to determine an adult's goal and, at least in simple situations, any obstacles in the way of that goal and procedures for removing them.

In the current study, we used the basic procedure of Warneken and Tomasello (2006), whose naturalistic helping paradigm makes it ideal for use across diverse cultural settings. To control for the possibility that children performed the target behaviors (such as giving a dropped object) irrespective of the agent's unachieved goal, we tested children also in control conditions with the same objects and same basic situation, only that the situation did not constitute a problem for the agent. Children from two age groups (18, 24 months) watched as an experimenter tried but was unable to complete a task (experimental) or as she manipulated the materials without indicating she needed help (control). Experimental and control conditions were tested between subjects. There is extensive discussion of the potential differences between cultures whose goal it is to socialize young children for later interdependence as compared to independence, and one may logically expect that cultures that foster independence may have young children who help less. However, even if distinct socialization goals exist between the Canadian versus the Indian and Peruvian settings, Warneken and Tomasello (2009) presented several lines of evidence that this behavior is not especially sensitive, at least in its earliest manifestations, to rewards or any other kind of direct socialization efforts. Thus, we did not expect to find differences in helping behavior across the settings in this study.

### *Participants*

A total of 111 infants participated in the Helping procedure, 36 (17 females, 19 males) from Canada, 45 (23 females, 22 males) from India, and

TABLE 5

HELPING TASK: AGE RANGES IN DAYS, MEAN AGE IN DAYS (MEAN AGE IN MONTHS), AND NUMBER OF PARTICIPANTS ACROSS CULTURAL SETTINGS, CONDITIONS, AND AGE GROUPINGS

Condition	Age (Months)	Cultural Setting		
		Canada	India	Peru
Control	18	526–628	489–572	504–657
		568.0	539.9	566.5
		(18.6) 9	(18.0) 11	(18.9) 7
	24	710–801	695–821	661–797
		761.4	760.6	724.3
		(25.3) 8	(24.6) 11	(24.1) 10
Experimental	18	500–638	516–596	581–649
		563.9	547.9	615.2
		(18.8) 11	(18.3) 13	(20.5) 5
	24	685–798	642–810	664–817
		733.9	735.0	758.2
		(24.5) 8	(24.5) 10	(25.3) 9

30 (16 females, 14 males) from Peru. Table 5 presents details of age ranges, mean age in days (months), and number of participants per condition for each of the two age groups across the three cultural settings.

Mothers reported that infants began to comprehend words around the same age (11–12 months) in all cultural settings. Canadian mothers reported that their infants began to produce words around 12.0 months, approximately 3 months earlier than mothers' reports for infants in India and 4 months earlier than in Peru. As with the previous procedures, mother's education level and literacy status varied across the three cultural settings. Mother's average education level was 15.5 years in Canada, 8.6 years in Peru, and 4.2 years in India. Literacy was high in Canadian (100%) and Peruvian (91%) settings and low in India (52%).

### *Interview*

#### *Interview Method*

An interview containing general demographic questions (see Participants section) as well as specific questions on both helping and collaboration was given to any child who participated in either procedure. In this interview, mothers were asked to indicate the age of onset of helping and collaborative behaviors and to give examples of each. In addition, they were asked to indicate the age at which they felt infants should help or collaborate

with others and which people they typically helped. To assess parental beliefs about these behaviors, mothers were asked why they felt it was important for children to help or collaborate with others and why they felt children engaged in these behaviors.

### *Interview Results*

Across all cultural settings mothers reported that their infants began to help others between 14 and 17 months of age (Peru = 15.7 months, India = 17.1 months, Canada = 14.9 months). For Peru and India, all helpful behavior could be classified as household help and included such behaviors as cooking, cleaning, fetching, and animal care. In Canada, the majority of behaviors were helping with household chores (79%), specifically cleaning and fetching. However, Canadian mothers also reported self-help behaviors (21%), which included dressing, feeding, and putting away toys. When asked whom their children helped the most, mothers from all settings were most likely to respond that their children helped their parents the most (Peru = 46%, India = 53%, Canada = 79%). In contrast to Canadian (17%) children, Peruvian (42%) and Indian (32%) children were also reported to help all people equally. When asked why it is important for children to help others, mothers from all settings offered a variety of common responses. These included serving to build character (Peru = 25%, India = 35%, Canada = 22%), to teach children how to do things (Peru = 44%, India = 32%, Canada = 17%), and to build community (Peru = 23%, India = 4%, Canada = 4%). In addition, Indian and Canadian mothers noted the purposes of gaining social approval (India = 12%, Canada = 9%) and responding to the needs of others (India = 11%, Canada = 4%). Mothers in Peru (8%) and India (6%) also named reciprocating for the help of others as an important role for helping. In contrast to Peruvian and Indian mothers, a large percentage of Canadian mothers (44%) responded “don’t know” to this question. Mothers had differing opinions about why children start to help, depending on cultural setting. In Peru, mothers saw helping as a natural human behavior (42%) or believed that children started to help because they were taught by others (24%) or were copying others (18%). In India, mothers were most likely to say that children started to help because they sensed the needs of others (43%) or that it was a natural behavior (31%) and less often that children were copying others (11%). Canadian mothers were most likely to say that children began to help because they were copying others (65%) and sometimes that they did so out of self-interest (17%). Only a small percentage of Canadian mothers saw helping as a natural (9%) behavior or one that was explicitly taught (9%).

## Helping Task

### Materials

The materials used for each of the five tasks were as follows: *paper balls*—plain white paper crumpled into balls, plastic see-through container, tongs; *box*—cardboard Xerox paper box with top, experimenter's clothing, water bottle; *flap*—wooden box (35 cm on each side) with door flap on front that could be lifted by the child and a slot on the top through which a spoon could be dropped, small tea cup and spoon; *books*—small children's notebooks (18 cm × 12 cm × 2 cm) wrapped in plain white paper (three notebooks per six wrapped sets); and *marker*—child's marker, small pieces of plain white paper for drawing, wooden box used in the flap task (used here as a table, with flap toward experimenter). All materials, with the exception of the wooden box, were obtained in the cultural setting that they were used in.

### Procedure

In each culture, participants were tested individually for their ability to infer that the experimenter needed help with a task. A caregiver accompanied the infant in all cultural settings. Most often this was the infant's mother, but occasionally it was a grandmother, father, or older sibling. Before the experiment began, caregivers were instructed to sit behind their infant and to keep him from locomoting until the experimenter began to interact with the props. All testing was conducted individually in a quiet room and sessions lasted approximately 15 min. The procedure was videotaped and later coded from tapes in the field by the primary author.

At the beginning of each trial, the infant was centered in front of the experimenter at a distance of approximately 4 ft. The experimenter knelt down on a mat with the props in front of her and began the trial when she was sure the infant was attending to her. Children were randomly assigned to one of two conditions, which differed only in the attitude (frustrated and needing help, neutral) that the experimenter adopted toward the tasks. Children were not rewarded for their responses.

In the experimental condition, the experimenter interacted with the materials for a period during which she completed a task successfully, and then she struggled but was unable to complete the task. The timing of these trials was as follows: (1) The experimenter began the task, successfully completing an action without needing help, and then, (2) due to the placement of the props, entered the phase where she indicated she needed help, holding her gaze on the props for 10 s; (3) if the child did not help at this point the experimenter alternated gaze between the child and the props for

10 s, and (4) if the child had not yet helped she verbally expressed frustration according to the task.

In the control condition, the experimenter engaged in the same actions but did not indicate that she needed any help. For control trials the experimenter acted as though she was merely exploring the materials. The timing of the trials was as follows: (1) The experimenter began the task, successfully completing an action, and then (2) engaged in the same “failed” action as in the experimental condition, but this time without “need help” attitude cues but (3) with a friendly expression as she looked at the child for 20 s.

There were five helping tasks in total; three that required reaching for props that were out of reach and two that relied on the child to engage in an action so the experimenter could reach her goal. Children in both conditions received all five tasks, according to the procedure described below, with the order of tasks randomized across participants.

*Paper Balls.* In the experimental condition, the experimenter successfully reached for paper balls using tongs to place them in a plastic container for half of the props and then unsuccessfully reached for the remaining balls. The verbal cue used if the child did not help earlier in the task was “I can’t reach.” In the control condition, the experimenter picked up and inspected the paper balls close to her and then placed them back on the table.

*Marker.* In the experimental condition, after making three drawings, the experimenter accidentally dropped the marker so that it was out of reach and then reached toward it. The verbal cue used if the child did not help earlier in the task was “My marker.” In the control condition the experimenter deliberately threw the marker out of reach after drawing the pictures and then placed her hands on top of the wooden box that was being used as a table.

*Books.* In the experimental condition, the experimenter tried to place three books, one at a time, on top of a small pile of books, but they accidentally fell to the side, at which point she indicated through her expression that it was a failure. The verbal cue used if the child did not help earlier in the task was “My book.” In the control condition, the experimenter deliberately placed the three books in a position so that they were falling to the side of the pile.

*Box.* In the experimental condition, the experimenter retrieved items that required both arms to carry and approached the box, trying unsuccessfully to open it with elbows and shoulders. The verbal cue used

if the child did not help earlier in the task was “I can’t open it.” In the control condition the experimenter placed the armful of items next to the box and then knelt with her hands on her lap.

*Flap.* Children were first introduced to the box through play with a research assistant while their caregivers were providing the experimenter with demographic information. In the experimental condition, the experimenter ostensibly stirred some tea in a cup with a small spoon and then took the spoon out and accidentally dropped it down the slot on the top of the box. She then attempted to reach the spoon by alternating between looking through the slot and pushing her fingers through the slot without success. The verbal cue used if the child did not help earlier in the task was “My spoon.” In the control condition, the experimenter deliberately put the spoon in the slot and then placed her hands on top of the box.

### *Coding and Data Analyses*

Children’s actions were coded from videotape in the field sites and reliability coded by assistants in the Canadian lab. All trials were coded as helping if the child left his or her position and retrieved items for the experimenter (paper balls, marker, flap) or assisted the experimenter in completing the action (box, books). The number of helping actions was calculated for each child and summed over the five trials. To assess inter-observer reliability, a random sample 28 of the 111 participants (25%)—with equal numbers for culture, age, and condition—was scored in the Canadian lab by an independent research assistant who was unaware of the hypotheses relevant to the conditions of the study. Cohen’s  $\kappa$  values were high for all cultural settings (Canada = 0.85, Peru = 0.95, India = 0.91). The data (i.e., number of helping actions) were analyzed using an ANOVA with between-participants factors of cultural setting, condition, and age. When necessary, we clarified interactions using Tukey’s tests. There was very little variability in the data within either the experimental or control conditions; thus we did not conduct linear regressions or frequency analyses for this procedure. We also conducted Pearson correlation coefficients to assess the relation between mother’s education level (number of years of schooling) and scores for children in the experimental condition.

### *Results*

The 3 (cultural setting; Canada, India, Peru)  $\times$  2 (condition; experimental, control)  $\times$  2 (age; 18, 24 months) ANOVA revealed a significant main effect of condition,  $F(1,100) = 6.51, p < .01$ , and a two-way interaction

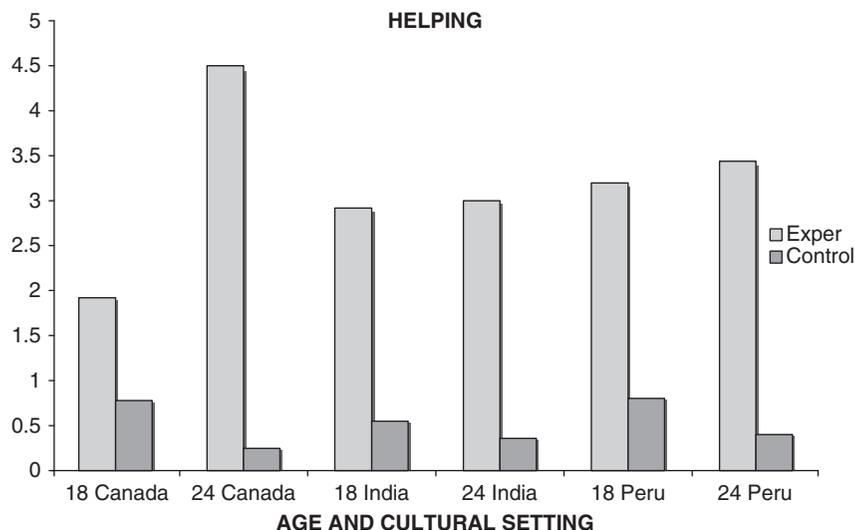


FIGURE 12.—Mean number of helping actions as a function of cultural setting, condition, and age group.

of Condition  $\times$  Age,  $F(1,100) = 21.26, p < .0001$ . These effects are qualified by a significant three-way interaction of Cultural Setting  $\times$  Condition  $\times$  Age,  $F(2,100) = 5.40, p < .006$ . The data relevant to this interaction are presented in Figure 12, and the interpretation is simple. Most importantly, there is a strong condition effect, showing higher levels of helping for experimental compared with control conditions across all cultures and ages. The one difference that accounts for the three-way interaction was that 24-month-old Canadian infants in the experimental condition performed at higher levels than 24-month-old Indian ( $p < .01$ ) and Peruvian ( $p < .09$ ) infants in that condition. There was no relationship between mother's education level and helping scores,  $r^2 = .06$ .

### Discussion

These results indicate that responding to the cues that others need help is well underway by 18 months of age in all three cultural settings. The only cultural differences found were for the 24-month-old Canadian toddlers, who performed at higher levels in the experimental condition as compared to the Indian and Peruvian toddlers. Because Warneken and Tomasello (2007) reported that even 14-month-olds act on helping cues, we might expect that regardless of the socialization goals and practices of the particular culture, children's ability and tendency to read and act on cues that another person needs help develop within a few months after the first birthday.

It is noteworthy that these experimental results found using tasks that were very likely novel to all children are consistent with the maternal reports of the children from all three cultures helping in everyday household chores and the like. Just as noteworthy is that children did not respond in control conditions. These findings make it very likely that, again, regardless of socialization practices, soon after their first birthdays young children from all cultural settings have the ability and tendency to help others when they are struggling to meet their goals—which means both that they understand goals and have some emerging altruistic motivations.

## GAZE FOLLOWING BEHIND BARRIERS

### *Background and Hypotheses*

During the first year of life infants often follow an adult's gaze direction to external objects (e.g., D'Entremont et al., 1997; Scaife & Bruner, 1975). But there are interpretive problems because infants might reactively turn their heads when they see another's head/eye orientation—and then they look at whatever attracts their attention in that general spatial area. Indeed, it would seem that very young infants may be doing something like this because 6-month-olds only follow an adult's general head direction—without any attempts to locate a specific target that may not be within their immediate visual field or the first object on their scan path (Butterworth, 1983).

By around 12 months of age, however, gaze following becomes much more sophisticated and flexible and seems to reflect an understanding that people do not just orient in some direction but actually see things. For example, having followed an adult's gaze to an object, 12-month-olds often point to the object and vocalize (Brooks & Meltzoff, 2002), or look back to the adult (perhaps to see if the adult sees it also; Bates, 1979; Carpenter, Akhtar et al., 1998). These “checking looks” to the other person suggest that infants at this age are truly monitoring the other's attention, as does the fact that at this age they will for the first time follow another's gaze direction to the space behind their own bodies (Deák, Flom, & Pick, 2000).

But perhaps the best evidence—analogue to the case with imitation in which overt behavior and underlying goal do not match (Imitation of Intended Action)—is provided by situations in which a person's gaze is oriented in a particular direction but simply following line of regard will not determine what he or she sees. Thus, if an adult conspicuously looks behind a barrier, from 12 months of age infants will not just look in that direction but will actually locomote behind the barrier to see what the other has just seen there (whereas they do not do this if the adult looks in front of the barrier; Moll & Tomasello, 2004). Also, if an adult looks in the direction of an interesting toy but there is an opaque barrier on the visual scan path to that toy, 14-month-old

infants will follow gaze not to the toy but to the adult's side of the barrier, presumably because they know that this is what the adult is actually seeing (whereas they look to the toy if there is a window in the barrier; Caron, Kiel, Dayton, & Butler, 2002). Finally, at around the first birthday infants also seem to know that the eyes are critical to seeing because they do not follow an adult's gaze direction if the adult is wearing a blindfold (whereas they do if the blindfold is on the adult's forehead; Brooks & Meltzoff, 2002). Western infants' behavior in these various "blockage" situations in which gaze direction does not straightforwardly map onto another's visual experience suggests that from around their first birthdays they understand that others are seeing things.

In this study, we used the barrier procedure of Moll and Tomasello (2004) to investigate whether 12- and 17-month-old children from India, Peru, and Canada would follow an adult's gaze to spaces they themselves could not see. In that study, by 12 months of age infants readily crawled behind barriers when an experimenter looked behind them and did not crawl when the experimenter looked to a visible sticker on the front of the barrier. We were concerned before the research that there may be differences in the onset of locomotion across the three cultural settings, and any delays in self-locomotion could obscure the ability to follow gaze. Although most infants we recruited in India were already crawling by 12 months, it was more difficult to find infants who were crawling at 12 months in the Peruvian setting. Our discussions with mothers in Peru revealed that they rarely put their young infants down on the ground, which is mostly damp and cold at this altitude, to explore by themselves because of health concerns. Nevertheless, we were successful in finding infants who were crawling (or walking) at this age and the data for these infants are reported below. The aim was to test our hypothesis that across all three settings infants would crawl or walk a short distance to follow another person's gaze to locations outside of their immediate visual field by 12 months of age.

## *Method*

### *Participants*

A total of 138 infants participated in the Barrier procedure, 65 (32 females, 33 males) from India, 38 (23 females, 15 males) from Peru, and 35 (17 females, 18 males) from Canada. Table 6 presents details of age ranges, mean age in days (months), and number of participants per condition for each of the two age groups across the three cultural settings. Because there were no interviews to accompany the barrier procedure, we do not have specific information relevant to the onset of language reported by mothers. However, because these infants were recruited from the same villages from which we do have reports on language onset in the other studies, we expect that similar estimates of language onset apply here.

TABLE 6

BARRIER TASK: AGE RANGES IN DAYS, MEAN AGE IN DAYS (MEAN AGE IN MONTHS), AND NUMBER OF PARTICIPANTS ACROSS CULTURAL SETTINGS, CONDITIONS, AND AGE GROUPINGS

Condition	Age (Months)	Cultural Setting		
		Canada	India	Peru
Control	12	337–437	333–416	340–445
		380.9	389.4	381.0
		(12.7) 9	(12.9) 11	(12.7) 7
	17	516–551	447–570	456–619
		519.1	516.4	515.7
		(17.7) 7	(17.2) 20	(17.2) 12
Experimental	12	349–434	330–419	301–440
		385.6	385.9	382.1
		(12.9) 11	(12.9) 12	(12.7) 12
	17	445–605	454–601	473–639
		529.3	515.6	533.7
		(17.6) 8	(17.2) 22	(17.8) 7

### *Materials*

All infants were exposed to four different barriers, which differed only slightly across cultural setting. The same barriers were used for both the control and experimental conditions. In all settings, one barrier was a wooden collapsible wall with side attachments for stability. A second wall-like barrier was used in all settings; for India and Peru this was a large plastic market bag that was stuffed and zipped, and for Canada it was a second wooden wall that had a white cardboard picket fence affixed to the front. In all settings, the remaining two barriers were a scrub bucket and a cardboard box with the top flaps folded so that the box was open. Thus, there were two barriers that were walls and two that were containers. For both conditions the barriers had a large bright sticker affixed to the front of the barrier approximately 10 cm from the floor. Four colorful infant toys were used as the hidden item for the experimental condition only.

### *Procedure*

In each culture, participants were tested individually for their ability to follow an experimenter's gaze behind a barrier. A caregiver always accompanied the infant. Most often this was the infant's mother, but occasionally it was a grandmother, father, or older sibling. Before the experiment began, caregivers were instructed to sit behind their infant and to

keep the infant from locomoting until the experimenter initiated the trial by establishing eye contact with the infant. At the beginning of each trial, the infant was centered in front of the barrier at a distance of approximately 3 ft. The experimenter knelt down to the side of the barrier at a distance of approximately 2 ft. In the experimental condition, the experimenter leaned sideways and gazed behind the barrier, accompanying her gaze with the sound “Oh!” and an excited facial expression. She gazed directly at the toy that was located behind the barrier, sustaining her regard there for approximately 3 s. She then looked back to the infant and waited for another 4 s while fixating the child. If the infant locomoted behind the barrier and found the toy, the experimenter let the infant play with it until the infant was satisfied so that the experimenter continue with the next trial. In the control condition, instead of turning slightly and looking behind the barrier, the experimenter turned slightly and gazed to the sticker on the front side of the barrier, which was in the equivalent position, only in front of the barrier, as the toy in experimental trials. The vocalizations (Oh!), facial expressions accompanying the gaze, extent of the head turn, and gaze durations were the same in the control condition as for the experimental condition. Each infant was randomly assigned to either the experimental or control condition in a between-subjects design. Every infant received a total number of four trials in their condition, one with each barrier. The order of barriers was counterbalanced across participants.

### *Coding and Data Analyses*

All trials were coded from the video-recordings by the primary author while in the field. For all trials in both conditions (experimental and control), the coder determined whether the infant moved around/toward the barrier to gain visual access to what the experimenter was looking at. For those barriers in which looking *behind* (walls) was necessary, the criteria were (1) the infant had to locomote an appropriate distance until the infant had visual access to the back of the barrier, and (2) the infant had to look to the target location where E1 had gazed (e.g., a child crawling past the barrier going somewhere else was not scored a positive response). For the barriers where looking *inside* was required (containers), the second criterion was that infants had to peek inside the container after locomoting there. The number of crawls to look behind/inside the barrier was calculated for each infant. To assess interobserver reliability, a random sample of 35 of the 138 subjects (25%) with equal numbers for culture, age group, and condition was scored in the Canadian lab by an independent research assistant who was unaware of the hypotheses relevant to the conditions of the study. Cohen’s  $\kappa$  values were high for all cultural contexts (Canada = 0.90, Peru = 1.00, India = 0.88). ANCOVAs on the number of looks behind/inside the barrier

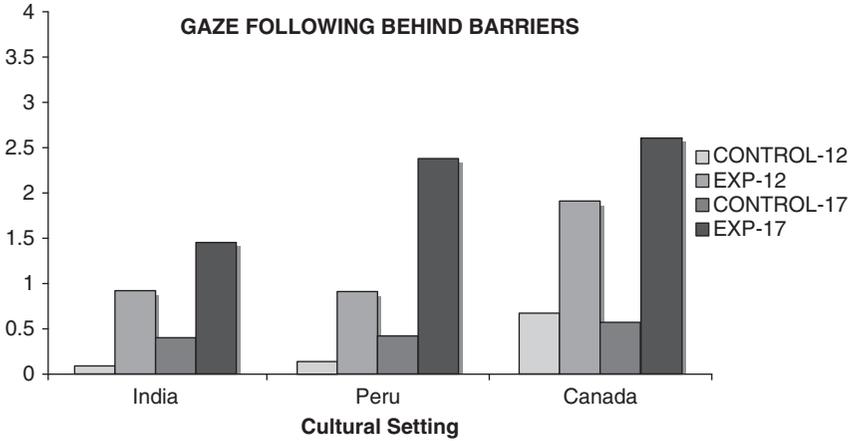


FIGURE 13.—Mean crawls behind or looks inside barriers as a function of cultural setting, age group, and condition.

were calculated first (age as covariate), followed by Tukey’s post hoc tests. We also calculated the number of children who crawled at least once behind the barrier in each condition across each of the settings. The Pearson correlation coefficients were conducted to assess the relation between mother’s education level (number of years of schooling) and scores.

### Results

Figure 13 shows the mean scores (out of a possible 4) for looking behind barriers as a function of culture, age group, and condition. These data were analyzed using an ANCOVA, which included cultural setting (Canada, India, Peru) and condition (control, experimental) as factors, and age as a covariate. There was a main effect of cultural setting,  $F(2,132) = 5.23$ ,  $p < .006$ , indicating that the Canadian children crawl behind the barrier most often in the experimental and control conditions combined. There was a main effect of condition,  $F(1,132) = 43.94$ ,  $p < .001$ , indicating that children in all three cultures looked behind the barrier more in the experimental than in the control condition. Most importantly, as can be clearly observed in Figure 13, there was no interaction between cultural setting and condition. Children in all three cultural settings manifested the barrier effect: They crawled behind the barrier when they could not see what the experimenter was looking at and did not crawl when they could see what the experimenter was looking at. There was a marginally significant interaction of Condition  $\times$  Age,  $F(1,132) = 3.48$ ,  $p < .06$ , such that 17-month-olds tended to show a more robust condition effect than 12-month-olds. Figure 14 illustrates that across all three cultural settings a majority of infants crawled behind the barrier at least once but only in the experimental

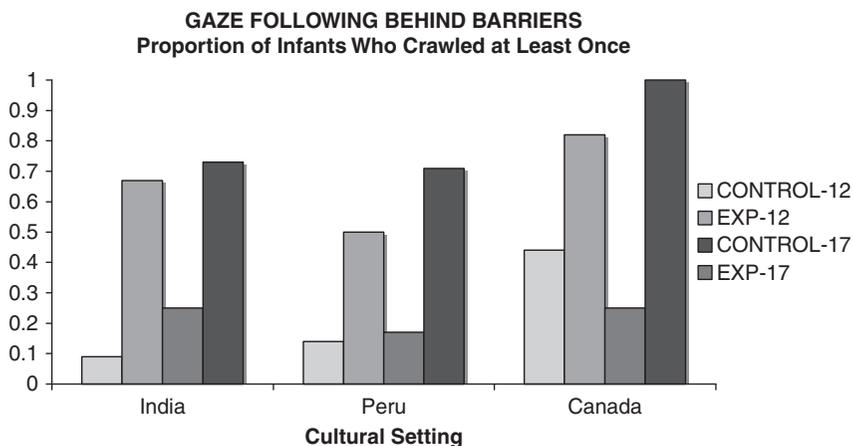


FIGURE 14.—Mean proportion of children who crawl behind the barrier at least once across cultural settings, age groups, and conditions.

condition. Mother's education level did not significantly correlate with tendency to crawl behind the barrier in the experimental condition,  $r^2 = -.27$ .

### Discussion

In this study, children from all three cultural settings reliably followed an adult's direction of gaze behind a barrier. The majority of infants at both ages in all three cultures followed gaze behind a barrier at least once. The Canadian infants followed gaze direction more often across conditions combined, but that could easily be because Canadian children receive many more opportunities at independent locomotion than Peruvian and Indian children at this young age. Although it would be of interest to follow up on the extent to which locomotor experience affects performance on this task, our aim was to assess whether the ability to follow gaze was manifested by an attempt to locate hidden objects by the first birthday. The data suggest that this is an ability demonstrated by the majority of 12-month-old infants, regardless of cultural setting.

## DECLARATIVE POINTING

### *Background and Hypotheses*

Children use gestures, especially the pointing gesture, to communicate with others before they use any conventional language (Bates et al., 1979; Liszkowski, 2005; Tomasello et al., 2007). Whereas the barrier task assessed infants' skills at following gaze direction, and doing something about it when

one cannot see what the other is attending to, the pointing task captures whether infants attempt to direct and share the attention of others to an object or situation. Infants begin to use index finger pointing at around 12 months of age (Carpenter, Akhtar et al., 1998; Leung & Rheingold, 1981; Murphy & Messer, 1977). From the onset, pointing for others can be driven by referential intentions for various social motives such as sharing attitudes and helping by informing (Tomasello et al., 2007). There has been some discussion of whether the existence and the types of pointing observed in contemporary European and North American research is universal for adults across cultures, and if so whether a similar developmental trajectory will be found.

Our goal here was not an in-depth study of the development of all possible types of pointing and the potential motives underlying them but to simply document whether infants manifested index finger pointing across the three cultural settings in the period around the first birthday—in one seemingly facilitative context (see Liskowski, Brown, Callaghan, Takida, & deVos, 2010, for a more extensive study of both parent and infant pointing). Additionally, we examined whether the levels of pointing were similar across settings. We expected that there would be evidence of index finger pointing regardless of cultural setting at this age but did not have a specific prediction regarding differential levels.

### *Participants*

A total of 42 infants participated in the pointing procedure, 9 (7 females, 2 males) from Canada, 21 (11 females, 10 males) from India, and 12 (6 females, 6 males) from Peru. To compare across cultural settings we restricted the age range to between 10 and 13 months, excluding infants who were older or younger. Table 7 presents details of age ranges, mean age in days (months), and number of participants per condition across the three cultural settings.

Age of onset of language was not requested in parental interviews for pointing. However, mothers were asked whether their infant was speaking yet. The percentage of mothers reporting that their infants were speaking was similar across cultural settings (70% for Peru, 72% for India, 70% for Canada). Mother's average education level was 15.2 years in Canada, 8.9 years in Peru, and 5.1 years in India. Literacy was high in Canadian (100%) and Peruvian (92%) settings and low in India (57%).

### *Interview*

#### *Interview Method*

In addition to providing the general language and education information reported earlier, mothers were asked to estimate the age of onset of

TABLE 7  
 POINTING PROCEDURE: AGE RANGES IN DAYS, MEAN AGE IN DAYS (MEAN AGE IN MONTHS),  
 AND NUMBER OF PARTICIPANTS ACROSS CULTURAL SETTINGS

Cultural Setting		
Canada	India	Peru
313–417	320–415	307–410
385.2	376.1	363.3
(12.6) 9	(12.5) 21	(12.1) 12

pointing in their infants and to indicate how their infants usually indicated things for their mothers. Mothers were also asked to demonstrate how they typically indicate things of interest to their infants.

#### *Interview Results*

Across all cultural settings mothers reported that their infants began to point around 9–10 months of age (Peru = 9.8 months, India = 9.4 months, Canada = 10.8 months). We improved the interview protocol in the second year of this study, so questions regarding how infants indicated things to their mothers were slightly different in the interviews of Indian (Year 1) as compared to Canadian and Peruvian (Year 2) mothers. In India, mothers were asked how their infants pointed, whereas in Peru and Canada they were asked how they indicated things. Owing to this difference in framing of the question we cannot directly compare type of infant indicators across settings. However, it is interesting to note that mothers of Indian infants reported a variety of types of points, including index finger (33%), downward grasping/waving (30%), outstretched arm with palm up (19%), and chin nod (14%). Peruvian mothers noted that their infants were most likely to indicate things by index finger pointing (29%) or verbally indicating (26%) and less likely to indicate by bringing the item to the mother (16%) or showing it (16%). In contrast, Canadian infants were most likely to show (46%) or index finger point to (38%) items and less likely to verbally indicate (8%) or pull their mother toward item (8%). There was diversity across cultural settings in mothers' reports of how they indicated things to their infants. Three main types of indicators were reported across settings: pointing, showing by holding up an item, and verbalizing. The relative proportions of examples coming from these three categories differed across cultural settings. In all settings mothers were most likely to point to things for their infants (Peru = 48%, India = 81%, Canada = 93%). No Canadian mothers reported verbally indicating things. In contrast, 24% of mothers in Peru and 12% of Indian mothers verbally indicated things to their infants.

Holding up an item to show their infant was another less common way that mothers from all settings used (7% in each setting).

### *Pointing Task*

#### *Materials*

The procedure was conducted in India a year before the other cultural settings and included slightly different materials than those used in Canada and Peru. In all settings, the items were of three types: picture/poster, exciting/novel, and liked/familiar. For the Indian study, the following 10 items were used: poster format photo of children, brightly colored festival streamers, 3-D cardboard advertisement hanging from rope, colorful star-shaped decoration, large shiny brass plaque, two large official's ribbons, vase with plastic flowers, flowered wall hanging, and giant pencil (35 cm). In Canada and Peru, we used the following 19 items from a standardized field kit that was compiled for a larger comparative study on infant pointing (Liszkowski & Brown, 2007): four laminated poster size pictures of animals, landscapes, and vehicles; feather boa; flower lei; small flashing light; bicycle reflectors; spiral pinwheel; clown face; large paper butterfly; clown doll; key ring; disco mirror ball; ball; doll; cup; paper balloon; and paper flowers. In all settings, the items were arranged in a variety of ways, depending on the layout of the room. In all cases, we strung a clothesline from which we hung approximately half of the items and had a small table or chairs on which we placed the remaining items. In India, we used chalk on the floor to outline a boundary around the set up so that handling of the items would be restricted. However, this was not entirely effective, so in Canada and Peru we roped off an area surrounding the setup using ribbon.

#### *Procedure*

Children were accompanied by their caregivers in all settings. The procedure consisted of a seminaturalistic exploration of a richly decorated space (Liszkowski & Tomasello, 2011). Before the experiment began, caregivers were told that the experimenter had decorated a room for the caregiver and child to explore together for about 5 min. They were asked to carry their infants on their hip throughout the exploration of the room and were told that if the baby did touch something to return it to its place before moving on. The terms "point" or "show" were avoided in instructions to ensure that they did not bias a natural interaction style. Two cameras were positioned in the room to capture images of the caregiver and infant regardless of their orientation. The experimenter left the room while the caregiver-infant pairs explored it.

### *Coding and Data Analyses*

Trained assistants, who began a coding session by synchronizing the tapes from the two cameras, coded all data. Following synchronization, a main coder counted all of the index finger points made by the infant throughout the entire 5 min exploration period. Index finger pointing was coded if the arm was either fully or half extended with an extended index finger relative to all other fingers and the palm facing either down or sideways and if it was clearly not an attempt to touch an object. A second coder coded reliability for 25% of each cultural sample. The numbers of points identified by the two coders (main and reliability) were highly correlated ( $r = .978$ ,  $p < .001$ ). The number of index finger points for each infant within the target age range (10.7–13.7 months) was calculated and the effect of cultural setting was assessed using an ANCOVA with age as a covariate. Because the data (number of index finger points) were skewed, they were square root transformed before conducting the ANCOVA. The proportions of infants who made at least one index finger point were also calculated for each culture and the Pearson correlation coefficients to assess the relation between mother's education level (number of years of schooling) and number of infant points were conducted.

### *Results*

The ANCOVA revealed a significant effect of cultural setting,  $F(2,43) = 4.49$ ,  $p < .02$ . Post hoc comparisons of the data indicated that infants in the Canadian context pointed significantly more often ( $p < .02$ ) than infants in the Indian context (mean number = 5.92 vs. 0.67, respectively). Levels of pointing for Peruvian infants were intermediate but not significantly different from either of the other two settings (mean number = 2.86). The individual data presented in Figure 15 mostly corroborate these findings. A smaller proportion of infants engaged in at least one instance of index finger pointing in the Indian (.24) as compared with Canadian (.75) and Peruvian (.58) settings,  $\chi^2 = 6.13$ ,  $p < .05$ . Mother's education level did significantly correlate with number of index finger points,  $r^2 = .44$ ,  $p < .01$  (two-tailed). Calculation of the mean number of points indicated that infants of mothers with university or college education (all but one of these mothers were Canadian) pointed more often (mean = 7.20) than infants of mothers with no education (all but one of these mothers were Indian, mean = 0), elementary education (mean = 0.70), or secondary/high school education (mean = 2.71). None of the 10 infants of mothers having no education pointed, whereas 16/27 infants of mothers with high levels of education (high school or above) pointed. A Fisher exact probability test revealed a

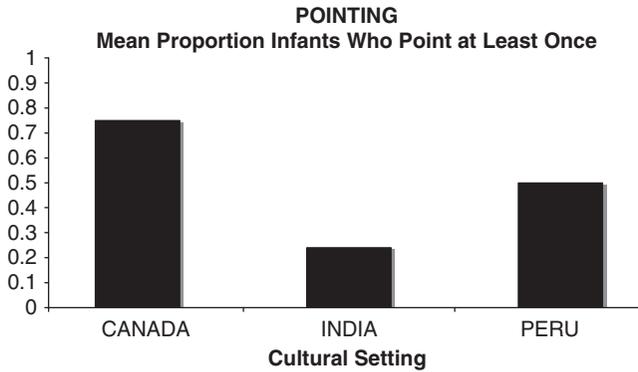


FIGURE 15.—Mean proportion of children who engaged in at least one index finger point across cultural settings.

significant difference in the numbers of infants who pointed across these two groups ( $p < .001$ ).

### Discussion

There are a couple of possible reasons for the lower levels of index finger pointing in the Indian setting. Owing to various logistical constraints, the stimulus set had fewer items in India than in Canada and Peru, which may highlight the role of the external environment in eliciting infant pointing (e.g., Butterworth, Franco, McKenzie, Graupner, & Todd, 2002). Given the positive correlation we found for these variables, it is also possible that the lower levels of infant pointing may be influenced by the lower level of education of mothers in the Indian relative to the Canadian and Peruvian samples. For example, it may be that mothers with little or no education do not engage, or engage very little, in preverbal communication with their infants. Richman, Miller, and LeVine (1992) investigated whether maternal education level was related to maternal responsiveness to infants (verbal, physical, and visual modalities were measured). Their samples varied in years of schooling but were chosen from the same neighborhoods in a Mexican city, thus controlling for socioeconomic differences. Mothers with higher levels of education were more likely to verbally engage with their infants in this study. It is possible that the mediating factor was the verbal skills mothers gain through schooling, with these skills subsequently influencing mothers' parenting routines. Exposure to communicative gestures from others is also thought to be crucial for the development of preverbal communicative behaviors in infants. In future research it will be important to link infants' pointing to mothers' pointing. As the Richman et al. (1992) research attests, research that samples from a variety of levels of education

within cultural settings, and then compares across diverse settings, could help to clarify the relative roles of education and how this variable may mediate general cultural practices in the development of declarative pointing.

Regardless of the reason for the differences observed across cultural settings, it is clear that some infants in all three settings do point around 12 months, and in no culture did all infants point, in the age range studied. Further studies are in progress that will help to clarify the extent to which infants engage in referential pointing across different cultural settings and how their pointing may be linked to pointing in caregivers and to subsequent linguistic development (e.g., see Lizkowski et al., 2010).

## COLLABORATION

### *Background and Hypotheses*

Joint commitments to joint goals characterize many adult human behaviors across many cultures, everything from making the bed and harvesting crops to mentoring students and enacting government policies. In situations of two people pursuing joint goals, the people involved typically operate under the expectation that they share a commitment, and if one of those people fails to hold up their end of the bargain, then the other will draw attention to the social breach or otherwise attempt to reengage the other in the joint activity. The question is whether and when children come to understand the shared nature of collaborative goals. Warneken et al. (2006) explored this issue using a procedure that engaged 18- and 24-month-old children in several different collaborative activities. After collaboratively playing the activity with the child for a few trials, the adult stopped interacting during the middle of two test trials. Virtually all of the children at least once made active attempts to reengage the adult in the activity. In a recent study, Gräefenhain et al. (2009) found that children did this even when the child could easily continue the activity independently.

In the current study, we explored the extent to which young children from diverse cultural settings are sensitive to the shared nature of collaborative goals. Our question was whether children from all three cultural settings would direct a noncollaborative partner to reengage in a collaborative game between the ages of 18–27 months, and our expectation was that they would.

### *Participants*

A total of 57 toddlers participated in the Collaboration task, 17 (8 females, 9 males) from Canada, 21 (10 females, 11 males) from India, and

TABLE 8

COLLABORATION TASK: AGE RANGES IN DAYS, MEAN AGE IN DAYS (MEAN AGE IN MONTHS), AND NUMBER OF PARTICIPANTS ACROSS CULTURAL SETTINGS AND AGE GROUPINGS

Age (Months)	Cultural Setting		
	Canada	India	Peru
20	516–676	528–667	583–673
	606.3 (20.2) 8	589.8 (19.4) 10	642.6 (21.4) 9
25	721–798	720–815	722–817
	757.6 (25.3) 9	773.5 (25.8) 11	787.4 (26.2) 10

19 (9 females, 10 males) from Peru. Table 8 presents details of age ranges, mean age in days (months), and number of participants for each of two age groups across the three cultural settings.

Mothers reported that infants began to comprehend words sometime between 9 and 16 months depending on cultural setting. Canadian mothers reported that their infants began to produce words around 12 months, approximately 3 months earlier than mothers' reports for infants in Peru and India. As before, mother's education level and literacy status varied across the three cultural settings. Mother's average education level was 15.4 years in Canada, 8.6 years in Peru, and 4.5 years in India. Literacy was high in Canadian (100%) and Peruvian (91%) settings and low in India (52%).

### *Interviews*

#### *Interview Method*

The same interview used for the helping task contained questions relevant to collaboration. Thus, mothers were asked to indicate the age of onset and examples of collaborative behaviors. In addition, they were asked to indicate the age at which they felt infants should collaborate with others, and whom they typically collaborated with. To assess parental beliefs about these behaviors, mothers were asked why they felt it was important for children to collaborate with others and why they felt children engaged in these behaviors.

#### *Interview Results*

Across all cultural settings mothers reported that their infants began to collaborate sometime in their second year (Peru = 22.3 months,

India = 20.9 months, Canada = 16.4 months). In Peru and India, all mothers (100%) reported household chores requiring two or more people (e.g., moving heavy furniture, spreading out blankets or saris) when asked to give examples of collaborative behaviors. In Canada, the majority (80%) of examples were also of this type; however, these mothers also reported collaborative play behaviors (20%) when giving examples of collaboration. When asked whom their children collaborated with the most, mothers from all settings were most likely to respond that their children collaborated with their parents the most (Peru = 46%, India = 50%, Canada = 71%). In contrast to Canadian (11%) children, Peruvian (43%) and Indian (50%) children were also highly likely to collaborate with all people equally. When asked why it is important for children to collaborate with others, mothers from all settings offered a variety of common responses. These included serving to build character (Peru = 64%, India = 21%, Canada = 27%) and teaching children how to do things (Peru = 12%, India = 12%, Canada = 27%). Mothers from Peru and India noted that collaboration served the function of building community (Peru = 16%, India = 3%). In addition, Indian and Canadian mothers noted the purposes of gaining social approval (India = 12%, Canada = 5%). Unlike mothers in other settings, Indian mothers reported sensitivity to others' needs (34%) as the main reason children begin to collaborate. As in the helping interviews, a large percentage of Canadian mothers (42%) responded "don't know" when asked why collaboration was important. Mothers had differing opinions about why children start to collaborate, depending on cultural setting. In Peru, mothers saw cooperating as a natural outgrowth of the connection to community (28%), or they believed that children started to collaborate because others taught them to (19%) or because they were copying others (25%). Some mothers also named pragmatic reasons (17%) or social approval (11%) as reasons children started to collaborate. In India, mothers reported that children started to collaborate because they sensed the needs of others (37%), because they were copying (30%), or because they felt a connection to their community (23%). A smaller percentage reported that collaboration was a natural behavior (10%). Canadian mothers were most likely to say that children began to collaborate because they were copying others (42%) or that it was natural (19%). Other responses included that collaboration came from being taught (15%), from sensing others' needs (12%), or out of self-interest (12%).

### *Collaboration Task*

#### *Materials*

We administered four tasks from the original study (Warneken et al., 2006), which were considered to be appropriate games to play with children

from the three cultural settings. With the exception of the toys used in the games, which were purchased in the cultural setting they were used in, we made all of the apparatuses used in the games. These were collapsible for ease of transport to the field sites, and made from materials obtained in Canada. For the *elevator* task we constructed an apparatus (45 cm wide × 65 cm high × 45 cm depth) that had a flat tabletop with a small center panel that rose up when the container attached below it was lifted by one of the partners in the game. The container had an opening so the child could retrieve the trinket. The bottom of the apparatus was closed on three sides so that the underside was not accessible to the player who would retrieve the toy, and the top of the apparatus was closed on three sides so the topside was not accessible to the player who lifted. In the *trampoline* game, we used a flat bag (30 cm × 45 cm) made from neoprene as a trampoline and a small toy, which was used to bounce on the trampoline. Neoprene is stiff enough to bounce the toy on when two people held each side, but it's also loose enough to collapse when one person lets go. In the *double tube* game, two mailing tubes were placed side-by-side in the openings of a wooden supporting box that was placed on high enough for children to reach the top of the tubes. A small toy was used to drop down the tubes and a small tin cup was used to catch the toy. In the *long tube* game, we constructed a long tube that opened in the middle from three smaller mailing tubes. The ends of the long tube were taped over with duct tape so that the small toy used for hiding was only accessible when the tube was pulled apart at the middle.

### *Procedure*

Participants were tested individually and accompanied by a caregiver in all cultural settings. Before the experiment began, caregivers were instructed to sit behind their child and to keep the child from locomoting until the experimenter began to interact with the props. Sessions lasted approximately 20 min and were videotaped and later coded from tapes in the field by the primary author.

At the beginning of each game (see later sections for details about individual games), the experimenter showed the child the parts of the apparatus and then demonstrated with an assistant how the apparatus for that game worked, asking the child to “watch how we play this game.” The child was then invited to play. If the child failed to engage, the child was given a second demonstration and then explicit instructions if needed before going to the next game. On the first two trials, the experimenter collaborated in playing the game with the child so that the child experienced success at the game. On Trial 3, the experimenter began to engage in the game and then abruptly stopped engagement and adopted a neutral expression beside the

apparatus for 15 s. If the child attempted to reengage the experimenter within 15 s, then the experimenter resumed collaborative play. If the child did not attempt to reengage within this time frame, then the experimenter went back to her position at the apparatus and began Trial 4, which repeated the sequence of Trial 3. Thus, there were two engagement trials and two perturbation trials for each game.

Two of the tasks (elevator, double tube) had two complementary roles (give, take) that had to be assumed by the two players for the goal to be reached. For these games, children first played assuming one role and then played in the other role. The other two tasks (long tube, trampoline) had a single goal, the success of which was dependent on both players working together, using the same actions toward the shared goal. The order of games was counterbalanced across participants, as were the orders of “taker” and “giver” roles in dual role games.

*Elevator.* In this game, the two players faced each other on either side of the apparatus (see Figure 16). When the child faced the accessible tabletop (“taker” role), the child could remove a small trinket from the container when the other player lifted it but could not lift the container to make it accessible. The “giver” sat on the side of the apparatus that had windows blocking accessibility to the tabletop and had to reach under the apparatus, place his or her palm under the container and lift it up. On perturbation test trials, the experimenter placed her hands on the tabletop on either side of the small panel for the “taker” role and squatted with her hands visibly on her lap for the “giver” role.

*Double Tube.* There were also “taker” and “giver” roles associated with this game. In the “taker” role, the child was to hold a cup under the tube that the “giver” was dropping a toy down. In the “giver” role, the child dropped the toy down the top of one of the tubes. On perturbation test trials the experimenter held the cup to the side of the bottom of the tube for the “taker” role as she squatted down to child height, and she held the toy to the side of the top of the tube in the “giver” role.

*Long Tube.* The goal of this game was to pull apart the long tube and expose the toy inside. The tube was made so that it was too long for one person to pull both ends. Thus, the child needed to pull from one end and the experimenter from the other end in a coordinated fashion for the tube to come apart. On test trials the experimenter dropped her side of the tube, which fell to the floor.

*Trampoline.* A small toy was placed on the trampoline while it was on the floor in between the child and the experimenter. Then they took



FIGURE 16.—An Indian child and researcher engaging in the collaborative elevator task.

either side of the trampoline and bounced the toy, with the experimenter squatting so her arms were at the same height as the child's. On test trials the experimenter simply dropped her side of the trampoline and the toy fell to the floor.

#### *Coding and Data Analyses*

Children's actions were coded from videotape in the field sites and reliability coded by assistants in the Canadian lab. The dependent measure

of interest was the proportion of trials on which the child attempted to reengage the experimenter (i.e., on Trials 3 and 4). There were a total of 12 test trials across the 4 games (4 trials for each of the 2 dual role games and 2 trials for each of the 2 single role games). Children were coded as trying to reengage if they indicated through action or verbalization that they wanted the experimenter to continue to participate. Verbalizations were straightforward and included directives to “lift it,” “pull it,” “hold it,” and so on. Nonverbal reengagement attempts included gestures that were referential (e.g., waving hands in an upward motion when the experimenter failed to push up the container in the elevator) or that were “helpful” attempts to get the experimenter going (e.g., lifting the long tube up toward the experimenter’s hands). In all reengagements attempts that were nonverbal, children had to alternate gaze between the experimenter and the part of the apparatus the experimenter had to manipulate to be coded as a reengagement attempt. Each child received a score out of 12 for the number of reengagement attempts over all test trials. To assess interobserver reliability, a random sample 15 of the 57 participants (25%)—with equal numbers across cultures—was scored in the Canadian lab by an independent research assistant who was unaware of the hypotheses relevant to the conditions of the study. Cohen’s  $\kappa$  values were high for all cultural contexts (Canada = 0.97, Peru = 0.98, India = 0.97).

The data (i.e., number of reengagement attempts) were skewed, so they were square root transformed. The transformed data were analyzed using an ANCOVA with cultural setting as the factor and age as a covariate. Following the ANCOVA, we calculated linear regressions of reengagement attempts using age in months as a variable to estimate the approximate age in each cultural setting at which children attempted on at least two trials to reengage the experimenter. The proportion of children making at least one reengagement attempt was also calculated. We also conducted Pearson correlation coefficients to assess the relation between mother’s education level (number of years of schooling) and collaboration scores.

### *Results*

The ANCOVA revealed a marginally significant effect of cultural setting,  $F(2,60) = 2.33$ ,  $p < .11$ . As indicated by Figure 17, children in India ( $p < .07$ ) and Peru ( $p < .05$ ) engaged in slightly more reengagement attempts than children in Canada, and there were no differences in performance between India and Peru. Linear regression analyses (see Figure 18) of the number of reengagement attempts corroborated the finding that cultural setting differences were not extensive; children passed the criterion (at least

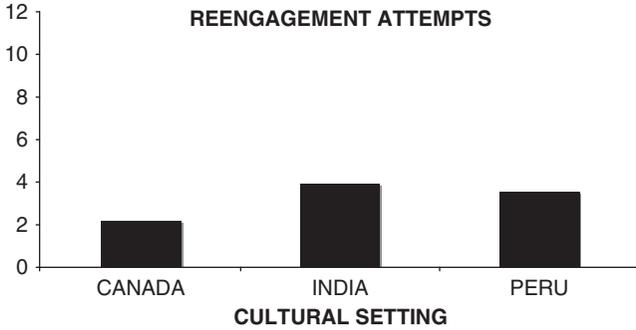


FIGURE 17.—Mean proportion of reengagement attempts as a function of cultural setting.

two reengagement attempts) approximately 2 months earlier in India (17.8 months) as compared with Canada (19.6) and Peru (19.5). Thus, despite slight differences in level, children in all cultural settings began to demonstrate sensitivity to the collaborative nature of the games within an age range considered typical for this task (17–20 months). Mother’s education levels did not correlate with number of reengagement attempts,  $r^2 = -.16$ .

### Discussion

Although Canadian children attempted to reengage their recalcitrant partners, reengagement attempts were not as common in this cultural setting. The interview data showed some subtle differences in maternal attitudes toward the importance of collaboration across cultural settings. In Peru, mothers stressed the benefits of building character and community, while Indian mothers highlighted social approval and sensitivity to the needs of others. In Canada, about half of the mothers responded that they did not know, and most other mothers stressed the importance of learning how to do things. It was also more likely for Canadian than Peruvian or Indian mothers to report collaborative play as a common context for collaboration for their children. Mothers from India and Peru were more likely to name family or community chores as the most common context and also more likely to report that their children would help everyone equally. Canadian children’s experience, and preference, may be to more readily engage in collaboration with parents and not with friendly strangers. It is possible—though we have no direct test of the possibility—that these different attitudes led to different socialization priorities across settings such that Canadian mothers do not attempt to engage their young toddlers in collaborative activities much outside of the play context, whereas Peruvian and Indian mothers do. There are a variety of other possibilities, all

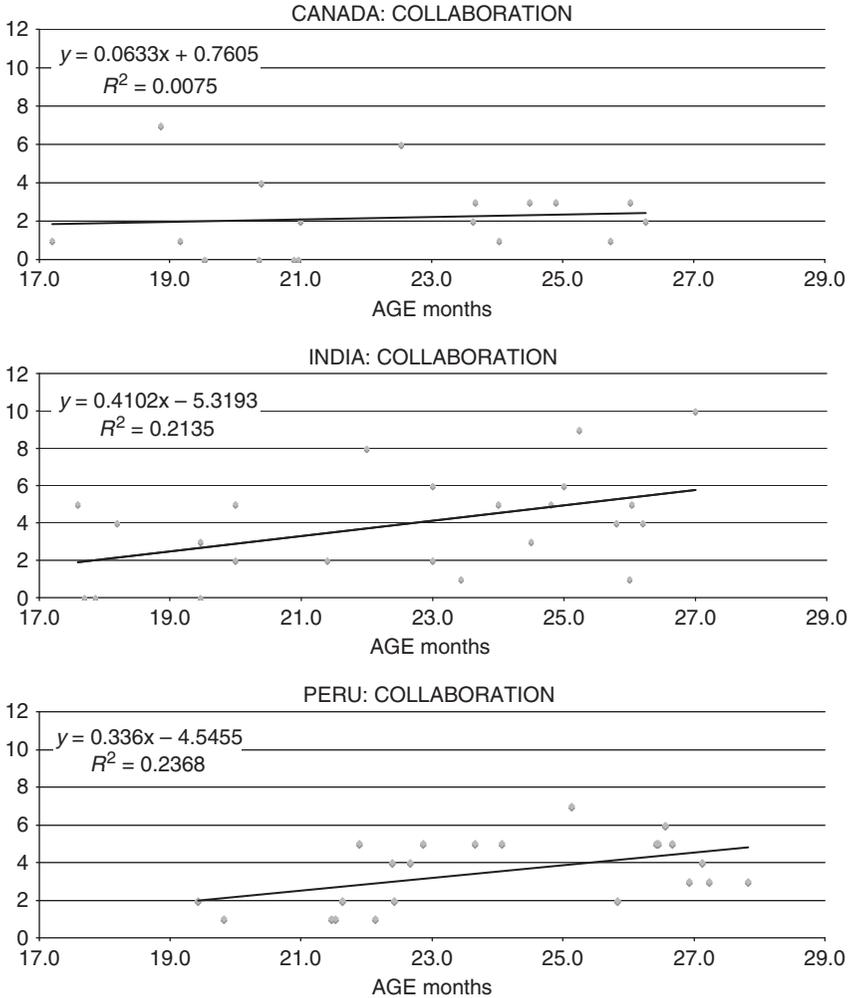


FIGURE 18.—Linear regression plots of the age (months) and number of reengagement attempts in the collaboration task for Canadian, Indian, and Peruvian children.

untested, for the slightly lower levels of reengagement attempts by Canadian infants. For example, there may exist differing levels of explicit teaching in collaborative activities across cultures, or of tendencies to challenge the child with an interruption of play that may indicate failure, and it is also possible that the youngest Canadian children may more readily abandon a game that is not going well with an unreliable adult. Given that an interesting difference in attitudes was found across cultural settings using open-ended questions from our interviews, in future research it will be important to

assess a priori whether parental beliefs and practices can predict differences in the levels of reengagement found in the task. Clearly a variety of possibilities could be explored in the future.

This difference of performance level found for Canadian children aside, our results support the notion that children from diverse cultural settings understand the shared nature of collaborative goals from an early age and are willing to communicate to a recalcitrant adult that he or she needs to play a part in the game. Importantly, as in the helping tasks, these collaboration tasks were almost certainly novel to children in all three cultural settings, so their behavior may not be attributed to a routine learned for specific materials.

## JOINT ATTENTION

### *Background and Hypotheses*

Sharing attention and monitoring others' attention are defining features of joint attention, which develops late in the first year and early in the second year of life (Bakeman & Adamson, 1984; Carpenter, Akhtar et al., 1998). In some cases a joint attention episode is begun when an infant follows the gaze of another person and checks back with the other to determine whether they are sharing the same object of attention. In other situations a partner may follow the infant's focus and begin to communicate about the object of attention, while the infant checks between that object and their communicative partner. It is in these early communicative exchanges with supporting partners that the infant enters into the world of shared communication and other collaborative endeavors. Thus, joint attention serves as a core foundation to other truly collaborative activities that begin around the first birthday, including early communication and language (Tomasello, 2003).

In the current study, we monitored joint attention to an experimenter who directed infants' attention to interesting objects and then communicated about them. The procedure was naturalistic and designed to elicit joint attention behavior on the part of the young infants, who ranged between 9 and 13 months of age. The same objects, procedure, and experimenter were used across cultural settings. It was expected that infants from all settings would engage in joint attention within this age range.

### *Method*

#### *Participants*

A total of 54 participants between the ages of 8–13 months were recruited, 18 from each of the cultural settings (Peru = 8 males, 10 females;

India = 9 males, 9 females; Canada = 9 males, 9 females). Table 9 presents details of age ranges, mean age in days (months), and number of participants per condition across the three cultural settings. Because there were no interviews to accompany the joint attention procedure, we do not have specific information relevant to the onset of language. However, because these infants were recruited from the same villages as for the other studies we expect that similar estimates of language onset will apply.

### *Materials*

Infants were presented with eight high-fidelity, laminated photographs (19 cm × 19 cm) of infant toys. Each photo depicted a toy in actual size.

### *Procedure*

Infants sat on their mother's lap on a mat on the floor in front of the experimenter. The same experimenter (primary researcher) conducted the procedure in all settings. Mothers were asked (through an interpreter in India and Peru) to help to keep the infant oriented toward the experimenter but otherwise to refrain from interacting with or helping their infant. The experimenter called the infant's name to begin the procedure and then held up one photo at a time to her left while pointing to it. While showing the photo to the infant in this way, the experimenter looked back and forth between the infant and the photo twice, saying "Look, look" in the language of the infant. Each photo was presented for approximately 10 s, making for a total of approximately 80 s for the presentation of the set of eight photos. The order of presentation of the photos was randomized and then that order was used for all infants. All sessions were videotaped and coded later.

### *Coding and Data Analyses*

The data consisted of the number of photo presentations where the infant engaged in at least one joint attention episode, out of a total possible

TABLE 9  
JOINT ATTENTION TASK: AGE RANGES IN DAYS, MEAN AGE IN DAYS (MEAN AGE IN MONTHS),  
AND NUMBER OF PARTICIPANTS ACROSS CULTURAL SETTINGS

Cultural Setting		
Canada	India	Peru
262–386	274–418	265–400
341.6	337.1	337.3
(11.4) 18	(11.2) 18	(11.2) 18

of eight. A joint attention episode was defined as a look from the photo to the experimenter and back to the photo or as a look from the experimenter to the photo and back to the experimenter. A Canadian research assistant, who was naïve to the hypotheses of the study, coded the tapes. Twenty-five percent of the tapes were reliability coded by a second assistant, and reliability was found to be high (Cohen's  $\kappa$ s for Canada = 0.91, Peru = 0.94, India = 0.91). We also conducted Pearson correlation coefficients to assess the relation between mother's education level (number of years of schooling) and joint attention scores.

### Results

The data were analyzed using an ANCOVA, which included cultural setting (Canada, India, Peru) as a factor, and age as a covariate. There was no effect of cultural setting. Infants engaged in joint attention on almost half of the trials in all three cultural settings (see Figure 19 for relevant means). When we calculated the proportion of infants who engaged in at least one episode of joint attention over the eight trials, we found that virtually all of the infants across all settings did so (mean proportion of infants engaging in at least one joint attention episode = 1.0, 0.94, and 0.83 for Canada, India, and Peru, respectively). Mother's education levels did not correlate with joint attention,  $r^2 = .01$ .

### Discussion

As predicted, infants from diverse cultural settings engaged equally in joint attention episodes with a female experimenter who interacted with them in a communicative exchange, and virtually all the 8–13-month-old infants showed at least one episode of joint attention during the session. These results are generally consistent with those from the longitudinal

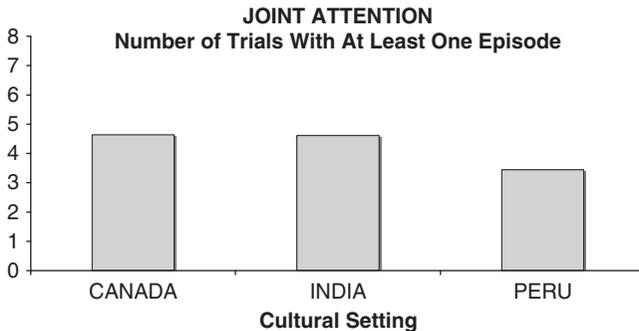


FIGURE 19.—Mean number of trials for which there was at least one joint attention episode initiated by infants across cultural settings.

study of Western, middle-class children of Carpenter, Akhtar et al. (1998), who also found that almost all of their 9-month-olds engaged in at least one joint attentional bout with an experimenter in a controlled setting. Clearly, engaging in joint attention early in life is a social cognitive activity that infants from a variety of cultures develop early in life, along the same developmental timetable.

## PRETENSE

### *Background and Hypotheses*

Naturalistic observations of 1-year-old children reveal a number of activities that could be interpreted as pretense, for example, bringing an empty cup to the lips (e.g., Bretherton, 1984; Fenson, 1984; Nicolich, 1977). The problem is that infants see adults doing this with cups, both for real and in many cases in pretend games with them, and they might just be simply mimicking without any pretend attitude at all. Evidence for this possibility comes from the finding that children younger than 2 years have difficulty using objects as symbols in pretend play that is not scaffolded or modeled by adults, particularly if the relevant items have other conventional uses (e.g., using a cup as a hat; Tomasello et al., 1999). Similarly, it is only after 2 years of age that children can creatively follow adult pretend actions (e.g., “wiping up” pretend juice an adult has pretended to spill; Harris & Kavanaugh, 1993).

A particularly stringent test of pretense understanding was used by Rakoczy, Striano, and Tomasello (2004, Exp. 3). Children saw adults performing pairs of superficially similar behaviors—*pretending* to perform an action (e.g., pretending to pour from a full container into a cup) and *trying* to perform the same action (e.g., trying to pour from a full container into a cup). These two models are similar in that they involve the same superficial “incomplete” behaviors (pouring movements without real pouring) but differ in their intentional deep structure (in trying one wants to really pour but fails, whereas in pretense the very point is that one does not really want to pour) and in the attitudes that mark these deep structures (serious effort, frustration, etc., in the trying case vs. playfulness, sound effects, etc., in the pretense case). If children understand the intentional deep structures of the two kinds of acts, after seeing a trying model they should respond with a serious attempt at performing the action in question, but after seeing the pretense model they should respond with an imitation of the pretense act or an inferentially appropriate pretense act (e.g., pretending to pour from the cup into which the actor had pretended to pour). Rakoczy et al. (2004) and Rakoczy and Tomasello (2006) found that children from 2 to 3 years indeed showed such a differential response pattern.

In the present study, we looked both at children's comprehension of pretense using the pretend/trying task (Rakoczy et al., 2004, Exp. 3), as well as their production of pretend acts. To obtain a production measure we presented children with two sets of objects with which they could play a "truck" or a "doll" game. One set contained conventional replica toys and the second included objects to be used in a nonconventional manner as toys. By having conventional replica toys as well as toys that would have to be used in a nonconventional way, we hoped to assess play production both with the small replica toys that are common in the Canadian setting, as well as the everyday items used nonconventionally that are common in the play environments of children in the Peruvian and Indian settings. So that children would feel at ease, a friendly adult encouraged play and sat with the child throughout the session, without directing or scaffolding their play. The goal of the naturalistic production task was to examine whether children begin to produce symbolic pretense at approximately the same age across the three settings, and whether their tendency to do so was influenced by whether the props resembled the real-world referents.

There is evidence to suggest that the extent of exposure to pretend play with supportive adults has an impact on the level of play in children. In contexts where there is little pretend play between parents and children, levels of pretense are lower than in settings where the level of pretense interaction is higher (Bornstein, Haynes, O'Reilly, & Painter, 1996; Farver & Howes, 1993; Gaskins, 1999; Haight, 1999). In the current contexts, only the Canadian children interacted frequently with parents in pretend play situations. Children in the traditional village cultures of India and Peru rarely interacted with mothers (or fathers) in pretense scenarios, particularly using objects symbolically. We expected that in the current study children from the Canadian setting would show the same trends that have been reported in the Western literature, given that they do engage in frequent pretense using objects with a supportive adult. In contrast, it was predicted that children from the traditional cultural settings of India and Peru would be later in the onset of pretense understanding and production in the games, given that they do not typically engage with adults in this way at this young age.

## *Interviews*

### *Interview Method*

In this interview, mothers were asked to estimate when their children began to engage in pretense and when they typically stopped playing in this manner. Additionally they were asked to give typical examples of this type of play and to indicate whom children were most likely to pretend with. To

assess their beliefs about the functions of pretense, mothers were also asked to indicate why they believed children engaged in pretend play.

### *Interview Results*

Across all cultural settings most mothers reported that their infants engaged in pretend play (Peru = 92%, India = 90%, Canada = 100%) and that they began to engage in pretense around 2–3 years of age (Peru = 23.5 months, India = 31.8 months, Canada = 23.8 months). In Peru and Canada, mothers reported that their children typically stopped pretending around 9 years of age, but Indian mothers reported an earlier cutoff date (7.5 years) and named school demands as being the reason for stopping. Only Canadian mothers (43%) responded that this type of play might go on throughout childhood. Although all Canadian mothers reported pretending with their children, far fewer Peruvian (42%) and Indian (24%) mothers reported ever pretending with their children. Most of these mothers responded that most of their child's pretense occurred with older children (Peru = 73%, India = 48%), a finding that is consistent with reports in the anthropological literature for other traditional cultural settings (Lancy, 1996). In addition to the pretending they engaged in with their children, Canadian mothers also noted a high level of sibling pretense (71%). Mothers' responses to the question of why they thought children pretended could be classified as one of three types: self-stimulation/enjoyment, social mirroring of the actions of others, and cognitive stimulation. In Peru, the majority of responses were classed as self-stimulation/enjoyment (49%), followed by social mirroring (26%) and cognitive stimulation (14%). A different ordering was found for the responses of Indian mothers, who reported more social mirroring (67%) than self-stimulation/enjoyment (24%) or cognitive stimulation (9%). Only Canadian mothers were more likely to name cognitive stimulation as the reason that children pretend (36%) compared to social mirroring (21%) or self-stimulation/enjoyment (18%).

When asked to give examples of their children's pretense two main categories were reported: social role playing and object substitution. As indicated in Table 10, the relative split between these two types of play varied, depending on cultural setting and with whom the child played. Indian children predominantly played on their own, so only those behaviors were categorized. According to mothers' reports, social role playing dominated Indian and Canadian children's play when they played on their own. Peruvian and Canadian children engaged in a predominance of social role playing when playing with older siblings and a fairly even split between role playing and object substitution when playing with their mothers.

TABLE 10

PERCENTAGE OF RESPONSES FOR SOCIAL ROLE PLAYING PRETENSE COMPARED WITH OBJECT SUBSTITUTION PRETENSE IN CHILDREN ACROSS CULTURAL SETTINGS AND PLAY PARTNERS

Play Partner	Social Role Play	Object Substitution
Peru		
On own	55	45
Older sibling	86	14
Mother	54	46
India		
On own	93	7
Older sibling	—	—
Mother	—	—
Canada		
On own	71	29
Older sibling	83	17
Mother	54	46

### *Pretend Production*

#### *Participants*

A total of 44 infants participated in the pretend production procedure, 20 (12 females, 8 males) from Canada, 13 (6 females, 7 males) from India, and 11 (6 females, 5 males) from Peru. Table 11 presents details of age ranges, mean age in days (months), and number of participants across the three cultural settings. Children in Canada were familiar and comfortable with occasional testing by female experimenters who visited their day cares. Thus, Canadian children were tested in their day care setting by the primary experimenter and children in Peru and India were tested by a female experimenter in the field settings accompanied by their mothers, who were asked not to help their children in any way. As there was no interview given for children participating in the naturalistic play procedure, we do not have data for language development or mother's education and literacy levels. However, we expect that these levels will be similar to those reported in the interview for the pretend/trying play procedure (next section) because children were recruited from the same participant pools in all settings.

#### *Materials*

A variety of everyday items and toys were included in the conventional and nonconventional doll and car sets used as toys in this procedure. Small replica toys comprised the conventional doll (cloth doll with clothes, plates, drink container, fork and knife, plastic food) and car (three small replica cars, wooden

TABLE 11

PRETEND PROCEDURES: AGE RANGES IN DAYS, MEAN AGE IN DAYS (MEAN AGE IN MONTHS), AND NUMBER OF PARTICIPANTS ACROSS CULTURAL SETTINGS FOR THE PRETEND/TRY AND PLAY PRODUCTION PROCEDURES

	Cultural Setting		
	Canada	India	Peru
Pretend/try	1,020–1,309 1,179 (39.3) 18	1,043–1,306 1,140 (38.0) 28	1,003–1,343 1,143 (38.1) 17
Play Production	751–1,294 1,072 (35.7) 20	731–1,322 1,028 (34.2) 13	720–1,263 1,070 (35.7) 11

stick, three plastic replica animals, pylons, trees) sets. Substitutes for these items were provided from a range of everyday items in the nonconventional doll (stuffed sock, cork coasters, clothespins, wooden blocks) and car (electrical three-way plug, shower mounting unit, door stop, metal rings, three 90° copper pipe fittings, clothespins) sets. The same items were used in all settings.

#### *Procedure*

All children played with conventional and nonconventional types of toys, with half of the children receiving the conventional toys first. To ensure they enjoyed the toys, children were given the choice of whether they wanted to play a car or a doll game. Once they had chosen, the experimenter presented them with the first set of toys (conventional or nonconventional, depending on the order) and encouraged them to play. After approximately 2 min, the experimenter demonstrated two symbolic actions with the toys and encouraged them to play some more. For the doll game these actions were giving the doll a drink of juice and dancing the doll around the table, and for the car game it was smashing two cars together and having a close encounter with another car at an intersection. Once children had played with the first set of toys, they were given the second set (either conventional or nonconventional, depending on what type they had already played with) and encouraged once again to play the “car” or “doll” game with the new set of toys. Thus, all children played either a “car” or “doll” game with two sets of toys: conventional or nonconventional. Most children’s play lasted approximately 4–6 min in total, but the experimenter stopped whenever the child lost interest or cut long periods short at a natural pause in action to maintain the interest of the child.

### *Coding and Data Analyses*

Children's actions and verbalizations were coded from videotape in the field sites and actions were designated as being symbolic or nonsymbolic. To assess interobserver reliability, a random sample of 12 of the 44 participants (25% for each culture) was scored in the Canadian lab by independent research assistants who used translated transcripts in addition to video and were unaware of the hypotheses relevant to the conditions of the study. There were high levels of interrater agreement ( $\kappa = .80$  for Canada,  $.86$  for India,  $.67$  for Peru).

Only symbolic actions were included in analyses. Symbolic acts were defined as any action where the child used one of the props to stand for an action or object (e.g., using the electric plug as a monster, or feeding the doll with the fork). Verbalizations often helped to disambiguate whether an action was symbolic or not, particularly for nonconventional items. With these items children occasionally held up an item and verbalized about the imagined role or function of the item (e.g., after placing the pipe fittings on the electrical plug one child held it up and announced "this is a dinosaur, he's real angry"), and in these cases they were credited with a symbolic action. The number of symbolic acts and the time in seconds was recorded for each child, and the rate of symbolic acts (i.e., number per minute) was calculated. The data (rate of symbolic acts) were skewed, so they were square root transformed before conducting the ANCOVA. The transformed data were analyzed using a repeated-measures ANCOVA, with a between-participants factor of cultural setting and a within-participants variable of type of toys (conventional, nonconventional), and age as covariate. Separate regression plots for conventional and nonconventional toy types were included in order to estimate the age at which children from different cultural settings began to engage in symbolic play under different conditions of stimulus support. The proportion of infants engaging in at least one symbolic act per minute was also calculated for each cultural setting.

### *Results*

The repeated-measures ANCOVA revealed significant main effects of cultural setting,  $F(2,38) = 16.50$ ,  $p < .001$ , and toy type,  $F(1,38) = 58.57$ ,  $p < .001$ . Figure 20 presents the mean rate of symbolic actions across cultures and toy types for this analysis. Canadian children engaged in significantly higher rates of symbolic acts than children in India ( $p < .001$ ) or Peru ( $p < .05$ ), and these groups did not differ. Cultural setting did not interact with any other variable. Across all cultural settings, children's rates of symbolic actions were higher for conventional as compared to nonconventional

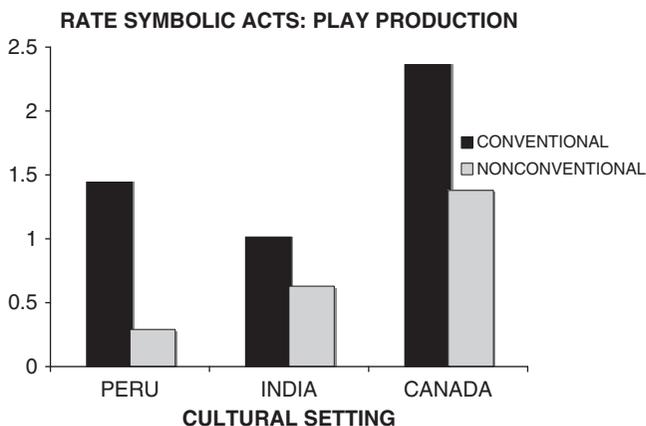


FIGURE 20.—Mean number of symbolic acts per minute across cultural setting and type of toy for the play production procedure.

toy types ( $p < .001$ ). Linear regression plots (see Figures 21 and 22) of the number of symbolic acts per minute indicated that Canadian children were performing at a higher rate across the entire age range for both types of toys when compared to the Indian and Peruvian children. Additionally, individual data (see Figure 23) indicated that a greater proportion of Canadian as compared with Indian or Peruvian children were engaging in at least one symbolic act per minute, particularly when playing with nonconventional toys (for conventional toys,  $\chi^2 = 13.21$ ,  $p < .01$ ; for nonconventional toys,  $\chi^2 = 18.78$ ,  $p < .001$ ).

### Discussion

Although there was evidence that children from all three cultural settings engaged in at least one symbolic play act, Canadian children showed higher levels of performance than Indian and Peruvian children. In terms of overall rate of production, the Canadian children produced symbolic acts with the nonconventional toys approximately five times more frequently than the other two groups of children (even though nonconventional toys were more common in Indian and Peruvian play environments), and they produced symbolic acts with the conventional toys about 2.5 times more frequently than the other two groups at the younger ages. With the nonconventional toys, more than 40% of the Canadian children produced at least one symbolic act, whereas less than 10% of the children from the other two groups did so. Thus, while we have evidence that under highly supportive stimulus conditions (i.e., the toys are small replicas of the real-world

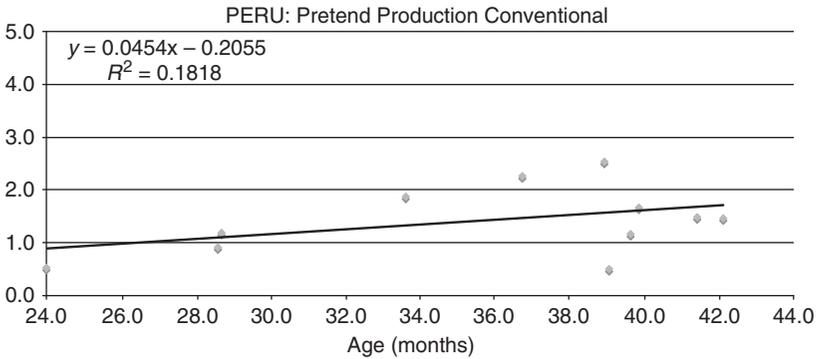
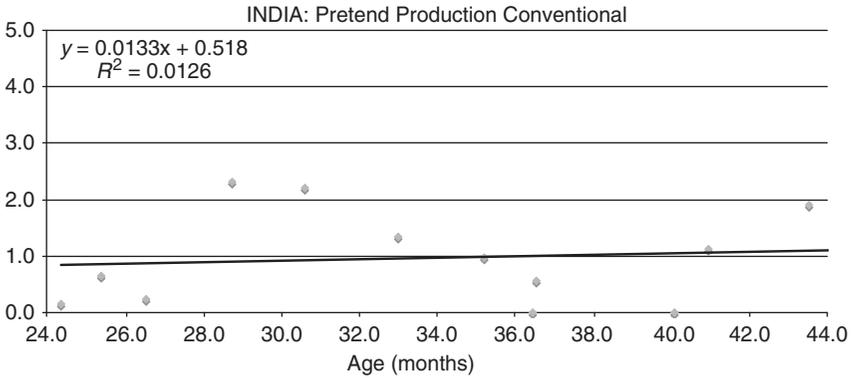
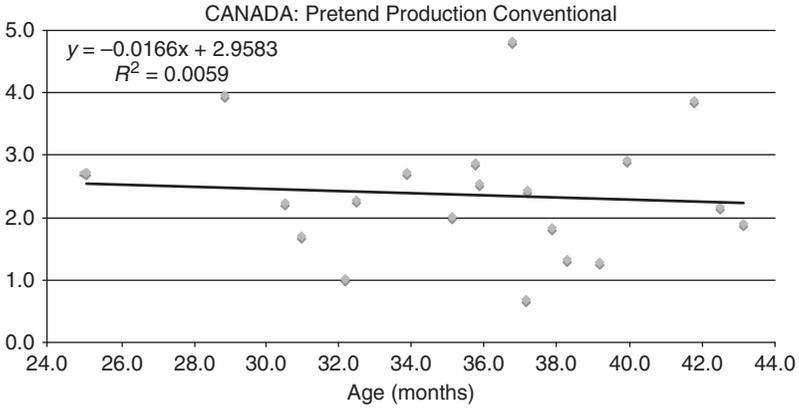


FIGURE 21.—Linear regression plots of the age (months) and number of symbolic acts per minute for conventional toys across cultural settings.

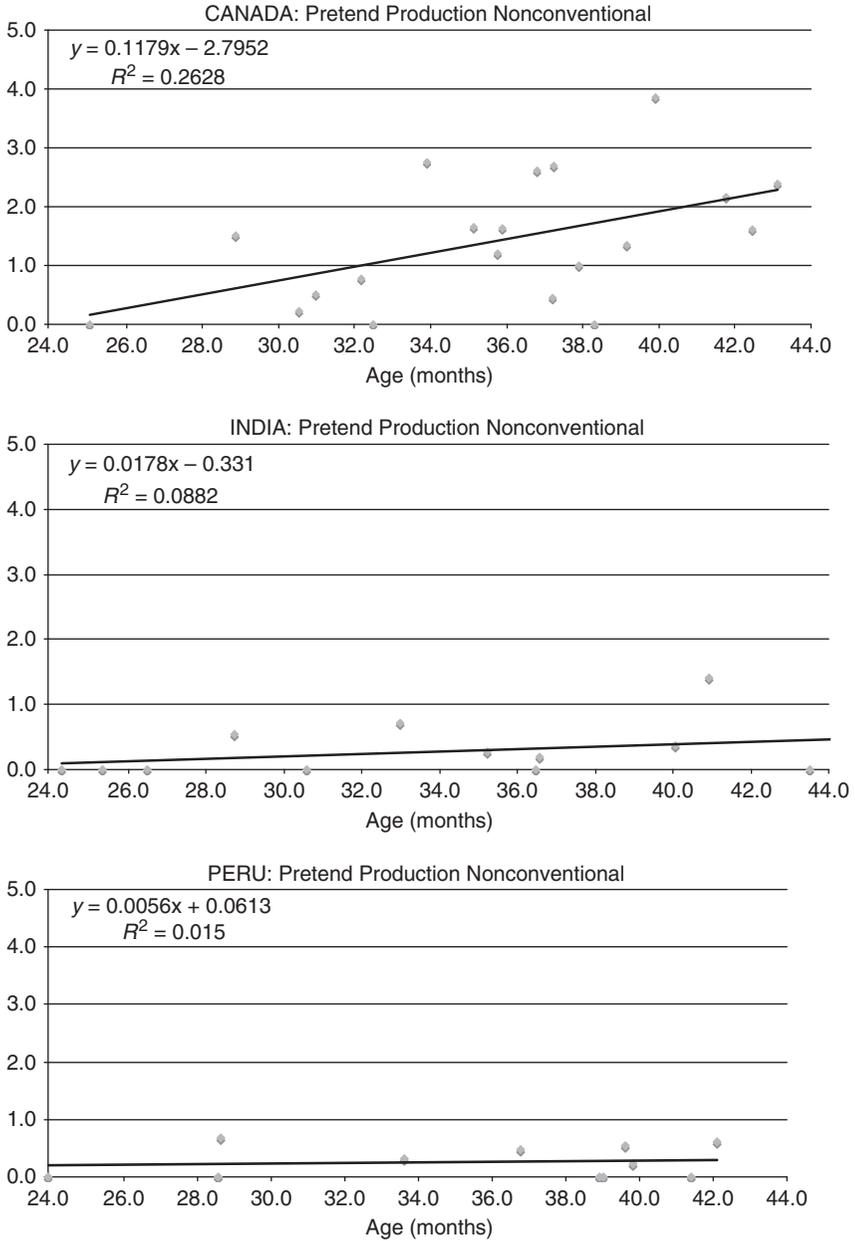


FIGURE 22.—Linear regression plots of the age (months) and number of symbolic acts per minute for nonconventional toys across cultural settings.

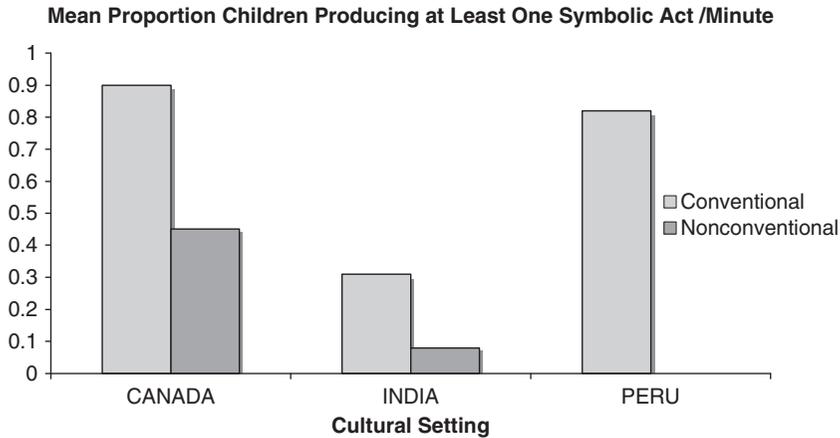


FIGURE 23.—Mean proportion of children producing at least one symbolic act per minute across cultural settings.

item) children across diverse settings show at least one instance of symbolic use of the toys, the data clearly show that symbolic production with conventional as well as nonconventional toys is much more robust in the Canadian children.

There are many potential explanations for these fairly dramatic differences. One could, of course, point to potential differences in the way the young children related to the play situation that was set up by adult experimenters. Perhaps Indian and Peruvian children are more comfortable with child play partners, whereas Canadian children are equally comfortable playing with children or adults. If this were the case, then we could have underestimated Indian and Peruvian children's productive capacities by having them interact with adults. However, it is also highly likely, in our opinion, that the Indian and Peruvian children have simply had much less experience in engaging with play partners whose aim it is to nurture their symbolic capacity in pretend play. Whereas all of the Canadian mothers reported that they engaged in pretend play with their children (many of whom report that cognitive stimulation is the value of such play), fewer than half of the Peruvian mother's and fewer than one quarter of the Indian mothers reported doing so. These large differences in experience suggest that a possible explanation for the lower rates of symbolic production in the two non-Western cultural settings could be that those children have received less of the supportive scaffolding that specifically promotes pretense with objects that Canadian mothers frequently provide in early play interactions with their children. Undoubtedly, parental beliefs about the role that pretense plays in children's development influences whether such play

becomes a part of their early social routines. We are suggesting that it is through these supportive cultural channels that children come to understand the symbolic nature of object substitution and role play. In the Canadian setting, parents often play this supportive role. In Peruvian and Indian settings it may be possible, though we think it is unlikely, that older siblings could provide the same degree of supportive child-directed pretense we are arguing is critical for symbolic development. Additional research is needed to help to disambiguate these questions.

### *Pretend/Trying Task*

#### *Participants*

A total of 63 three-year-old children participated in the pretend/trying procedure, 18 (11 females, 7 males) from Canada, 28 (15 females, 13 males) from India, and 17 (11 females, 6 males) from Peru. Table 11 presents details of age ranges, mean age in days (months), and number of participants per condition across the three cultural settings. Mothers reported that infants began to comprehend words around the same age (9–10 months) in all cultural settings. In contrast, Canadian mothers reported that their infants began to produce words around 12.6 months, approximately 2 months earlier than mother's reports for infants in Peru and India. Mother's education level and literacy status varied across the three cultural settings. Mother's average education level was 15.3 years in Canada, 8.2 years in Peru, and 5.2 years in India. Literacy was high in Canadian (100%) and Peruvian (92%) settings and low in India (55%).

#### *Materials*

A variety of everyday items and toys were used in the warm-up and test trials of this procedure. The materials and procedure followed Rakoczy et al. (2004, Exp. 3). In the initial freeplay period, a toy boat, plastic tubes, a gourd, and a flute were included. During the warm-up period, a variety of pretend and trying scenarios were introduced using the following items: replica plastic food, containers, modeling clay, blocks, small boxes, juice box, and giant pencil. In addition the following props were introduced and available during test trials so that the child could engage in inferential pretense that went beyond the demonstration of the experimenter: teddy, dish with spoon, and plastic knife. All items were obtained in the cultural setting they were used in so as to be familiar to children. For the test trials involving eating actions we used oranges across all settings and walnuts in the shell in India and Peru. Owing to a nut ban in the day cares in Canada, children

were presented with hardboiled eggs as the second food item on test trials. For test trials involving pouring actions we used two novel containers with easy to open lids and two small cups.

### *Procedure*

Children in India and Peru were accompanied by their caregivers, and in Canada a majority of children (12 children) were tested in their day care setting accompanied by a female assistant. Most often the caregiver was the child's mother, but occasionally it was a grandmother, father, or older sibling. Before the experiment began, caregivers were asked to sit behind their child but to refrain from helping or interacting with the child. When the session began, the experimenter followed a detailed script of actions and verbal prompts to accompany each of the props. The script was delivered with a natural, easy-going playful manner, and there were no pauses between the phases described below. All testing was conducted individually in a quiet room and sessions lasted approximately 20 min. The experimenter began the session after interacting with the child until the child was comfortable and indicated the desire to play a game. The procedure was videotaped and later coded from tapes in the field by the primary author. To facilitate the flow of the play session, a research assistant unobtrusively sat behind a barrier to the rear of the experimenter and passed her the props.

*Initial Free Play.* The primary aim of this phase was to make sure the child would engage with the experimenter and would hand back props without fuss. Additionally, different attitudes were adopted for different actions by the experimenter during this phase (i.e., either a pretend or trying attitude), so a secondary purpose was to introduce the two types of attitudes to the child.

*Warm-Up.* At the end of free play, the experimenter introduced the warm-up trials where a variety of props were used to introduce both pretend and trying attitudes toward actions, as outlined in the script. The purpose of this phase was to provide children with a supportive backdrop for the test trials, which were embedded seamlessly into the warm-up period. During warm-up the experimenter encouraged the child to produce appropriate actions and praised the child for doing so. She also engaged in dialogue according to the script and answered questions if the child asked them.

*Test Trials.* Test trials were embedded in two positions in the script; once approximately 10 min into the warm-up period and the second time

at the end of warm-up. In between the two sets of test trials, there was second phase of warm-up so that children were once again exposed to the supportive context before being tested. Test trials were of two types. On pretend trials the experimenter demonstrated a pretense attitude while demonstrating one of two actions: pouring from a container or eating a food item. On trying test trials, the experimenter demonstrated the same action but with an attitude of really trying. The two pretend and trying trials were separately blocked and counterbalanced across participants. Within each block, the experimenter demonstrated a pouring action and an eating action. The particular containers and food items used on any given test trial were counterbalanced across participants. Thus, there were four test trials in total, two for which the experimenter demonstrated a pretend attitude and two for which she demonstrated a trying attitude. The surface qualities of the actions were similar across these two types, what differed was the attitude. The experimenter did not give feedback and refrained from verbal interaction with the child during test trials.

#### *Coding and Data Analyses*

Children's actions were coded from videotape in the field sites and reliability coded by assistants in the Canadian lab. Actions throughout the test trials were transcribed and then the first complete action sequence taken by the child was coded as being one of two types: (1) pretend—all actions having a pretend attitude that were simple imitations of the experimenter's actions (e.g., for the "eat" action pretending to bite the orange) or that went beyond what the experimenter had demonstrated in a way that was appropriate to the props (e.g., for the "pour" action pretending to pour into a container and then pretending to give a drink to teddy)—and (2) try—all actions having an attitude of really trying to do the action that were simple imitations of the experimenter's actions (e.g., trying to pour water from the closed container into a cup) or that went beyond what the adult demonstrated (e.g., trying to open the lid of the container before pouring). To assess interobserver reliability, a random sample of 16 of the 63 participants (25%)—with equal numbers for culture—was scored in the Canadian lab by an independent research assistant who was unaware of the hypotheses relevant to the conditions of the study. Interrater agreement was high ( $\kappa = .82$  for Canada,  $.80$  for India,  $.78$  for Peru).

Only first actions were used as data in analyses because they followed immediately from the experimenter's demonstration, and any subsequent actions may have been influenced by the child's actions that preceded them. To assess the extent to which children read the attitudes (pretense, trying) of the experimenter while she demonstrated the action, the number of target

actions was calculated for each child. A target action consisted of the child performing a pretense action following pretend demonstrations, and a trying action following trying demonstrations. These data were analyzed using a repeated-measures ANCOVA with a between-participants factor of cultural setting and a within-participants variable of type of demonstration, and age as a covariate. Following analyses of variance, we calculated linear regressions of the target pretend actions following pretend demonstrations to estimate the approximate age of onset for understanding the pretense attitude. We also conducted Pearson correlations to assess the relation between maternal education and children's pretense and trying scores.

### *Results*

The repeated-measures ANCOVA found significant main effects of cultural setting,  $F(2,59) = 4.65$ ,  $p < .01$ , and demonstration type,  $F(1,60) = 53.83$   $p < .001$ . These need to be interpreted in light of the Cultural Setting  $\times$  Demonstration Type interaction,  $F(2,60) = 2.40$ ,  $p < .10$ . Following pretend demonstrations, Canadian children performed more target actions than Indian and Peruvian children (see Figure 24) ( $p < .05$ ). Following trying demonstrations, children in all cultural settings performed at a high level, and Peruvian children were moderately lower in their performance relative to Canadian ( $p < .05$ ) and Indian children ( $p < .002$ ). Linear regression analyses of the number of target actions confirmed that Canadian children began performing target actions following the pretend demonstration at an earlier age (average age of at least one target action = 34.4 months) compared with Indian (46.5 months) and Peruvian (45.8 months) children. Figure 25 presents the scatter plot of these data, along with the trend lines for each of the cultural settings. Mother's education levels did not correlate either with children's tendency to pretend following pretend demonstrations,  $r^2 = .13$ , or to try following try demonstrations,  $r^2 = .07$ .

### *Discussion*

These results suggest that Canadian children were more likely than children in Indian and Peruvian cultural settings to pick up on the pretend attitude of the experimenter and to follow up on that with pretense of their own. Estimates of the onset of this understanding put the Canadian children approximately 1 year ahead of the Indian and Peruvian children. The pretend/trying procedure is a stringent test of comprehension given that it requires an instrumental response that itself encompasses both an action and an appropriate attitude. Thus, it relies on both comprehension as well

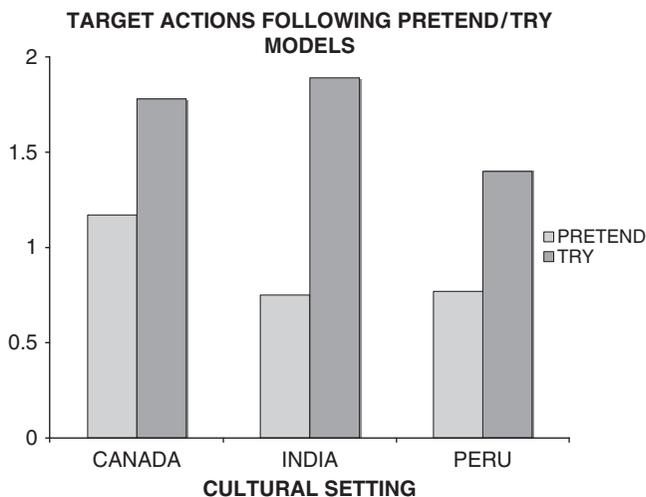


FIGURE 24.—Mean number of target actions as a function of cultural setting and demonstrated action in the pretend/trying procedure.

as productive abilities. It is possible that children in the non-Western settings understood the distinction earlier but did not manifest this understanding in their own actions. Though it is possible that the Indian and Peruvian children were reluctant to pretend with the adult experimenter—as discussed, perhaps they prefer to play with children who are their typical playmates—we propose, once again, that a more likely explanation for the lower levels of performance is that these children had very little input from supportive adults with symbolic play in their environments. The interview data suggest that only the Canadian children engaged in frequent, rich interactive pretend play episodes with their mothers, and we would argue it is precisely this type of pretense with an adult who is tuned in to the child's level of ability that will provide the most effective scaffold for coming to understand the unique pretense attitude.

## PICTORIAL SYMBOLS

### *Background and Hypotheses*

A familiar symbolic system to every Canadian parent of a young child is the system of pictorial symbols. From early in infancy, middle-class parents are showering their infants with baby board books containing pictures, ranging from realistic photos of construction sites to artful caricatures of caterpillars. Amazon.com lists 17,530 titles in the category of books for babies from birth to 3 years, all of these containing pictures. Once they are able

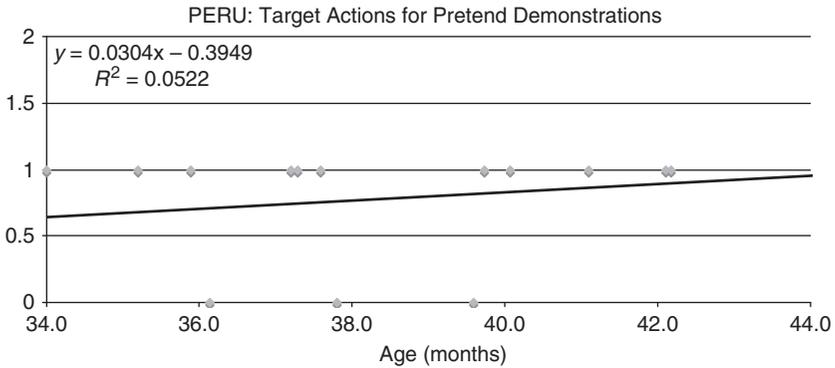
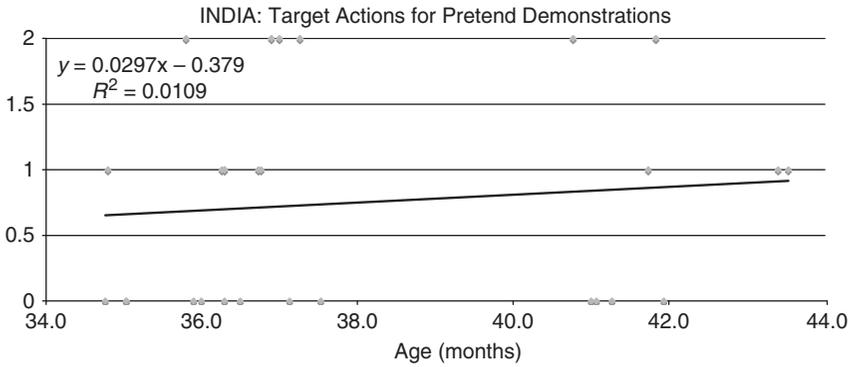
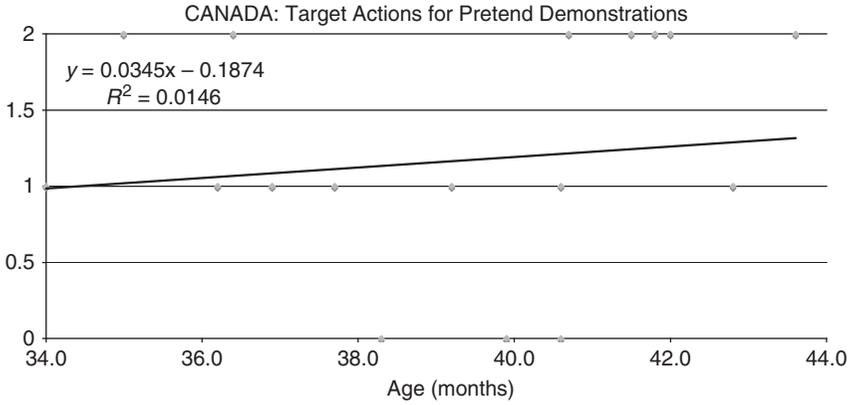


FIGURE 25.—Linear regression plots of the age (months) and number of target actions following pretend demonstrations in the pretend/trying procedure for Canadian, Indian, and Peruvian children.

to hold a crayon, the fridges fill up with toddlers' productions. First scribbles, then more representational pictures created using drawing materials designed specifically for children. Researchers who study the development of understanding and production of pictorial symbols place the onset of comprehension sometime between 24 and 36 months (Callaghan, 2008; DeLoache & Burns, 1994; Ganea, Pickard, & DeLoache, 2008; Preissler & Carey, 2004), depending on the task, and the emergence of (representational) productive capacity sometime between 36 and 48 months (Callaghan, 1999). The onset of pictorial symbol comprehension can be accelerated within activities that bootstrap with language (Preissler & Bloom, 2007; Preissler & Carey, 2004), and both comprehension and production of pictorial symbols can be facilitated with targeted interactions that highlight the symbolic link between pictures and referents (Callaghan & Rankin, 2002).

This is the typical trajectory for children who are immersed in a cultural setting that is highly invested in fostering pictorial symbol "play" in their infants. But what of infants whose early environments have no such infant-directed pictorial play? Will they also understand, without prior experience, that a picture stands for an entity beyond itself? Will they produce drawings that another person interprets as representing something? Callaghan (2008) proposed that, like other symbolic systems, the development of a pictorial symbol system depends on cultural supports in the form of scaffolds from supportive adults who use pictures as symbols in interactions with infants and young children. The early environments of infants and young children in the Indian and Peruvian settings were not rich in pictorial play with others, relative to the Canadian setting (see interview data reported below). As such, they provide an ideal contrast to the Canadian settings for a test of the cultural supports view. Based on this view, we expected that children in the Indian and Peruvian contexts would develop symbolic functioning with pictures later than children in the Canadian context.

### *Participants*

A total of 100 children between the ages of 24–51 months participated in the pictorial symbol comprehension and production procedures. There were 33 children from Canada (18 females, 15 males), 42 from India (20 females, 22 males), and 25 from Peru (10 females, 15 males). Table 12 presents details of age ranges, mean age in days (months), and number of participants per condition across the three cultural settings. Canadian children were tested either in day cares without parents or in a university child study laboratory with mothers. Indian and Peruvian children were all tested in simple community buildings with their mothers present.

Mothers reported that infants began to comprehend words around the same age (9–10 months) in all cultural settings. In contrast, Canadian mothers

TABLE 12  
 PICTORIAL SYMBOL COMPREHENSION AND PRODUCTION PROCEDURES: AGE RANGES  
 IN DAYS, MEAN AGE IN DAYS (MEAN AGE IN MONTHS), AND NUMBER OF PARTICIPANTS  
 ACROSS CULTURAL SETTINGS FOR THE PICTORIAL SYMBOL COMPREHENSION AND  
 PRODUCTION PROCEDURES

Cultural Setting		
Canada	India	Peru
767–1,850	901–1,682	746–1,722
1,250	1,295	1,303
(41.7) 33	(43.2) 42	(43.5) 25

reported that their infants began to produce words around 11.8 months, approximately 3 months earlier than mothers' reports for infants in Peru and 4 months earlier than in India. As with the other procedures, mother's education level and literacy status varied across the three cultural settings for the pictorial symbol procedure. Mother's average education level was 15.5 years in Canada, 6.7 years in Peru, and 3.7 years in India. Literacy was high in Canadian (100%) and Peruvian (88%) settings and low in India (54%).

### *Interview*

#### *Interview Method*

In this interview, mothers were asked to indicate whether their infants were exposed to pictures in the home setting and if so what types of pictures were commonly found in the home. In addition, mothers were asked to estimate the age at which their infants began to show an interest in pictures.

#### *Interview Results*

Across all cultural settings mothers reported that their infants began to show an interest in pictures around 10 months of age (Peru = 10.7 months, India = 10.5 months, Canada = 10.4 months). Mothers in all cultural settings reported some exposure to pictorial symbols in the home (Peru = 85%, India = 95%, Canada = 100%). For Peru (56%) and India (78%) the most often reported pictorial symbol was a wall poster or calendar, and in most cases this was the only picture in the home. For both of these settings the two predominant themes for these pictorial symbols were religion and movie. In contrast, Canadian mothers (100%) reported more child-directed pictorial symbols than Peruvian (20%) or Indian (0%)

mothers. Only Canadian mothers (100%) reported having children's picture books in their homes. Some mothers in all settings reported that their infants were exposed to family photos (Peru = 12%, India = 22%, Canada = 100%), although it was much more common in the Canadian context. It was also more common for Canadian (52%) than Peruvian (7%) or Indian (14%) mothers to report more than one type of pictorial symbol when asked to name types of pictures their child was exposed to.

### *Pictorial Symbols Tasks*

#### *Materials*

For the comprehension task, an artist prepared a total of eight detailed black-and-white line drawings of four pairs of toy items for this procedure. All drawings were on laminated index cards (8 cm × 12 cm). The items were all miniature, highly realistic replica toys, including pairs of cats, dogs, cars, and trucks. The items within each pair were highly discriminable. Small boxes without lids were used to conceal the toy objects while the experimenter was showing the pictures to the child. For the production task, children were presented with six items in the drawing production task. They included a small rubber ball (4 cm diameter), a black wooden stick (1 cm diameter, 12 cm long), a plastic toy dumbbell (15 cm long), a keychain with two small balls attached (each 2.5 cm diameter), a maraca (7 cm diameter, 15 cm long), and a miniature pan flute (8 cm wide). Children's drawings were made in pencil on a small plain sheet of paper (8 cm × 12 cm).

#### *Procedure*

We were able to individually conduct the procedures with children in quiet rooms in all three settings. The pictorial symbols procedures were the only ones that were not videotaped. The experimenter used a score sheet to record comprehension choices and all drawings were collected for later coding. In India and Peru, mothers sat on a mat on the floor with children beside them, and in Canada children sat at a table next to an experimenter (in day care centers) or their mother (in the lab). In all settings the experimenters sat with the child and mother (or child alone) for a few minutes, conversing and playing with a small toy to ensure that mother and child were comfortable playing with the experimenter. All children were given comprehension and production procedures, beginning with comprehension.

*Comprehension.* Children were presented with the picture-referent matching task developed by Callaghan (1999). Children were first told that they were going to play a game where they would find the toys that were depicted in some pictures. As the experimenter held up the picture directly in front of the child, the experimenter pointed to the depicted object as she asked the child to "... find me this one, find me the one from the picture." Object names were never used. As soon as she removed the picture, the experimenter presented the small box containing the two choice objects. To control for the possibility that children would use linguistic rather than pictorial symbol cues to complete the task, the experimenter presented pairs of choice objects having the same linguistic labels (i.e., cats, dogs, cars, trucks). Thus, a picture of one cat was followed by the presentation of two miniature replica cat toys, including the one that was depicted and a foil. This procedure provides a stringent test of comprehension; children have to use the picture as a symbol of a particular item and the name that may be generated when they see the picture cannot help them choose. Canadian studies that have used this procedure find that it is not until 36 months that children perform well on this task (Callaghan, 1999). Left-right position of the target was randomized across the eight trials, with the constraint that the target item was never on the same side for more than two consecutive trials. Order of presentation of the eight pictorial symbols was randomized across participants.

*Production.* In this procedure, children were given pencil and paper and asked to make a drawing of an object that the experimenter held in front of the child. Children were always asked to first make a drawing of the ball or stick, with order alternated across participants. These items were requested first because they can be drawn using either of the two form elements that children use to represent a variety of things in their early drawings; circle and line. Then, they were asked to make drawings of four items in random order, all of which could be depicted using some combination of the circle and line elements (see Figure 26 for a child drawing a simple object). Each of the six objects was individually drawn on a separate piece of paper. The production task is designed to yield unambiguous evidence of symbolic production in that all of the items can be made using the same simple forms found in children's presymbolic scribbles (i.e., circles and lines), but to be effective symbols they must point to a particular object.

#### *Coding and Data Analysis*

The data for the comprehension procedure were the total number of correct picture-referent matches made by the child. The data for the production procedure were the total number of representational drawings made



FIGURE 26.—A Canadian child drawing a jingle bell wrist strap in the drawing production task.

by the child. To be classified as representational, a coder who was naïve to the item the child intended to draw judged which of the six items each drawing depicted. Children received one point for each drawing that the coder correctly classified and zero otherwise. To assess interrater reliability, a second coder naïve to the hypotheses of the study judged the representational status of the children's drawings for 25% of the children. Cohen's  $\kappa$ s were calculated for each culture (Canada = .93, Peru = .79, India = .86). Comprehension and production data were analyzed using an ANCOVA with cultural setting as the factor and age as a covariate. Following the ANCOVA, we plotted linear regressions to estimate the approximate age of onset of pictorial symbol comprehension and production. In addition, we calculated the proportions of children performing better than chance in the comprehension procedure and producing at least four representational drawings in the production task. Finally, we conducted separate Pearson correlations of maternal education with both comprehension and production scores.

### Results

*Comprehension.* The ANCOVA was conducted on the number of correct picture-referent matches (out of a total of eight) and revealed a significant main effect of cultural setting,  $F(2,100) = 7.56, p < .0009$ . Tukey's tests indicated that performance was better in the Canadian (mean = 5.79) as compared with the Indian (mean = 4.53,  $p < .001$ ) and Peruvian (mean = 4.62,  $p < .008$ ) contexts. To assess how many children in the age range studied had actually achieved understanding of the symbolic function of pictures we calculated the proportion of children in each cultural setting

who had passed six or more trials in the comprehension task, the number needed to be significantly better than chance in this task. These data confirm that the majority of Canadian children (mean proportion = .65) had achieved comprehension of the symbolic function of pictures and used pictures to assist in the matching task. Far fewer Indian (mean proportion = .29) and Peruvian (mean proportion = .27) children reached this same level of understanding. Regression plots presented in Figure 27 corroborate the claim that Canadian children were performing at higher levels than Indian or Peruvian children, and achieved high levels of performance at an earlier age. Canadian children reached the transition between chance and above chance performance (between 5 and 6 out of 8) at around 2.5 years of age, whereas the Peruvian children did not reach it until about 4.0 years of age, and the Indian children never reached this criterion. Mother's education level did correlate significantly with pictorial symbol comprehension scores,  $r^2 = .41$ ,  $p < .01$  (two-tailed). Calculation of the means indicated that comprehension scores were at chance for children of mothers in all but the university education group (mean = 3.78, 4.40, 4.39, 6.11 for no education, elementary, high school, university/college levels, respectively). Only 1 child of 9 in the no education group achieved above chance performance, whereas the majority of children (13/19) in the university/college group were above chance levels (Fisher exact probability = .006).

*Production.* The ANCOVA conducted on the number of representational drawings made by children (out of a total of 6) revealed a significant main effect of cultural setting,  $F(2,99) = 50.17$ ,  $p < .001$ . Tukey's tests indicated that Indian (mean = 1.86) and Peruvian (mean = 1.69) children made fewer representational drawings than Canadian children, (mean = 3.03),  $p < .05$ , in both cases. It is informative to contrast the proportion of children who drew at least one representational drawing with the proportion who drew four or more. Achieving a score of one on the production task could happen if a child draws a circle to represent all of the items (a common strategy used by toddlers in between scribbling and true representational drawing stages), and as such does not unambiguously confirm that a child has productive symbolic capacity. To achieve the more stringent score of 4, a child could render the simplest distinction between the ball and stick (i.e., circle for one, line for the other) but would also have to depict at least two of the items that require the combination of circles and lines to distinguish them from the other items. Figure 28 presents these frequency data, which indicate a similar proportion of children across cultural settings were drawing at least one representational drawing in this age range (2–4 years) but that many more children in the Canadian sample were drawing

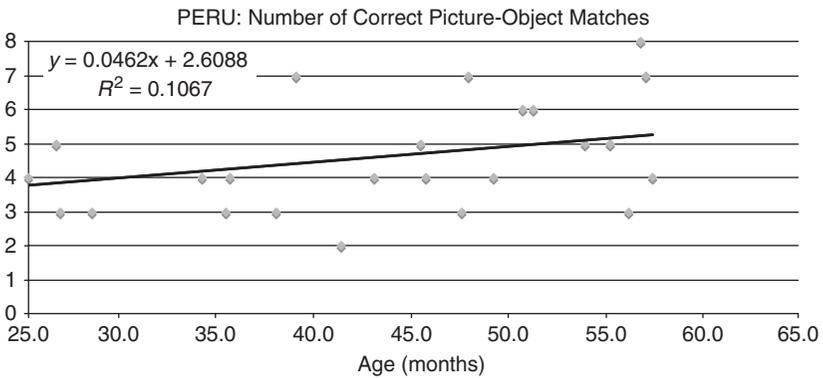
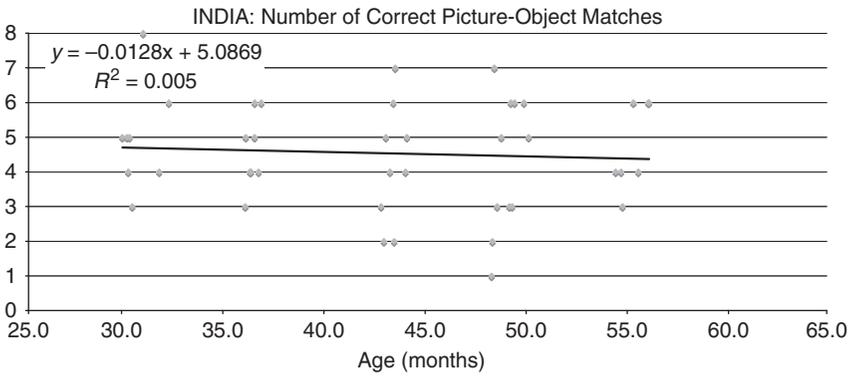
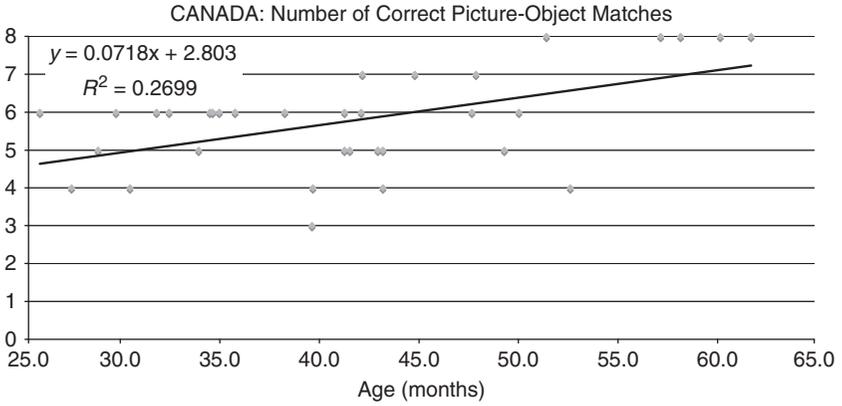


FIGURE 27.—Linear regression plots of the age (months) and number of correct comprehension trials for pictorial symbols across cultures.

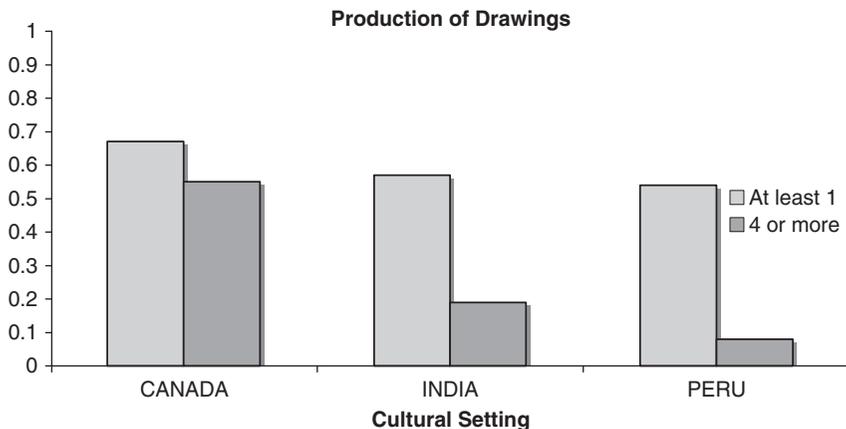


FIGURE 28.—Mean proportion of children producing “at least 1” or “4 or more” representational drawings in the pictorial symbol production task.

four or more drawings. Specifically, for number of children producing one or more drawings, there is no effect of cultural setting,  $\chi^2 = .86$ , *ns*, whereas for number of children producing four or more drawings, there is a cultural effect,  $\chi^2 = 20.96$ ,  $p < .001$ . Linear regressions (see Figure 29) also indicate that Canadian children were drawing representational drawings at an earlier age and higher rate than children in India and Peru. Using the same criterion of symbolic production as above (i.e., 4/6 of the objects are coded as representational), the Canadian children reach this value at around 4.0 years of age, the Indian children at just under 5.0 years of age, and the Peruvian children at approximately 5.5 years of age. Mother’s education level did not correlate significantly with production scores,  $r^2 = .06$ .

### Discussion

As in the case of the production and comprehension of pretense symbols, the Canadian children appear to be more solidly in command of pictorial symbolic functioning than do children in the Indian and Peruvian contexts. In the task measuring comprehension of the representational status of drawings, the Canadian children performed better than chance more than 1.5 years earlier than either of the other two groups of children. In the production of representational drawings of their own, the Canadian children showed productive capacity about 1–1.5 years earlier than either of the other two groups of children.

As in the case of pretense symbols, the most likely hypothesis for these group differences is the significantly lower level of pictorial symbol experience for the Indian and Peruvian children. Engaging young

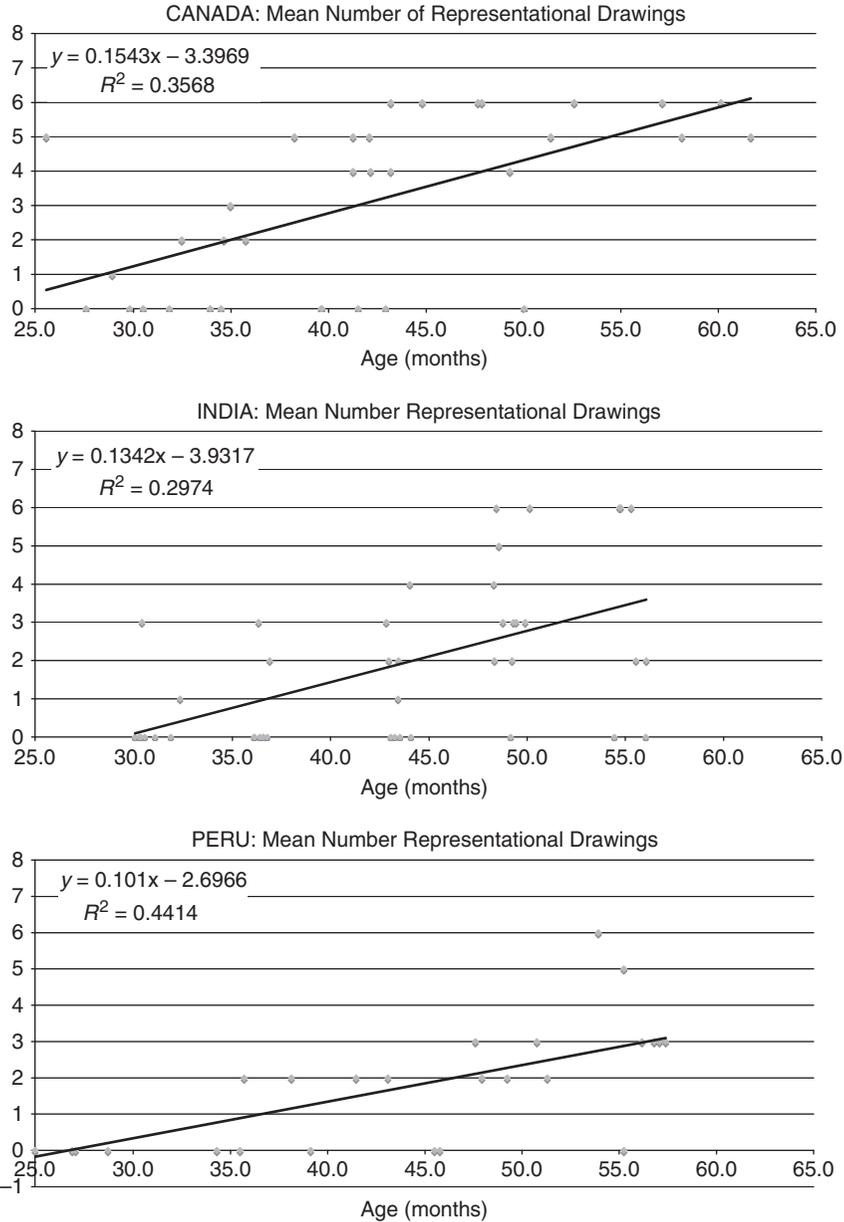


FIGURE 29.—Linear regression plots of the age (months) and number of representational drawings produced by children across cultural settings.

children in symbolic activities using pictorial symbols is not a typical routine in these settings. Based on the maternal interviews, only the Canadian children had experience with pictorial symbols beyond one or a few calendars or religious paintings hanging passively on the wall; specifically, only the Canadian children had had reasonable amounts of experience interacting with adults around child-oriented pictures, picture books, and family photos.

Our finding that maternal education level correlated with comprehension but not with production performance is intriguing. Typically, comprehension of a symbol is presumed to precede production, a trend studied mostly in language research. Recently, however, there are new findings that suggest children may only implicitly understand the symbolic nature of pictures when they begin to use pictures and do not possess explicit, conceptual levels of insight into the shared nature of these and other symbols until later (Callaghan, 2008). It is possible that this more conceptual understanding is tapped by the comprehension task used here and that this deeper insight into symbolic function is more likely to be facilitated by mothers who have extensive education. Children of mothers with university or college levels of education were the only group to reach above chance levels (mean = 6.11) in the comprehension task. Though these findings are suggestive, in the future it will be necessary to disentangle maternal education from culture in a single study by sampling across education levels within and across cultural settings.

Of course it is possible once again that the children in the Indian and Peruvian settings simply needed more experience or guidance with the materials in the experimental setting, and they too would have used pictures to symbolize or made pictorial symbols themselves. Although a possibility, we found in the production task for example, that children in all cultural settings were happy to make marks and appeared to have no difficulty manipulating the pencil on paper to make those marks. What differed was whether the marks they made were representational. It is this transition—from nonrepresentational to representational mark-making—that distinguished the children across settings, and it is this transition that we propose is facilitated by supportive adults who present the symbolic nature of pictures to children when they use pictures in their interactions. Once again, we propose that the development of full capacity in a symbolic system depends on engagement in that system with other symbol users. Canadian children who are given extensive interaction with symbolic games using pictures develop comprehension and productive capacity earlier than those in a baseline control group (Callaghan & Rankin, 2002). It would be informative in future research to assess whether the same benefits accrue from a similar pictorial symbol training regime for children in the Indian and Peruvian contexts, as predicted by a cultural supports view.

## IV. GENERAL DISCUSSION

The data presented in this study are the first of their kind. Despite a fair amount of discussion of the role of culture in cognitive development, no previous study has systematically assessed the earliest emerging cognitive skills—in this case social-cognitive skills—of young children growing up in very different cultural settings. One of the cultural settings was Western middle class—characteristic of most of the children in most current developmental research—and two were different small-scale, traditional societies with non-Western parenting, socialization, and educational practices. By the time children are attending school and learning to read, write, and calculate, differences in cultural setting will of course have profound influences on many different aspects of cognitive development—as previous research has shown (Cole, 1996; Lancy et al., 2010; Wagner, 2010). But it has never been clear what to expect with regard to the earlier-emerging, more foundational social-cognitive skills that make meaningful participation in culture possible in the first place. Do differences in parenting and socialization practices affect early social-cognitive development in significant ways?

### SUMMARY OF RESULTS

Overall, we predicted that children in the three cultures would display their most basic social-cognitive skills—those relying on an understanding of the intentions and attention of others—at around the same age. On the other hand, we predicted that children from the different cultural settings might possibly show somewhat different developmental trajectories with the social-cognitive skills of a more interactive type—those involving active behavioral collaboration and joint attention—for which one could argue that different amounts and types of experience should be more important. Finally, we predicted that children from the different cultural settings in all likelihood would show significant differences in social-cognitive skills relying more heavily on specific kinds of social experience and input,

specifically those involving the use of external symbols in pretense and pictorial domains.

### *Understanding Intentions and Attention*

Children's understanding of goals and intentions was measured with tasks of imitation and helping. First, when provided with action demonstrations using artifacts from their own local environment, children from all three cultural settings imitated these actions at similar levels at all ages. In the two more standardized tasks, at 9 months again all of the children showed similar skills. At 12 months, children in the Canadian setting were especially skillful in one task, and at 15 months the Indian children were a bit less skillful than the other two groups. But by 18 months all of the children were reproducing even intended actions at equal levels—which requires them to imagine the act the demonstrator intended to perform. The small differences in imitation we observed, then, were neither at 9 nor 18 months but only in specific tasks in between these two endpoints. Second, in the helping tasks children from all three cultures at 18 months all inferred the goal of the actor with equal facility and were equally predisposed to help her. The Canadian children were a bit higher in their level of helping at 24 months than children in the other two cultural settings. However, the important finding in this task was that children distinguished when the experimenter needed help and when she did not and that condition effect was found across cultures and ages, demonstrating again similar abilities across cultures at inferring goals and intentions.

Children's understanding of others' attention was measured with tasks of gaze following around barriers and the production of pointing to direct attention. Children in all three cultures instrumentally followed the gaze direction of an adult by crawling to a hidden location behind a barrier with some frequency, thus showing the ability to make inferences about interesting things at unperceived target locations. The Canadian children crawled more overall in both the experimental and control conditions, which may be explained by less locomotor experience in the settings where infants spend much time on the mother's back or hip at this young age. However, once again the important effect for this task is a condition effect where infants crawl when the experimenter gazes to a hidden location but not when she gazes at a visible location. The condition effect was strong at both ages and across all cultural settings. In the pointing task, a slightly smaller percentage of Indian relative to Canadian children were inclined to single out things for their mother's attention in our elicitation task at 10–13 months of age. Mother's education level correlated with level of infant pointing, and needs to be investigated further. However, in all cultural settings there were infants who did not point and infants who pointed

frequently. Declarative pointing does not appear to be a culture-specific behavior.

Despite a few small differences, then, the overall picture in these tasks measuring young children's understanding of intention and attention is similarity across cultures. The general ages of emergence in all cases fit the general picture from previous studies with Western, middle-class children (e.g., Carpenter, Akhtar et al., 1998; Moll & Tomasello, 2004; Warneken & Tomasello, 2006). Any differences we found were differences in level of performance found primarily at the upper end of the age range, perhaps indicating that children from the Canadian setting begin to refine their skills more quickly as parenting socialization practices targeting symbolic development that relies on these skills ramp up. This finding of overall similarity is not surprising because these social-cognitive skills are so basic (many of them are shared with our great ape relatives) that it is difficult to imagine children functioning normally in any cultural setting without them.

#### *Sharing Intentions and Attention*

Children's ability to form shared goals and intentions with others was measured in a series of collaboration tasks, and their ability to share attention with others was measured in a structured joint attention task. In the collaboration tasks, children in all three cultures were skillful at collaborating—the precise measure being their tendency to reengage recalcitrant others into the collaboration—but in this case the Canadian children were slightly less skillful. Children in all settings developed this skill within the age range considered typical for these tasks, between 17 and 20 months. In the joint attention task, children at around their first birthdays were successful in achieving joint attention with an adult equally often in all three cultures.

Again, despite one small developmental difference in the collaboration tasks, the overall picture in our tasks of shared intentionality is similarity across cultures. And again, the general ages of emergence in all cases fit the general picture from previous studies with Western, middle-class children (Carpenter, Akhtar et al., 1998; Warneken et al., 2006). One might expect that coordinated pursuit of goals would require directed input from others in the culture, and cultures may vary in the extent to which they provide this direction. Most especially, in more traditional cultures adults typically do not play the sort of games used in our collaboration and joint attention tasks with infants and very young children on a routine basis. Nevertheless, the children from the Indian and Peruvian settings were slightly more collaborative than Canadian children. This is interesting because our collaboration measure depended on children communicating to adults in order to reengage them, and children from traditional contexts did more of this.

This could perhaps be a case where parenting style could lead to a difference: those experiencing more “proximal parenting” communicate more naturally in close, collaborative contexts than those experiencing more “distal parenting.”

But the overall pattern of developmental trajectory found here is clearly similarity across cultures. This may suggest that parenting styles have no effect on the early development of these behaviors, or it may simply be that the necessary directed input may be achieved equally, though perhaps in different ways, across cultures. Based on the interview data and ethnographic observations, children in the Indian and Peruvian settings were less likely to be involved in play with adults but more likely to be involved in the everyday activities and routines of their mothers (e.g., food preparation and clean up) in comparison to Canadian children. As in the case of intentional understanding, the emergence of the most basic skills of shared intentionality would seem to be cross-culturally quite stable and predictable.

### *Comprehending and Using Symbols*

Unlike the foundational skills that enable infants to engage with and learn through others, which seem to have a heavily canalized developmental pathway across very different social environments, joining into a symbolic community requires specific types of experience and support from expert symbol users. In the current study, the Canadian children were comprehending and producing both pretense and pictorial symbols skillfully between 2.5 and 3.0 years of age, on average. Children in the other two cultural settings, however, only became skillful more than a year later as they approached 4.0 years of age. Though we cannot rule out more transient factors associated with the experimental settings for these tasks and how the children in the different cultures related to these settings, data from the maternal interviews confirmed that Canadian children received much more experience with both of these types of symbolic devices, typically with scaffolding from adults, than did children in either of the other two cultural settings. These different levels of experience, particularly within supportive interactions with expert symbol users, provide the most natural explanation for cultural differences in these symbolic skills. It is noteworthy that pretense abilities—considered by many to be universal at least in play between children—showed differences across cultural settings on both the comprehension and production measures used here. At least for the tasks used here, play with other children may not be as effective in scaffolding true understanding of the pretense attitude.

Thus, although 5-year-olds in all cultures may pretend on their own and draw pictures on their own, the contention here is that 2-year-olds do

not do this in any culture. Two-year-old children do not just pick up random objects and pretend things with them, as older children might, and they do not representationally draw things spontaneously. But if 2-year-olds encounter an adult pretending things for them, or drawing things for them and pointing out the referents, they are capable of beginning to comprehend such pretense and pictorial symbols and perhaps even producing some themselves. For whatever reason—perhaps due to a child-rearing philosophy focused heavily on pedagogy—parents in many Western, industrialized societies quite naturally interact with their young children in these ways, whereas parents in more traditional, small-scale societies do so much less often. The comprehension and use of pretense and graphic symbols, therefore, is something that would seem to be quite dependent—especially in terms of early emergence—on the ways that children in different cultural settings experience these symbols.

### *Summary*

Overall, then, the results of these eight studies are generally in line with our predictions. In their most basic social-cognitive skills children from the three cultures were highly similar (with the Indian children being a bit slower in the pointing task). In the more interactive skills involving active collaboration and joint attention, children in the three settings were again highly similar (with Canadian children being a bit slower on the collaboration task). The one place we found robust cultural differences was in children's acquisition of skills with external symbols—specifically pretense actions and pictorial symbols—which the Canadian children were quicker to develop. This pattern makes perfect sense because children in this culture experience social interactions involving these kinds of symbols at a much higher rate than children in smaller scale, more traditional settings.

## THE ROLE OF CULTURE IN EARLY SOCIAL-COGNITIVE DEVELOPMENT

Research investigating the cognitive development of older children very often finds significant cultural differences, often due fairly straightforwardly to differences in routine parenting practices or to their exposure to formal schooling and literacy/numeracy training (see Introduction for references). Most researchers would probably agree that we should expect fewer and smaller differences with infants and younger children and with more basic cognitive skills, but it was not clear whether we should expect no differences. There have been claims in the developmental literature that certain kinds of social experiences are critical for early social-cognitive development, most especially, participation in certain kinds of

“protoconversations” (i.e., those with adult mirroring of child affect and behavior) and exposure to adults inviting children into joint attention with objects triadically (see Introduction for references). And we know from cross-cultural research on early parenting and socialization practices that adults from larger scale, more industrialized societies quite often provide their children with more exposure to social experiences of these kinds (see Introduction for references). Based on these hypotheses and data, then, even at early ages and with very basic social-cognitive skills, we might expect to see differences in the developmental trajectory of these skills as a function of cultural setting.

Gaskins (2006) presented a useful typology of the possible results and conclusions that research such as ours might establish and reach with regard to such questions. Her three main types of results and conclusions are as follows:

1. We might find different developmental trajectories in the different cultures, and so conclude that different cultural settings lead to different developmental outcomes.
2. We might find similar developmental trajectories in the different cultures because for these skills ontogeny depends very little, if at all, on environmental input.
3. We might find similar developmental trajectories in the different cultures because for these early emerging, very basic social-cognitive skills all cultural settings provide enough of the right kind of social experiences for species-typical ontogeny.

The results of the current study provide solid evidence in favor of the first of these explanatory options for children’s acquisition of skills with pretense and graphic symbols. Although we do not have quantitative information about how often children in the different cultures are exposed to these kinds of symbols, ethnographic observations, and interviews suggest that the Canadian children have had much more experience with them. And we know from other studies with Canadian children that the amount and type of exposure they have to pictorial symbols, in particular, significantly influences how early they acquire skills with them (Callaghan & Rankin, 2002). We have no such data for pretense symbols, but some approaches to pretense emphasize its inherently social nature, specifically, that certain kinds of pretense are learned via general skills of cultural learning from other people, and pretense is produced, at least in the early stages, only “for” other people in social interaction (e.g., Rakoczy, Striano et al., 2005; Rakoczy, Tomasello et al., 2005). From this view, then—as opposed to the theory that pretense is a natural outcome of skills of individual cognition

(e.g., Nichols & Stich, 2000)—we would expect significant cultural variability as a function of the amount of exposure children have with pretense in supportive social interactions.

In contrast, the results of the current study provide fairly strong evidence against the first of the three explanatory options for the more basic social-cognitive skills we investigated (imitation, helping, gaze following, and pointing), as well as those of a more interactive nature (collaboration, joint attention). Although there were a few, small cultural differences observed on some of the specific tasks, there was no pattern across tasks such that children from one cultural setting consistently outperformed the others across the board. In all, the general picture was one of cross-cultural similarity for these foundations.

Our finding of similarity in cognitive outcome for the basic and interactive social-cognitive tasks does not, of course, enable us to choose between the second and third explanatory options above. But general observations of differences between Western industrialized cultures and small-scale, traditional cultures, along with our own ethnographic observations, do enable us to make at least some progress on distinguishing the two possibilities. For example, the documented differences between the two main types of cultural settings (traditional, industrialized) in terms of mirroring in protoconversations (e.g., Demuth, 2008) and the use of adult strategies for encouraging joint attention (Gaskins, 2006; Morelli et al., 2003) do not seem to lead to any large differences in social-cognitive outcomes in the specific settings studied here. In the case of protoconversations, the best evidence is that infants in all cultures experience these, though they are somewhat differently structured and possibly occur at different frequencies. And so in this case we do not know whether a threshold level of such interactions is a necessary experiential basis for the development of later social-cognitive skills or whether they would develop even in their absence. In the case of adults inviting young children into joint attention, again it is likely that children in all cultures experience this kind of interaction at least on occasion, perhaps even in a more directive context (e.g., the adult wants the child to see a piece of food she is offering so that she will grasp it for herself). And of course children in all cultures very likely gain experience with joint attentional interaction through their own efforts of following into adult attention. So again in this case we do not know whether a threshold level of relevant interactions is a necessary experiential basis for the development of later social-cognitive skills or whether they would develop even in their absence.

In all, it seems unlikely that a child raised in complete social isolation, with no social-interactive experience with others, would develop skills of imitation, helping, gaze following, pointing, collaboration, and joint attention. It is possible, but it would seem much more likely that young

children develop these skills as they engage with other persons in very basic types of social interactions of a type present, apparently, in all of the different cultures of the world. For example, in traditional societies where mothers carry their infants most of the day as they go about their work, face-to-face interaction with infants will be less common, but there will be some, often in connection with feeding and cleaning. And similarly, young children will naturally experience some bouts of joint attention with adults as a result of common kinds of experiences such as offering food, warning about dangerous objects, and the like. So we have not demonstrated here that social experience with protoconversations and joint attention is not necessary for children to develop their most basic social-cognitive skills but only that they do not need to experience these things at high frequencies and in the Western manner.

All of our interpretations and conclusions must be tempered, of course, by recognition of several limitations of our studies. First, it is not possible in such studies to make the samples of children comparable in all respects except cultural setting. The infants and young children in our studies varied on many levels. All we could do for certain was to make sure that the children from the three cultures were comparable in age in each study. Then, in addition, we attempted to characterize each sample and their experiences, in most cases, by interviewing the mothers about their children's experiences relevant to each domain tested. But we did not, for example, test children from a Western culture but from a social setting with fewer artifacts and verbal instruction, nor did we have sample sizes such that we could systematically evaluate the role of separate factors such as maternal education and the like. The correlational and ethnographic findings suggest that these are promising avenues for future research.

Another potential limitation is the comparability across settings in the extent to which infants and young children playing games with friendly strangers provides an optimal estimate of performance. As our ethnographic observations attest, it was not typical for infants and young children in the Indian and Peruvian settings to have close, one-to-one interactions in games and routines with an adult, particularly one who, though friendly, was not known to the infants beforehand. We were acutely aware going into the study of the criticisms that have been leveled at researchers who parachute their procedures from Western labs into cultures where even asking a question one knows the answer to is considered odd. In our pilot studies that led up to this research, in these and four other cultural settings, it was clear that affectionate interactions with infants and young children—in the form of games or other reciprocal routines—were an important part of the early social landscape everywhere. The game may be different, the partner may not always be the parent, but the friendly inclusion of infants in these interactions is pretty much standard practice in all the cultures we observed.

The procedures we used for measuring the foundational skills were originally designed to mimic natural, everyday interactions that infants routinely experience and to do so with very little accompanying language. In delivery of these procedures, the experimenter always “pretends to be real,” and the children seemingly always buy it. The children are not even aware, as is typically the case in assessments of older children, that they are being tested. The primary experimenter was present for all of the data collection in India and Peru, and most of it in Canada, and if an infant showed reluctance to interact with the experimenter (this was very rare), the session was ended. The data we present here are from happy children playing with friendly strangers (who have spent some time warming them up beforehand) in relatively naturalistic play interactions. Nevertheless, we must acknowledge the possibility that there still may be an issue of the comparability of how infants related to our procedures across settings.

We think it is not likely that either of these potential limitations—possible noncomparability of the children and their relation to the observational procedure—poses a serious threat to our general conclusions. If either of these was a serious problem, we would expect to see some differences between the three cultural groups that manifest across the board in all tasks. We saw none of these. In general, our finding of overall similarity in the most basic social-cognitive skills of the children across cultures also suggests that these were not serious methodological problems. Differences in the way the children from the different cultures comprehended and produced pretense and graphic symbols would obviously be the place where one might most reasonably raise methodological issues—based on the different results—but in this case the findings are actually quite reasonable, given that in the two more traditional cultures the children have very limited experience at the young ages we tested with pretense and graphic symbols.

Finally, we lack direct observational data of the cultural environments for developing infants and young children in the three settings. Our sketch of these environments relies on the interview data and our ethnographic observations. This potential limitation is tempered by the fact that in India we employed a local research assistant who was from the cultural setting, and in Peru our Canadian assistants had previously lived for an extended period within the cultural setting. It is also tempered by a fit between our interview and ethnographic observations and the descriptions of parenting patterns in traditional cultures as described by others (Bornstein & Lansford, 2010). Nevertheless, we recognize that extended, embedded living within the cultural settings may have provided insights that would add to our portrait of the cultures and inform our interpretation of the results. This is another worthy topic for future research.

## BECOMING CULTURAL

Organisms inherit their environments as much as they inherit their genes. Indeed, because genes are selected by environments, one could say metaphorically that the genome of a particular individual “expects” a certain environment for its normal phenotypic realization in ontogeny. Fish are born “expecting” water, as can be seen from their gills and fins, not to mention their swimming skills. Some organisms, in addition, shape or construct aspects of their environment (so-called niche construction, Laland, Odling-Smee, & Feldman, 2000), and then future individuals of the species adapt to that new environment. And so ants are born “expecting” ant hills, as can be seen in such things as their rapid and predictable repair responses when their hill is compromised. The theoretical framework for this kind of thinking about evolution is sometimes called Dual Inheritance Theory, which has as a critical component gene–environment (or culture) coevolution (see, e.g., Richerson & Boyd, 2005).

In the case of humans, the genomes of individuals cannot “expect” any particular constructed environment. Human beings must be equipped with whatever skills are necessary for becoming competent members of whatever culture they are born into. Human beings have evolved skills of social cognition and cultural learning that enable them both to create many different cultural structures and to acquire whatever cultural structures they are born into. These skills are highlighted by comparative studies in which human children are compared with their nearest primate relatives. For example, Herrmann et al. (2007) found that 2-year-old children have basically the same cognitive skills as other great apes for dealing with the physical world of space, objects, and causality. But already by this young age—before literacy and formal schooling—they have species-unique skills of social cognition, some of which were investigated in the current study as well. Such basic social-cognitive skills as imitation, joint attention, and communication by pointing are things that humans do in unique ways and that, generalizing from the current data, they begin to do at roughly the same developmental period universally across cultural contexts. They are skills that humans have evolved for functioning in their self-built cultural worlds.

Beyond these most basic universal skills for living culturally, different populations of humans have also adapted to their local environments by creating their own unique sets of cognitive skills for working with their own particular artifacts, symbols, and behavioral practices. Children use their basic skills of social cognition and cultural learning to acquire these particular artifacts, symbols, and cultural practices, but to do this, of course, they must experience them in appropriate contexts. There is cultural variability in the way children experience the cultural skills of their natal group, with children in some cultures actively taught skills (including by verbal

instruction) by adults, whereas others must observe and learn from adults more independently (Rogoff, 2003). But in either case, there must be some child-friendly exposure to the skills. In the current study, the two sets of symbolic skills involving pretense and graphic symbols are of this type, we would argue. And the finding is that in cultures in which children get little exposure to these kinds of symbolic artifacts and practices, their skills with them are slower to emerge in ontogeny.

We would thus like to end by stressing this distinction between basic social-cognitive skills that enable children to become members of cultures in the first place and the particular cognitive skills characteristic of particular cultures, typically involving the social learning of some kinds of artifacts, symbols, and behavioral practices. The current results suggest that children in many different kinds of societies, using many different kinds of socialization practices, develop their most basic social-cognitive skills for participating in culture at around the same age early in ontogeny. However, even very young children's acquisition of the culturally constructed cognitive skills and practices of their culture—dealing with its artifacts and symbols, for example—are clearly influenced in critically important ways by the amount and nature of the exposure they have to these skills and practices. Our current understanding of precisely which skills are influenced and in what ways by different cultural settings is very rudimentary in the case of infants and very young children, however. Discovering more about how this all works is a worthy goal of future research.

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