Research Article

Synchrony in the Onset of Mental-State Reasoning

Evidence From Five Cultures

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ABSTRACT—*Over the past 20 years, developmental psychologists have shown considerable interest in the onset of a theory of mind, typically marked by children's ability to pass false-belief tasks. In Western cultures, children pass such tasks around the age of 5 years, with variations of the tasks producing small changes in the age at which they are passed. Knowing whether this age of transition is common across diverse cultures is important to understanding what causes this development. Cross-cultural studies have produced mixed findings, possibly because of varying methods used in different cultures. The present study used a single procedure to measure false-belief understanding in five cultures: Canada, India, Peru, Samoa, and Thailand. With a standardized procedure, we found synchrony in the onset of mentalistic reasoning, with children crossing the false-belief milestone at approximately 5 years of age in every culture studied. The meaning of this synchrony for the origins of mental-state understanding is discussed.*

A major social-cognitive achievement of young humans is the understanding that people act on the basis of their representations of reality, rather than reality itself. For more than 20 years, developmental psychologists have explored the onset and refinement of this psychological understanding in children under the rubric *theory of mind* (Premack & Woodruff, 1978). The basic question in this research is how children come to take the mental state of other individuals into account when making judgments about their overt behavior. Appreciation of the effect of false belief on behavior is taken to be the strongest indicator that children have achieved this insight (Dennett, 1978). In a seminal study by Wimmer and Perner (1983), children heard a story about a doll who put chocolate in location A and then went out of the room, at which point the chocolate was moved to location B. The children were asked where the doll would look for the chocolate upon returning. A majority of 5-year-olds passed (i.e., said the doll would look in the original location), and all of the 3-year-olds failed (i.e., said the doll would look in the new location). Consistent findings have been obtained with altered versions of the false-belief task, confirming that the fundamental shift in understanding the impact of the mind on behavior occurs between the ages of 3 and 5 years in European and North American children (Wellman, Cross, & Watson, 2001).

Such reasoning reflects what is generally viewed as the human ability to represent the mental world of other individuals by age 5, and to learn by taking others' perspectives (Tomasello, Kruger, & Ratner, 1993). Research with autistic individuals (Baron-Cohen, 1995) suggests a biological mechanism for the onset of mentalistic reasoning because even when their mental age is over 6 years, they still fail false-belief tasks. Finding a small age window during which children universally develop an understanding of false beliefs could also be taken as evidence for a biological account, although it would leave open the question of whether culturally universal childhood experiences are necessary triggers for such understanding. We consider this issue in the General Discussion.

Very few cross-cultural studies have investigated mental-state reasoning, and most of these have looked at only a single non-Western culture or varied in methodology, making cultural comparisons difficult. The cultural appropriateness of a verbal task posing questions about hypothetical characters is also a

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recurring problem in these studies, even when careful attempts are made to make the language in the non-Western cultural setting comparable to the language used in the original study. In one such cross-cultural study, Vinden (1996) attempted to measure mentalistic reasoning in Quechua-speaking children in the highlands of Peru using a false-belief location task modeled on Perner, Leekham, and Wimmer's (1987) hidden-chocolate story, as well as two other theory-of-mind tasks (a deceptive container task after Gopnik & Astington, 1988, and an appearance-reality task following Flavell, Flavell, & Green, 1983). Although the tasks were conducted by a native Quechuan collaborator who was known to the children, and although Vinden took care to provide a meaningful translation of the task, the children, who were 4 to 8 years old, performed poorly on all tasks. Either Junin Quechua children truly do not understand false belief even by age 8 or the task did not translate into their culture.

An earlier study by Avis and Harris (1991) used a more culturally natural version of the false-belief task with preliterate children (Baka of southeast Cameroon) and found that the children passed at an age comparable to that seen in European and North American studies. In Avis and Harris's modified task, children engaged in what appeared to be a real situation of deception involving two confederates who were members of their community. One confederate made a special meal in a hut used for cooking, while the other confederate sat with the child. The cook announced how much he liked the food and that he would be right back to eat it as soon as he had visited in the male meeting place. When he left, the second confederate asked the child to play a game by hiding the food. When the child did this, he or she was asked to predict where the first confederate would look for it, and how he would feel before and after discovering the missing food. This task modification required the child to reason about the mental state of the deceived person, but may have made that reasoning easier by having the scenario acted out with real people in what appeared to be a real situation, rather than by using the typical puppets and stories.

A second study by Vinden (1999) adapted Avis and Harris's (1991) task for four cultural groups: Western children (of European descent, attending a missionary school in Papua New Guinea), Mofu schooled children (from northern Cameroon, attending French immersion schools), Tolai schooled children (from Papua New Guinea, attending English preparatory schools), and Tainae nonschooled children (from a remote jungle village in Papua New Guinea). Children in all four groups appeared to pass the task by 6 to 7 years. However, it is difficult to assess the developmental trajectory for these children because very few were younger than 6 years, and the task included additional questions about thoughts and feelings that may have created difficulties. Perhaps the most interesting finding was that the 6 children in the youngest age category (4–8 years) from the most remote, preliterate setting (Tainae) passed the false-belief question about where the person would look. This finding corroborates the high passing rate for this question reported for preliterate 5-year-old children by Avis and Harris.

In a third study, Vinden (2002) compared schooled and nonschooled Mofu children on a battery of theory-of-mind questions, including location false-belief questions and 11 other questions related to prior and subsequent true and false beliefs. Although schooling did not influence performance on the false-belief test, schooled children had better overall scores on the battery of questions. Because the schooled children in this study received second-language immersion (French), it is difficult to determine whether it was schooling or bilingualism that accounted for their higher overall scores.

In sum, although most research that is relevant to an understanding of the development of mentalistic reasoning has been conducted in Western cultures, there are a few notable exceptions. When researchers (Avis & Harris, 1991; Vinden, 1999, 2002) have used a naturalistic procedure in which non-Western children participate in deceiving a familiar person, their performance has appeared to approximate that of Western children. However, in these studies, sample sizes have been small, only a limited number of cultures have been examined, and tasks have varied across cultures. When a natural procedure has not been used, there has been a discrepancy of 2 years in the estimated age of onset of this ability across cultures (Vinden, 1996). A more extensive and controlled study is needed to make a stronger case for synchrony of onset of mental-state reasoning across cultures. The present article reports such a study, in which we used a single simplified version of the naturalistic task with 3- to 5-year-old children from five diverse cultural settings (Canada, Peru, India, Thailand, and Samoa).

METHOD

Cultural Contexts

The research was conducted in five cultural settings: Canada, Peru, Samoa, India, and Thailand. In Canada, children from a rural town having a middle-income socioeconomic level and a variety of private early education programs were tested in a quiet room in their preschool. Classroom groupings in this preschool included approximately 12 children, led by one teacher and one assistant. Children in this preschool were familiar with researchers and teachers conducting special tasks with them in individual settings, and thus are similar to children sampled in previous research.

In Peru, children from a rural Andean town were tested. Socioeconomic levels were low relative to Peruvian standards, but private and public early education programs were common. Children were tested in their preschools, where one teacher, assisted by one or two aides, was in charge of each group of approximately 25 children. These children rarely received individual attention from teachers, and when they did, it was usually within the classroom. Although children in these Peruvian schools were typically administered tests in a group

setting, children nevertheless showed a willingness to play the game individually with the two researchers, who were introduced as "teachers."

In Samoa, children from traditional Polynesian agrarian villages governed through a chief (*matai*) system were tested in preschools or their homes. Preschools sponsored by local churches are becoming more common in Samoa, although many young children are still cared for by an extended family group. The socioeconomic status of these villages was typical according to standards in Samoa, where wealth is communal, shared according to the traditional *matai* system. Although separate rooms were not available because of the open design of buildings, we successfully secluded the children during testing, in both preschool and home settings, so that other children who would subsequently be tested could not observe or interfere with the procedure. As were the Peruvian children, the Samoan children were unfamiliar with special, individualized tasks in an educational setting.

In India, children from a populous city were tested in their highly formal and regimented private schools, each of which went from primary grades through high school. The socioeconomic status of the sample was middle to upper middle class by Indian standards. In this community, children attended school from the age of 3 years. Classroom groups generally included approximately 30 to 40 children, with 3- to 4-year-olds and 5-year-olds in separate groups. These children were familiar with formal testing by an adult, but this was usually accomplished in group settings. Each group was headed by one teacher and one assistant, who were responsible for instruction and testing. For this study, children were tested in the false-belief task in a quiet room or hallway outside of their classrooms.

In Thailand, children were tested in a Buddhist temple school for disadvantaged children in a large Thai city. Socioeconomic status of the sample was low by Thai standards, even though the school was in the relatively affluent university neighborhood. Preschools and day-care centers were common in this city, but this preschool was unusual in targeting children who were economically disadvantaged. Relations between teachers and students were respectful, but relaxed and friendly. Typically, one teacher and two assistants were assigned to each class of about 40 preschoolers. Instruction was delivered in group settings, and individualized testing and attention were rare. These children were tested in hallways or rooms adjacent to their main classroom.

Experimenters

In all settings, the children were tested by two female experimenters. In Canada, the experimenters were research assistants with prior experience conducting research with children. Canadian-trained research assistants traveled to the other locations to train local collaborators. In Peru, Samoa, and Thailand, the Canadian researcher served as the deceived adult (see Procedure), and the local assistant took on the other role, encouraging the child to play a game on the other researcher. In India, two local assistants played these roles.

Participants

The final sample included 267 children between the ages of 30 to 72 months. For statistical analyses, children from Canada, India, Samoa, and Peru were grouped into three ages (3, 4, and 5 years). Children were considered 3-year-olds if they were between their third and fourth birthdays, 4-year-olds if they were between their fourth and fifth birthdays, and 5-year-olds if they were between their fifth and sixth birthdays. Children from Thailand were grouped into 3-year-olds and 5-year-olds (no 4-year-olds were tested). For all Thai children, and some Samoan children (13 out of 72), it was necessary to estimate children's ages through discussions with parents and teachers because accurate birth-date information was not kept. Mean ages were 3.7, 4.5, and 5.3 years for the Canadian age groups; 3.5, 4.5, and 5.4 years for the Peruvian age groups; 3.5, 4.5, and 5.6 years for the Indian age groups; 3.6, 4.4, and 5.2 years for the Samoan age groups (excluding children with estimated ages); and 3.3 and 5.0 years for the Thai age groups (estimated).

Procedure

A false-belief task involving location was used in all settings. This task, a simplification of the naturalistic task used by other researchers (Avis & Harris, 1991; Vinden, 1999), involved an experimenter hiding a trinket under one of three bowls, then leaving the room. Whereas Vinden (1999) and Avis and Harris (1991) asked about a person's thoughts, emotions, and behavior in response to a false-belief situation, we asked only about behavior. Such a strategy minimizes issues of translation and cultural mores (such as it not being acceptable to discuss other people's mental states, see Lillard, 1998). Local collaborators translated the script, taking care that the tone and wording corresponded to typical adult-child friendly interactions in their respective cultural settings.

First, the experimenter showed the child the trinket (e.g., ring, coin), which was chosen to be attractive to children, and commented on how it was her favorite toy. She then said, "I'm going to hide my toy under here while I go to _____ [an errand was invented]," as she placed the toy under one of the bowls. Before leaving the room, the experimenter lifted the bowl and said, "See, it's right there. I'm going to play with it when I get back." The experimenter then left the room. At this time, the second experimenter asked the child, "Do you want to play a game on _____ [the other experimenter's name]? Take the toy and hide it under another bowl." She waited for the child to act, and if the child did not, she indicated one of the bowls and said, "Hide it under here." If the child still did not act, the experimenter moved it and said, "See, I've moved it to this bowl," as she lifted the bowl to show the toy. Once the trinket was moved,

the child was asked, "Where is _____ going to look for her toy when she comes back?"

Children indicated their choice by pointing. All sessions were videotaped and later checked for reliability. Fourteen children out of the initial sample ($N = 281$) were excluded because of procedural errors (6 cases) and response ambiguity (8 cases). For the remaining 267 children, there was 100% agreement for response coding. As in traditional false-belief location tasks, a child was scored as having passed the task if he or she pointed to the location where the experimenter who left the room had hidden her trinket, and as having failed if he or she pointed to the location where the trinket was moved in that experimenter's absence.

RESULTS

Separate sign tests were conducted on the pass/fail frequency data from each culture, as well as on these data combined across cultures. Table 1 presents the data along with the probability levels for the sign tests. From the table, it is evident that in all five settings, a majority of 3-year-olds failed the false-belief task (all ps $< .05$), and a majority of 5-year-olds passed (all ps $< .01$ except in Samoa, where $p < .10$). In all settings except Samoa, where most 4-year-old children failed ($p < .05$), 4-year-olds were fairly evenly split between those who failed and those who passed the task (all p values were not significant). The data for individual cultures are mirrored in the data combined across cultures. Sign tests of the combined data revealed that the majority of 3-year-old children failed the task ($p < .001$), approximately equal numbers of 4-year-old children failed and passed (n.s.), and a majority of 5-year-old children passed ($p < .001$).

In addition to conducting statistical analyses, we plotted the percentage of children passing the false-belief task as a function of age in order to provide a visual representation of the trends. To obtain an accurate plot of the developmental trajectory as a function of age in months, we did not include in these graphs the children for whom we estimated ages. For each culture, data were ordered by age and then clustered into 10-children groups starting with the youngest child (there were 9, 4, 1, and 2 children in the last cluster for the Samoan, Indian, Peruvian, and Canadian samples, respectively). For each of the age clusters, the percentage of children who passed the test was calculated; these results are plotted in the upper panel of Figure 1. To plot the data combined across all cultures, we grouped the data into the following age clusters: 30–36 months, 36–42 months, 42–48 months, 48–54 months, 54–60 months, 60–66 months, and 66–72 months. Within each of these age clusters, the percentage of children who passed the false-belief task was calculated; these results are plotted in the bottom panel of Figure 1. The graphs clearly show that for both individual cultures and the combined data across cultures, there was a shift from failure to success on the false-belief location task between the ages of 3 and 5 years.

GENERAL DISCUSSION

These results align with findings from studies using a variety of procedures with European and North American children (Wellman et al., 2001), as well as with the findings from studies using the same modified procedure with preliterate Baka and Tainae children (Avis & Harris, 1991; Vinden, 1999). Including the present study with these previous ones, children in European, North American, Latin, Asian, African, and Polynesian cultures have been sampled, as have schooled children (the majority of research) and nonschooled children (Avis & Harris, 1991; Vinden, 1999, 2002). The fundamental shift in understanding the impact of a false belief on behavior appears to be a universal milestone of development that occurs between 3 to 5 years of age. Synchrony in the age at which children of diverse cultures pass the false-belief task undermines the claim that particular cultural views, such as a Western concept of mind, profoundly influence this very basic aspect of early mental-state reasoning, and strengthens a claim of universality. Whether the synchrony results more from biological maturation or from experiences that are universal across the cultures sampled, or both, remains at issue.

TABLE 1

Number of Children Passing and Failing the False-Belief Task for Each Culture and Age Group

	Age group								
	3 years			4 years			5 years		
Culture	Pass	Fail	p	Pass	Fail	p	Pass	Fail	p
Peru	4	27	<.001	12	14	n.s.	20	3	<.001
India	5	15	<.05	11	6	n.s.	14	3	<.01
Samoa	2	14	<.01	7	18	<.05	13	5	<.10
Thailand	1	16	<.001	—	—	—	12	1	<.01
Canada	2	11	<.01	9	8	n.s.	13	1	<.001
Overall	14	83	<.001	39	46	n.s.	72	13	<.001

Note. The p values indicate the probability levels of sign tests.

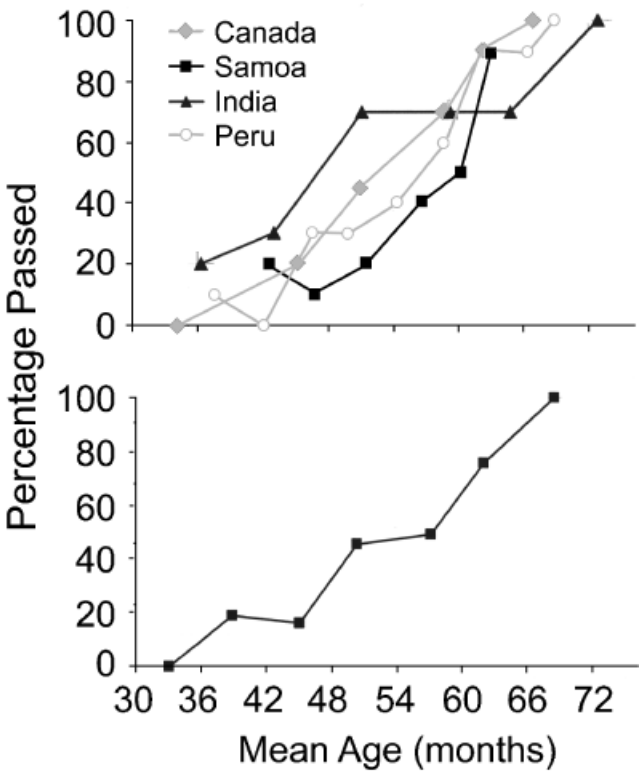

Fig. 1. Percentage of children passing the false-belief test as a function of age. In the top panel, data are plotted separately for Canada, Samoa, India, and Peru. In the bottom panel, results for these four cultures are combined. Data from 13 Samoan and all Thai children were excluded from this analysis because their birth dates were not available.

If biological maturation is the main factor responsible for the onset of false-belief understanding, then different cultural experiences would not have tremendous impact on the age of onset. An analogous situation is learning to walk. Children the world over learn to walk at around 1 year of age, although one can hasten this achievement, as the Kipsigis do, by providing experiences that strengthen the legs (Super, 1976) or slow it by providing "walker" experiences that might reduce the child's drive to walk (Garrett, McElroy, & Staines, 2002). A biological-maturation account is consistent with the evidence accrued thus far, including synchrony in the onset of false-belief understanding across cultures. Children with autism develop false-belief understanding very late, and possibly by different mechanisms than other children (Baron-Cohen, 1995; Leslie & Roth, 1994). Children with older siblings (Perner, Ruffman, & Leekham, 1994; Ruffman, Perner, Naito, Parkin, & Clements, 1998), children who engage in more pretend role play (Lillard, 2002), and children whose parents talk about mental states more understand false belief earlier than other children, but not much earlier (Ruffman, Slade, & Crowe, 2002), and children from low-income homes develop the understanding later than other children, but not much later (Holmes, Black, & Miller, 1996).

The one exception to this universality in the age of onset is the case of deaf children. Deaf children are delayed in false-belief understanding, even into the teen years (Peterson & Siegal, 1995). However, this delay is particular to deaf children who are late signers and whose parents are not deaf (Figueras-Costa & Harris, 2001; Lundy, 2002; Remmel, 2003; Woolfe, Want, & Siegal, 2002). Because deaf children are not thought to have impairments in the particular brain circuitry that appears to be involved in false-belief reasoning (Frith & Frith, 1999), this finding raises the issue of whether there are experiences that contribute crucially to its development, and what those experiences are. The synchrony of onset of false-belief understanding across cultures demonstrated in the present study could be more the result of common experiences across the cultures, or cultural universals, than of biological maturation.

One candidate common experience is schooling. When children are in school, they interact with children from different families and with a teacher, and this interaction might create new pressures, beyond those felt at home, to develop false-belief understanding. Children in all the samples in the present study were in school programs, so the present evidence cannot be definitive regarding the impact of schooling. However, in the only study to directly compare schooled and nonschooled (Mofu) children, Vinden (2002) reported no effect of schooling on false-belief understanding. These findings support those reported by Avis and Harris (1991) in their study of nonschooled Baka children, who showed onset of false-belief understanding at around 5 years. Schooling may help to refine understanding of false belief, but is not necessary for the onset of this understanding.

An alternative candidate experience, raised particularly with regard to deaf children, is conversation. Conversation both brings other individuals' mental views to light and brings a vocabulary necessary to the transaction of mental states. All children except deaf ones who do not sign are exposed to conversation throughout their lives. Perhaps passing false-belief tasks requires a certain amount of experience hearing and participating in conversations in which mental states are shared. This would make sense in terms of the findings on slight variations in the onset of false-belief understanding: Children's need to discuss mental states and exposure to mental-state conversations increase the more other children (siblings) there are in their environment; children discuss mental states frequently in the context of pretend role play; and children from low-income families experience less talk in the home than do children from higher-income families (Hart & Risley, 1995).

Other precursor abilities probably also play a role, both in promoting conversation and in making children aware of mental states. Certain social-cognitive accomplishments of infancy, including joint attention, social referencing, imitation (Tomasello, 1999a, 1999b), and understanding of intentional action (Gergeley, Bekkering, & Kiraly, 2002; Rochat, Morgan, &

Carpenter, 1997; Tomasello & Haberl, 2003; Woodward, 1998) have been proposed as precursors to theory-of-mind understanding (Tomasello, 1999b; Wellman, 1994). These skills, developed through maturation and social experience, might work with conversation to assist children in developing an understanding of the mental lives of other individuals.

Synchrony in the age of onset of mental-state reasoning does not preclude diversity in outcome. Our findings support the view of Avis and Harris (1991), who suggested that adults and children may have access to a universal understanding of belief-desire psychology even though they may come to elaborate this understanding differently, depending on their culture's practices. The precise nature of such elaborations and how they develop from early understanding is a theme that needs to be addressed in future research. The present study establishes the existence of a common starting point for the very fundamental understanding that actions are based on representations of reality. We agree with other researchers (Avis & Harris, 1991; Harris, 1990) who have suggested that reasoning on the basis of inferred belief systems is merely the beginning foundation of psychological understanding that is later supplemented with more complex forms of mental-state reasoning and with culturally specific principles of the causes of human action (Lillard, 1998). The sophisticated theories of mind held by adults in the cultures studied by these researchers, as well as in other cultures, are rich in their diversity, and the refinement of early fundamental understanding to later sophisticated nuance is undoubtedly the work of cultural influence.

Although we have focused on one ubiquitous milestone of human cognition, we suggest that the social-cognitive precursors we mentioned earlier in this section may demonstrate synchronous onset as well. There may also be universal milestones of mentalistic reasoning that occur later in development. Harris (Gardner, Harris, Ohmoto, & Hamazaki, 1988; Harris & Gross, 1988) reported that the age at which children first understand the distinction between real and apparent emotion is similar for American, British, and Japanese children. In order to determine the nature of any universal core understanding of mind, it would be informative to determine whether synchronous developmental trends, such as the one reported here for the onset of false-belief understanding, are also characteristic of both precursors and refinements to theories of mind by examining milestones of social cognition from infancy through childhood across diverse cultural settings.

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