

Synchrony in the Onset of Mental State Reasoning: Evidence From 5 Cultures

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Abstract

Over the past twenty 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 this test around 5 years, with variations on the task producing small changes in the age of passing. 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 due to varying methods used in different cultures. The present study used a single procedure measuring false belief understanding in 5 cultures: Euro-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.

Synchrony in the Onset of Mental State Reasoning: Evidence from 5 Cultures

A major social cognitive achievement of young humans is the understanding that people act based on their representations of reality, rather than on reality itself. For over twenty 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 others 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, then went out of the room, at which point the chocolate was moved to location B. Children were asked where the doll would look for the chocolate upon return. 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 3- to 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 others by age 5, and to learn by taking others’ perspectives (Tomasello, Kruger & Ratner, 1993). Research from 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 evidence understanding 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. This issue is taken up in the discussion.

There are very few studies investigating mental state reasoning across cultures and most of these are limited to single cultures and/or vary in methodology, making cultural comparisons difficult. The cultural appropriateness of a verbal task posing questions about hypothetical characters is also a recurring problem, even when careful attempts are made through translation to make the language comparable across settings.

In one such 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 and 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 children and care was taken to provide a meaningful translation of the task, Vinden (1996) reported that the children who were between the ages of 4-8 years 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 the 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 children passed at an age comparable to that seen in European and North American studies. In their 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 a visit in the male-meeting place. When he left, the second confederate asked the child to play a game by hiding the kernels. When they did, they were 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, but may have made that reasoning easier by having it 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 the Avis and Harris (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). Across all settings, children appeared to pass the task by 6-7 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 six children in the youngest age category (4-8 years) from the most remote, preliterate setting (Tainae) passed the 'look' false belief question. This finding corroborates the high passing rate for this question reported for preliterate 5-year-old children by Avis and Harris (1991). In a third study, Vinden (2002) compared schooled and nonschooled Mofu children on a battery of theory of mind questions, including location false belief and eleven 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 children in this study received second language immersion (French), it is difficult to determine whether it was schooling or bilingualism that accounted for higher overall scores.

In sum, while most research to date 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) use a naturalistic procedure in which children participate in deceiving a familiar person, their performance appears to approximate Western findings. However, in these studies sample sizes were small, only a limited number of cultures were examined, and tasks varied across cultures. When researchers have not used this natural procedure, there is 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 across cultures. The present paper reports such a study, using a single simplified version of the naturalistic task with children from five diverse cultural settings (Canada, Peru, India, Thailand, and Samoa) in the age range of 3-5 years.

Method

Cultural Contexts

The research was conducted in 5 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. Their groupings of approximately 12 children were headed

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 existing 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 groups of approximately 25 children were headed by one teacher and assisted by 1-2 aides. Children rarely received individual attention from teachers, and when they did it was usually within the classroom. Although tests were typically administered to the group, children nevertheless showed a willingness to play the game 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, although many young children are still cared for by an extended family group. The socioeconomic status of these villages was typical according to Samoan standards, where wealth is a communal concept, shared according to the traditional matai system. Although separate rooms were not available due to the open design of buildings, in both preschool and home settings researchers successfully secluded the child when the task was conducted so that other children who would subsequently be tested would not observe or interfere with the procedure. The Samoan children were also 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, which went from primary through high school. The socioeconomic status of the sample was middle to upper middle class by Indian standards. Children attended school from the age of 3 years and were usually grouped in a 3- to 4-year-old and 5-year-old groups of approximately 30-40 children. Instruction and testing were delivered in group settings headed by one teacher and one assistant. They were tested in a quiet room or hallway outside of their classrooms. Children in these settings were familiar with formal testing by an adult, but this was usually accomplished in group settings.

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 setting but this preschool was unusual in that it targeted children who were economically disadvantaged. Relations between teachers and students were respectful, but relaxed and friendly. There were typically one teacher and two assistants in a class of 40 preschoolers. Instruction was delivered in group settings, and individualized testing and attention were rare. Children were tested in hallways or rooms adjacent to their main classroom.

Experimenters

In all settings children were tested by two female experimenters. In the Canadian setting, experimenters were research assistants with prior experience conducting research with children. For other settings, Canadian-trained research assistants traveled to a site where they were assisted by local collaborators. Local researchers were trained by the Canadian assistants to follow the procedural script outlined below. In Peru, Samoa, and Thailand the Canadian researcher served as the deceived adult 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 3 and 6 years from five cultures. For statistical analyses, children from Canada, India, Samoa and Peru were grouped into three ages (3, 4, 5 years). Children were considered 3-year-olds if they were between their third and fourth birthdays, 4-year-olds if between their fourth and fifth, and 5-year-olds if between their fifth and sixth. Children from Thailand were grouped into 3 and 5 years groups. 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 for Canadian children were 3.7, 4.5, and 5.3 years; for Peruvian children 3.5, 4.5, and 5.4 years; for Indian children, 3.5, 4.5, 5.6 years; for Samoan children (excluding those with estimated ages) 3.6, 4.4, and 5.2 years; and for Thai children (estimated), 3.3 and 5.0 years.

Procedure

A false belief location procedure was used in all settings. This procedure, a simplification of the naturalistic task used by others (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 behaviors 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 others' mental states, see Lillard, 1998). Translations of the script presented below were made by local collaborators, taking care that the tone and wording corresponded to typical adult-child friendly interactions in that setting.

First, the experimenter showed the child the trinket, which was chosen to be attractive to children, and commented on how it was her favorite toy (ring, coin, etc). 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 didn't 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 an 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 pass was coded when the child pointed to the location where the experimenter who left the room hid her trinket, and a fail was coded when the child 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. The number of children passing and failing the task at each of the three age levels for each culture, and combined across cultures, are presented separately in Table 1 with the probability levels for sign tests. From Table 1 it is evident that in all five settings a majority of 3-year-olds failed the false belief task (all p s < .05), and a majority of 5-year-olds passed (all p s < .01, except 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 *ns*). The data for individual cultures are mirrored in the data combined across cultures. Sign tests of 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 (*ns*), and a majority of 5-year-old children passed (p < .001).

In addition to statistical analyses, we plotted the average percentage of children passing the false belief task across 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 Figure 1A, data were ordered by age for each culture and then clustered into groups starting with the youngest child. In all but the last age cluster there were 10 children per group. There were 9, 4, 1, and 2 children included in the last cluster for Samoa, India, Peru, and Canada respectively. For each of the age clusters, the percentage of children who passed the test was calculated and is represented by the individual points in Figure 1A, with each culture represented by a separate line. For Figure 1B, data were combined across all cultures and grouped into the following age clusters: 30-36 mos, 36-42 mos, 42-48 mos, 48-54 mos, 54-60 mos, 60-66 mos, and 66-72 mos. The percentage of children passing the false belief task within each of these age clusters was calculated and is plotted in Figure 1B. As is clear in the graphs, for individual cultures, and for the combined data across cultures, there is a shift from failure to success on the false belief location task between 3 and 5 years.

Discussion

These results align with findings from studies using a variety of procedures with European and North American children (Wellman et al, 2001), and from studies using the same modified procedure as the current study with preliterate Baka and Tainae children (Avis & Harris, 1991; Vinden, 1999). Including these and the current study, children in European, North American, Latin, Asian, African, and Polynesian cultures have been sampled, as have schooled (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. Synchrony in the age at which children pass the false belief task across diverse cultures argues against the claim that particular cultural views, like a Western concept of mind, profoundly influences 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.

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 one year of age, although one can hasten this time as the Kipsigis do by providing experiences that strengthen the legs (Super, 1976), and 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, 1999), children who engage in more pretend role play (Lillard, 2002), and children whose parents talk about mental states more understand it earlier but not a lot earlier (Ruffman, Slade, & Crowe, 2002), and children from low-income homes develop the understanding later, but not a lot later (Holmes, Black, & Miller, 1996).

The one exception to this 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 with less conversational experience: late signers, and children whose parents are not deaf (Figueras-Costa & Harris, 2001; Lundy, 2002; Remmel, 2003; Woolfe, Want, & Siegal, 2002). Since deaf children are not thought to have impairments to the particular brain circuitry that appears to be involved in false belief reasoning (Frith & Frith, 1999), this raises the issue of whether there are experiences that crucially contribute to its development, and what those are. The synchrony of onset of false belief understanding across cultures seen 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 a teacher, possibly creating new pressures to develop false belief understanding beyond what transpires in the home. Children in all of 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 at around 5 years. Schooling may help to refine understanding of false belief, but is not necessary for its onset.

An alternative candidate experience, raised particularly with regard to deaf children, is conversation. Conversation both brings others' mental views to light, and brings a vocabulary necessary to the transaction of mental states. All children except deaf ones without sign are exposed to conversation throughout their lives. Perhaps passing false belief tasks requires a certain amount of experience hearing and participating in conversation in which mental states are shared. This would make sense in terms of other findings as well: children need to discuss mental states more and would hear mental state conversation more when there are more children (siblings) about; they discuss mental states frequently in the context of pretend role play; and children from low income families experience less talk in the home (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 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, 1993). These skills, developed through maturation and social experience, might work with conversation to assist children's developing understanding the mental lives of others.

Synchrony in onset of mental state reasoning does not preclude diversity in outcome. Our findings support the view of Avis and Harris (1991) who suggested adults and children may have access to a universal understanding of belief-desire psychology even though they may come to elaborate this understanding differently according to diverse cultural practices. What exactly these elaborations consist of 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 across cultures for the very fundamental understanding that actions are based on representations of reality. We agree with others (Avis & Harris, 1991; Harris, 1990) who suggest that the 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 these and other cultures are rich in their diversity, and the refinement of earlier 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 mentioned above may be likely candidates for synchronous onset as well. There may also be universal milestones of mentalistic reasoning that occur later in development. Harris (Harris & Gross, 1988; Gardner, Harris, Ohmoto & Hamazaki, 1988) reported a similar age shift in understanding of the distinction between real and apparent emotion across studies of 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 the synchronous developmental trends reported here are found for 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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Table 1

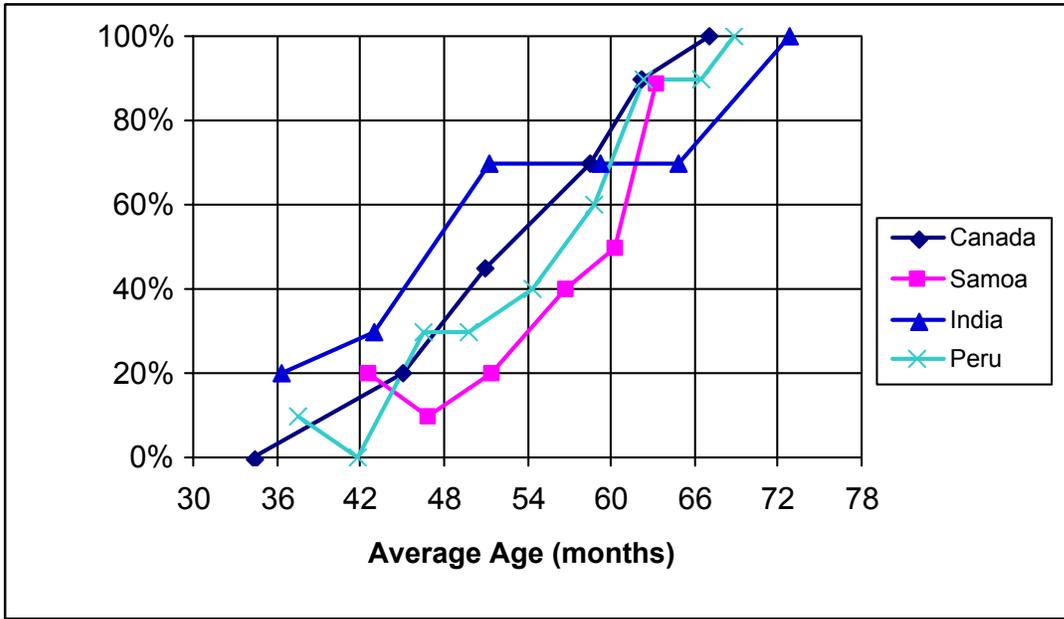
Number of children passing the false belief task for each culture (Peru, India, Samoa, Thailand, Canada) and age group (3, 4, 5 years), with corresponding probability level of sign test.

CULTURE	AGE GROUP								
	3			4			5		
	Pass	Fail	<i>p</i>	Pass	Fail	<i>p</i>	Pass	Fail	<i>p</i>
PERU	4	27	<.001	12	14	<i>ns</i>	13	1	<.01
INDIA	5	15	<.05	11	6	<i>ns</i>	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	<i>ns</i>	13	1	<.001
OVERALL	14	83	<.001	39	46	<i>ns</i>	72	13	<.001

Figure Caption

Figure 1. A. Percentage of children passing the false belief test as a function of age plotted separately for Canada, India, Samoa, and Peru. Data from 12 Samoan and all Thai children are excluded because birth dates were not available. B. Percentage of children passing the false belief test as a function of age, from data combined over cultures.

A.



B.

