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Cross-Cultural Variations in Naïve Psychology among 2-year-olds: A Comparison of Children in the United Kingdom and Singapore

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Abstract
Children's understanding of naïve psychology is the main focus of this study. Research evidence suggests that 2- and 3-year-olds understand some aspects of naïve psychology. By 4 years, they develop internal representations of mental states. Previous studies have also reported cross-cultural variations in naïve psychology development. The majority of this research has focused on Western individualistic societies such as Australia, Europe and North America, and Eastern collectivism societies such as China and Japan. Singapore with its blend of Eastern and Western values represents a unique case for comparison with Western societies. This paper reports a cross-cultural study of young children's developing understanding of naïve psychology in Edinburgh, UK and Singapore. It addresses three main questions: (a) Are there cross-cultural differences in the development of naïve psychology?; (b) What are children's performance sequences on naïve psychology tasks?; and (c) Are naïve psychology concepts coherent? The participants were 87 children from the UK (*n*=43, mean age 2 years 4 months) and Singapore (*n*=44, mean age 2 years 5 months). This study incorporated several established tasks of pretence, desires, emotions, perceptions, appearance-reality and false-beliefs to investigate children's understanding of non-representational and representational mental states. The results showed no gross cross-cultural differences. However, significant cultural differences in performance on two tasks and differences in the coherence of naïve psychology concepts were identified. The results highlight the importance of considering subtle cultural influences on children's developing understanding of various aspects of naïve psychology.

Keywords
Cultural differences, theory of mind, naïve psychology

Children's developing understanding of the mind can be viewed as an unfolding sequence of naïve psychology concepts that change gradually from birth and throughout the preschool years. Naïve psychology encompasses

understanding and attribution of various mental states, traits and processes to oneself and others (see Forguson and Gopnik, 1988). Most theories of the nature of naïve psychology are devised principally on research findings from children living in the West. However, social and cultural values, norms and practices may play a crucial role in shaping when and how children acquire naïve psychology. The aim of this paper is to examine the development of early naïve psychology among 2-year-olds in two cultural contexts. First, we will briefly review evidence from Western countries and then explore issues of cross-cultural universals and differences in young children's naïve psychology.

Development of Naïve Psychology in Western Countries

Early in life infants begin to acquire several interconnected foundations of naïve psychology including: deferred imitation, self-recognition, synchronic imitation, pretend play, joint attention and symbolic gestures (e.g., Leslie, 1987; Meltzoff, 1995; Asendorpf et al., 1996; Charman et al., 2000; Nielsen and Dissanayake, 2000, 2004; Tomasello and Haberi, 2003; Liszkowski et al., 2004). Between infancy and the age of 2 years children develop a rudimentary understanding of some key aspects of naïve psychology. A distinction can be drawn between 'non-representational' and 'representational' concepts. Among children younger than 2 years, their naïve psychology remains largely non-representational (e.g., Perner, 1991; Gopnik and Wellman, 1992; Gopnik et al., 1994).

Children learn to use their imagination to substitute real objects and invent pretend situations from around 18 months of age (e.g., Leslie, 1987, 1988, 1994; 2005; Nielsen and Dissanayake, 2004). By approximately 2 years children can understand pretence scenarios and transformations in shared pretence (e.g., Harris and Kavanaugh, 1993; Walker-Andrews and Kahana-Kalman, 1999), display a variety of pretence skills (e.g., Harris and Kavanaugh, 1993) and conceptualise pretence as an intentional activity (e.g., Rakoczy et al., 2004). However, they may have difficulty distinguishing pretence from reality (e.g., DiLalla and Watson, 1988). It has been suggested that there is an innate cognitive mechanism for pretence (see discussions in Leslie, 1987, 1988, 1994; Harris, 1994; Lillard, 2002; Friedman and Leslie, 2007). However, while the development of pretence skills may have a biological underpinning, culture-specific experiences and environmental influences have also been suggested to contribute to differences in play behaviours, frequency of social pretend play, communicative strategies and pretend play themes (e.g., Farver et al., 1995; Farver and Shin, 1997).

Children also develop a psychological understanding of subjective desire at around 18 months (Repacholi and Gopnik, 1997). They understand that desires are internal states directed towards objects and that the desired objects give happiness and the undesired objects may cause negative feelings. This demonstrates an understanding that different people may have different desires directed toward the same object. The link between desires, actions and emotions begins to be conceptualised by around 2 to 3 years of age. For instance, Wellman and Woolley (1990, Experiment 1) reported that 2-year-olds (range 31–37 months) can predict actions and reactions related to simple desires. While 2-year-olds failed discrepant belief reasoning tasks, they passed comparable desire reasoning tasks, demonstrating an understanding of desires before beliefs (Experiment 2).

Children come to understand that someone else may see something that they do not by 2½ years of age (level-1 perspective-taking; Masangkay et al., 1974; Flavell et al., 1981). Although 2-year-olds can solve level-1 perspective-taking problems, they have difficulty solving level-2 perspective-taking problems. They fail to understand that another person could see something in a different way than they do (Masangkay et al., 1974; Flavell et al., 1981). Level-1 perspective-taking is non-representational because it only requires a child to demonstrate an understanding that other people perceive a different object from themselves. By contrast, level-2 perspective-taking is representational because it requires a child to understand that people can represent a single object in two different ways (Flavell, 1988). Two-year-olds also have difficulty distinguishing between appearance and reality (Flavell, 1986, 1993; Flavell et al., 1983a, 1986).

Several studies have also shown that younger children have difficulties understanding representational change (e.g., Gopnik and Slaughter, 1991) and false beliefs (e.g., Wimmer and Perner, 1983). Children are considered to have a representational understanding when they demonstrate knowledge of their own mental representation and that another person can hold a mental representation different from their own (Forguson and Gopnik, 1988). These representational concepts are a later developmental achievement.

There are a variety of interpretations of the empirical evidence relating to the development of naïve psychology in young children. One of the key issues concerns the extent to which young children's naïve psychology concepts can be described as theoretical and coherent (Gopnik, 1988, 1996, 2003; Astington and Gopnik, 1991; Gopnik and Wellman, 1992, 1994; Gopnik et al., 2001). Numerous studies have found correlations among performance of false-belief, appearance-reality distinction, representational change and visual perspective-taking tasks (e.g., Flavell et al., 1986, 1992; Gopnik and

Astington, 1988; Moore et al., 1990; Astington and Gopnik, 1991; Slaughter and Gopnik, 1996; Taylor and Carlson, 1997; Call and Tomasello, 1999). The coherence account in children's conceptual development has been a major proposition put forth by theorists to explain "why the child's theory of mind really is a theory" (Gopnik and Wellman, 1992: 145).

In sum, 2-year-old children in Western countries have been shown to hold a number of naïve psychology concepts, which develop in a broad sequence and which some suggest are coherent and form a naïve theory. However, do children growing up in other cultures reveal a similar pattern of development in naïve psychology?

Cultural Universals and Differences in Naïve Psychology

Most studies examining the influence of culture on the development of naïve psychology have focused on a single country, continent, or region, including: Africa (e.g., Avis and Harris, 1991), Asia (e.g., Flavell et al., 1983b; Naito et al., 1994; Lee et al., 1999; Tardif and Wellman, 2000), Australia (e.g., Siegal and Beattie, 1991; Nielsen and Dissanayake, 2004), North America (e.g., Gopnik and Astington, 1988; Wellman and Bartsch, 1988; Moses and Flavell, 1990; Wellman and Woolley, 1990; Gopnik and Slaughter, 1991; Moses, 1993), Europe (e.g., Wimmer and Perner, 1983; Brown and Dunn, 1991; Perner et al., 1987) and the Middle East (e.g., Yazdi et al., 2006). These studies provide evidence that the development of understanding of internal mental states such as pretence, desires, emotions, perceptions, intentions and beliefs corresponds with a similar marked shift between 2 and 5 years of age in a variety of different cultures. A few studies have made direct cross-cultural comparisons. For example, Callaghan et al. (2005) found consistent patterns in false-belief performance in Canada, India, Peru, Samoa and Thailand, with children passing the false-belief task at approximately 5 years of age. Furthermore, a meta-analysis of 178 studies of children's false-belief task performance, conducted by Wellman et al. (2001), showed that children's understanding of beliefs develops similarly across cultures.

Other studies, by contrast, have found cultural differences revealing that the dynamics of culture is a meaningful force in children's cognitive development. Vinden (1996) reported poor performance on false-belief and representational change tasks among children in Peru compared to Western norms. Vinden (1999) studied four groups of children living in Papua New Guinea: Western children and non-Western children from three cultural groups (Mofu, Tolai and Tainae). Vinden (1999) demonstrated a one-year time lag in false-belief

performance among the non-Western children. Furthermore, the Western cohort showed a lag of a year behind typical Western norms. A similar delay in false-belief understanding was also found in a study of Mofu children in Cameroon compared to Western norms (Vinden, 2002). Cross-cultural differences have similarly been reported in other naïve psychology tasks, such as mental-reality distinction (e.g., Wahi and Johri, 1994).

Where cultural differences have been identified it is often between cultures located on the extreme end of the individualism–collectivism spectrum. The majority of studies investigated false-belief understanding in children aged 3 years and above. For example, comparisons between Western countries and collectivist cultures such as China and Japan have been made. Naito and Koyama (2006) revealed that Japanese children only acquired an understanding of false-belief at around 6 to 7 years of age, a year and a half later than Western samples. Moreover, they found a cultural difference in that Japanese children explain action based on behavioural and situation cues rather than on their mental states. Naito (2003) also showed that Japanese children's false-belief understanding emerges later than Western norms. Ruffman et al. (1998, Experiment 4) found that Japanese children performed more poorly on false-beliefs and understanding of sources of knowledge gained by seeing or feeling in comparison to British and Canadian children.

Comparisons of Chinese and Western cultures have also revealed cultural differences. Similar patterns of performance on the false-belief task was reported in a meta-analysis of 196 conditions from mainland China and Hong Kong as compared to 155 conditions from North America (Liu et al., 2008). However, systematic cultural differences were also found, with children from North America performing at above chance levels up to 2 years before children from Chinese cultures. Interestingly, against prediction, children from China passed the task significantly earlier than children from Hong Kong. Wellman et al. (2006) demonstrated that Chinese children in China showed a sequence of development similar to that found by Wellman and Liu (2004) in children living in the United States and Australia. Both Western and Chinese children understood desires before knowledge and false-belief, followed by hidden emotions. However, subtle differences were also reported. Western children performed better on the diverse-beliefs tasks compared to the knowledge-ignorance task, whereas the order was reversed for the Chinese sample. Wellman et al. (2006) attributed the different sequences of understanding to different cultural emphases on beliefs and perspectives. Western culture emphasises belief and diverse belief, whereas Chinese culture accentuates knowledge acquisition. In contrast, the results of Sabbagh et al. (2006) revealed that while preschoolers in China outperformed their United States

counterparts from a previously studied sample (Carlson and Moses, 2001) on executive function tasks, there was no cross-cultural difference in performance on false-belief, deception and appearance-reality tasks.

Researchers have explained the differences in naïve psychology development between Western and Eastern cultures in terms of a variety of influences including: language differences such as bilingualism (e.g., Kobayashi et al., 2007, 2008) and specific false-belief terminology in Mandarin (e.g., Lee et al., 1999), social differences such as socio-economic status, parental factors, family composition and child-rearing practices (e.g., Wellman et al., 2006; Liu et al. 2008), differences in cultural experiences (e.g., Vinden, 1996; Naito and Koyama, 2006) and cross-cultural differences in executive function ability (e.g., Chasiotis et al., 2006; Sabbagh et al., 2006). Liu et al. (2008) point out that these factors are likely to have an influence on naïve psychology in complex and interactive ways.

The mixed pattern of results is further confused by the fact that even within Western cultures performance on naïve psychology tasks is not uniform within age (e.g., Wellman and Estes, 1986; Wellman and Bartsch, 1988; Bartsch and Wellman, 1989; Chandler et al., 1989; Flavell et al., 1990; Lewis and Osborne, 1990; Freeman et al., 1991; Mitchell and Lacohee, 1991; Siegal and Beattie, 1991; Robinson and Mitchell, 1992; Moses, 1993; Sullivan and Winner, 1993; Chandler and Hala, 1994; Carlson et al., 1998; Surian and Leslie, 1999). This could be attributed to a range of methodological issues but also raises the possibility of important within-culture variations in naïve psychology. Some studies have provided evidence that within culture, the rates of development will vary according to number of siblings (e.g., Perner et al., 1994; Jenkins and Astington, 1996); birth order (e.g., Ruffman et al., 1998; Howe et al., 2005); availability of extended family members (e.g., Lewis et al., 1996); socioeconomic status (e.g., Holmes et al., 1996; Cutting and Dunn, 1999; Garner et al., 2005), parenting style (e.g., Ruffman et al., 1999, 2006; Vinden, 2001); language development (e.g., Astington, 2001; Astington and Baird, 2005); within-family communication about mental states (e.g., Dunn and Dale, 1984; Dunn et al., 1987, 1991; Youngblade and Dunn, 1995; Ruffman et al., 2002); genetic influences (e.g., Hughes and Cutting, 1999); and family relationships (e.g., Hughes et al., 2005). These subtle differences are also likely to be evident between cultures and while gross cultural differences are important more subtle cultural variations, particularly where cultures are distinct but similar, should not be ignored.

Present Study

The aim of this study is to investigate 2-year-old children's understanding of various aspects of naïve psychology in two different cultural contexts, namely, the UK and Singapore, using a large battery of non-representational and representational naïve psychology tasks. In addition, a parental questionnaire on demographics was collected.

Edinburgh is the capital of Scotland and is a cosmopolitan UK city, with a population of 471 650 (General Register Office for Scotland, 2008), comprising 95.9% White, 1.5% from ethnic groups of Indian sub-continent, 0.8% Chinese and 1.8% from other ethnic groups (City of Edinburgh Council, 2001). Singapore is a multi-ethnic city-state with a resident population of 3.6 million, comprising 74.7% Chinese, 13.6% Malays, 8.9% Indians and 2.8% others (Singapore Department of Statistics, 2009). Singapore embraces an official bilingual education policy. English, Chinese (Mandarin), Malay and Tamil are the official languages. English is used as the medium of instruction in schools. Most Singaporean children speak at least two languages by the age of 3 years. As a result of globalisation, Singaporean children are exposed to Western cultures, values and ideas. Singapore with its mix blend of Eastern and Western values represents a unique case for study.

This paper addresses three main questions: (a) Are there cross-cultural differences in the development of naïve psychology in preschool children from Edinburgh, UK and Singapore?; (b) Are there cross-cultural differences in the performance sequences on various naïve psychology tasks?; and (c) Are naïve psychology concepts coherent among children in the UK and Singapore?

Methods

Participants

A total of 87 children were recruited from six nurseries in Edinburgh, UK and seven childcare centres in Singapore. Each child was assessed on the British Picture Vocabulary Scale (BPVS; Dunn et al., 1997) in order to ascertain their verbal mental age and ensure that their language was in line with their chronological age. Details of each cohort's characteristics can be found in Tables 1 and 2. For the purpose of this study, children recruited from Edinburgh will be referred to as the "UK cohort" and children from Singapore will be referred to as the "Singapore cohort". All participants had normal hearing and normal or corrected to normal vision. Parents reported no case of learning disabilities and/or developmental disorders.

Table 1
Baseline measures

Measure	UK cohort (*n*=43)	Singapore cohort (*n*=44)
Gender	23 girls and 20 boys	17 girls and 27 boys
CA (in months), *M* (SD)	28.60 (2.05)	29.89 (2.76)
Range	25–33	25–34
BPVS-VMA (age equivalent in months), *M* (SD)	33.95 (2.96)	35.41 (3.53)
Range	28–42	29–45
Number of languages used at home and in preschools, *M* (SD)		
Range	1.09 (0.29)	2.23 (0.42)
	1–2	2–3

CA=chronological age, BPVS-VMA=British Picture Vocabulary Scale (Dunn et al., 1997)-verbal mental age.

General Procedure

Invitation letters were sent to the nurseries and childcare centres. Consent was obtained from the parents, who were informed that all personal details would be kept strictly confidential. Prior to each session, children were informally asked whether they would like to participate. Children were tested individually in quiet corners of the nurseries and childcare centres. The BPVS was administered in the first session. The battery of naïve psychology tasks was divided and administered in a randomised order over a further five sessions, each lasting approximately 15 min and spaced one week apart. The same experimenter conducted the testing across all sessions in English. All sessions were video-taped for later coding. After each task, the experimenter took an opportunity to check whether the child was becoming tired or distracted. The only feedback given during the test trials was non-specific praise. To thank them for taking part, children were given stickers after each session.

Materials and Procedure

To ensure cultural relevance, familiarity and age-appropriateness, all materials employed in the current study were first piloted. These materials are shown in

Characteristic	UK cohort (*n*=43)	Singapore cohort (*n*=44)
Birth order		
Firstborn	26 (60.5%)	23 (52.3%)
Secondborn	12 (27.9%)	14 (31.8%)
Thirdborn	3 (7.0%)	5 (11.4%)
Fourthborn	2 (4.7%)	2 (4.5%)
Number of siblings		
None	20 (46.5%)	18 (40.9%)
One	18 (41.9%)	17 (38.6%)
Two	2 (4.7%)	6 (13.6%)
Three or more	3 (7.0%)	3 (6.8%)
Paternal education		
No formal qualification	–	3 (6.8%)
O-Levels/GCSE or equivalent	1 (2.3%)	15 (34.1%)
A-Levels/Higher education	1 (2.3%)	5 (11.4%)
College qualification or equivalent	8 (18.6%)	5 (11.4%)
University degree	12 (27.9%)	9 (20.5%)
Postgraduate qualification	10 (23.3%)	1 (2.3%)
No information available	11 (25.6%)	6 (13.6%)
Maternal education		
No formal qualification	–	4 (9.1%)
O-Levels/GCSE or equivalent	–	10 (22.7%)
A-Levels/Higher education	4 (9.3%)	6 (13.6%)
College qualification or equivalent	2 (4.7%)	6 (13.6%)
University degree	18 (41.9%)	10 (22.7%)
Postgraduate qualification	9 (20.9%)	1 (2.3%)
No information available	10 (23.3%)	7 (15.9%)
Paternal working status		
Full-time	41 (95.3%)	42 (95.5%)
Part-time	1 (2.3%)	–
Unemployed/Retired	1 (2.3%)	1 (2.3%)
No information available	–	1 (2.3%)

Table 2 (*cont.*)

Characteristic	UK cohort (*n*=43)	Singapore cohort (*n*=44)
Maternal working status		
Full-time	11 (25.7%)	36 (81.8%)
Part-time	28 (65.1%)	2 (4.5%)
Unemployed/Retired	1 (2.3%)	3 (6.8%)
No information available	3 (7.0%)	3 (6.8%)
Ethnic groups		
Asian Chinese	–	31 (70.5%)
Asian Indian	2 (4.7%)	4 (9.1%)
Asian Malay	–	9 (20.5%)
Caucasian	41 (95.3%)	–
Number of preschool hours per week		
M (SD)	25.05 (9.44)	46.64 (12.17)
Range	9–50	15–60
Number of hours cared for by non-parent caregivers per week		
M (SD)	5.13 (2.75)	30.13 (18.07)
Range	2–9	4–70

Figs 1 and 2. The battery of tasks was selected to ensure that the full range of children's naïve psychology could be assessed. This study is the first phase of a 2-year longitudinal study, so representational tasks were included to create consistency across phases of the research.

Battery of Naïve Psychology Tasks

The battery consisted of non-representational and representational tasks. The non-representational tasks included: (1) Attribution of pretend properties; (2) Object substitution; (3) Discrepant desires; (4) Action prediction; (5) Emotion prediction; (6) Level-1 visual perspective-taking; and (7) Pretend transformation and mental-reality distinction. The representational tasks included: (1) Representational change; (2) False-belief (puppy-lemon); (3) Appearance-reality; (4) False-belief (hat-pen); and (5) Level-2 visual perspective-taking. In order to familiarise the child with the testing environment, warm-up trials were conducted at the beginning of each task.

(1) and (2)

(5)

(3)

(6)

(4)

(7)

Figure 1. Stimuli used for non-representational tasks. 1=Attribution of pretend properties; 2=Object substitution; 3=Discrepant Desires; 4=Action prediction; 5=Emotion prediction; 6=Level-1 visual perspective-taking; 7=Pretend transformation and mental-reality distinction.

(1) and (2)

(3) and (4)

(5)

Figure 2. Stimuli used for representational tasks. 1=Representational change; 2=False-belief (puppy-lemon); 3=False-belief (hat-pen); 4=Appearance-reality; 5=Level-2 visual perspective-taking.

Non-representational Tasks

(1) Attribution of pretend properties (Harris and Kavanaugh, 1993). This task consisted of two trials assessing children's ability to follow and comprehend the sequence of the pretend scenarios. Children were asked to pour imaginary cereal into two bowls. The experimenter then introduced characters from Pooh Bear and the Hundred Acre Wood Gang: Pooh Bear, Tigger, Eeyore and Piglet. One of the two key props was subjected to a pretend transformation (e.g., Piglet ate all the imaginary cereal in one bowl). The children were then asked to feed Eeyore some cereal. In the second trial, Pooh Bear drank all the imaginary tea in one cup and the children were then asked to feed Tigger some tea. They were scored as correct if they fed Eeyore and Tigger from the bowl and cup which were "full". Children received a score of 1 for each correct trial.

(2) Object substitution (Harris and Kavanaugh, 1993). This task consisted of a warm-up trial, followed by four experimental trials assessing children's ability to attribute pretend identities to substituted objects. The experimenter placed two separate piles of cubes, six yellow cubes to the right of the child and six blue cubes to the left, on the table within easy reach. In the warm-up trial, the experimenter introduced a Little Bee puppet to the children and announced, "Little Bee is hungry. Let's give him some honey." Next, she pretended to feed a yellow cube to Little Bee while holding the block to its mouth and making "yummy" sounds. Then, the experimenter said, "Little Bee wants some more honey. You feed Little Bee some more honey," and passed the child another yellow cube. After the child fed Little Bee, the experimenter presented Mr Frog and declared, "Mr Froggie is also hungry. He wants some blueberries. Let's give him some blueberries." The experimenter then fed the frog with the blue block and encouraged the child to do the same. In the experimental trials the experimenter asked the children to feed honey to Pooh Bear and Piglet, and blueberries to Tigger and Eeyore. Children received a score of 1 for each correct trial.

(3) Discrepant desires (Repacholi and Gopnik, 1997; Slaughter et al., 2002). Children were presented with two illustrated story trials in which a boy and a girl puppets' favourite foods were relatively unappetising raw vegetables (celery and broccoli). Each vegetable was presented alongside an appetising food (biscuit and chocolate). The experimenter enacted the role of the puppet looking at the food and making a facial expression of disgust while saying a long "Eeew, I don't like to eat biscuits" in reference to the more appetising food. Then, she smiled and expressed pleasure with a long, "Mmmm, yummy, I like to eat celery" in reference to the raw vegetables. The children were asked to differentiate which of the two foods to give to the puppet. Memory (puppet's favourite food) and control (children's favourite food and the food they would

want to eat) questions were asked to ensure that the children were not simply reporting their own mental states. Children received a score of 1 if their offer corresponded to the puppet's preference and if they answered all memory and control questions correctly. Following the procedures of Slaughter et al. (2002), the scores of those children who did not report a preference that was in conflict with the characters for both trials were dropped from the analysis.

(4) Action prediction (Wellman and Woolley, 1990). This task involved three trials in which children were asked to make judgement about the actions of puppet characters who were seeking out objects to take to a final destination. In the Finds-Wanted situation, the puppet wanted something (a cat) that might be in one of two locations and they searched and found it. In the Finds-Nothing situation, the puppet searched for a skateboard but found nothing. In the Finds-Substitution situation, the puppet searched for a horse, but found an appealing object (a cat) that was not what they wanted. The puppets' reasons for wanting to find the objects were explained to the children. For each trial story the children were told that the puppet had searched the first location and then asked to indicate whether the puppet would look in the second hiding location or in the final destination. Children received a score of 1 for either pointing or naming the correct location in each trial.

(5) Emotion prediction (Wellman and Woolley, 1990). This consisted of three trials in which children were asked to make judgements about the emotional reactions of puppet characters in three types of situation similar to those described in the action prediction task. Children were asked to state the feelings of the puppets either verbally or point to the cut-outs of a happy or a sad face. Children received a score of 1 for either pointing or naming the correct emotion for each situation.

(6) Level-1 visual perspective-taking (Flavell et al., 1981). The child and the experimenter sat on opposite sides of a table for both trials of this task. Children were shown drawings of a bear (Pooh Bear) and a dog (Scooby-Doo) on either side of a poster stand. They were asked to indicate which drawing they and the experimenter could see. The child and the experimenter then changed seats so that they could see the other drawing. Children were then asked to report their new perception and the initial state. They received a score of 1 for correctly answering both their own perception and other's perception questions and another point for giving correct responses to both the post-transformation perception and initial state questions.

(7) Pretend transformation and mental-reality distinction (Harris et al., 1994, Experiment 3). Children were presented with two pretend trials with puppets carrying out two successive but related actions (e.g., Piglet is eating imaginary ice-cream from a container and Pooh Bear pushes him into the container).

Five questions were asked in each trial to ascertain: (a) the pretend identity of the substitute object; (b) the pretend consequences of the puppet's action; (c) the pretend outcome for the puppet; (d) whether the object is pretend or real; and (e) the true identity of the pretend object. Children received a score of 1 for each correct answer, providing a total possible score of 10 across the two trials.

Representational tasks

The inclusion of this battery of tasks that tap representational understanding of mental states allows us to follow changing competence in children's naïve psychology in our longitudinal study.

(1) Representational change (Flavell et al., 1986). This task consisted of two trials. In the first trial, children were shown a yellow lemon that appeared green behind a green filter. In the second trial, they were shown a white toy dog that appeared red behind a red filter. They were asked to select the apparent and real colours of the stimulus from three colour cards depicting the real, apparent and an unrelated colour. A third colour option was included to reduce the possibility that the children might have used a matching strategy to simply select the remaining colour because they have already chosen the other option. Children received a score of 1 on each trial for correctly answering both the apparent and real questions.

   (2) False-belief (puppy-lemon). In the representational change task described above, false-belief questions were administered to assess children's understanding of another person's false-belief about the objects. Children were asked to state what their friend would think the objects' colours were before they uncovered the objects from behind the filters. Children received 1 point in each trial if they correctly responded to the false-belief and reality questions.

   (3) Appearance-reality identity (Flavell et al., 1983). This task assessed children's understanding of the distinction between what an object looked like (appearance) and what it actually was (reality). There were two separate trials in which children were shown an object that had a misleading appearance involving discrepancy between its actual and apparent identity (i.e., a hat that looked like a birthday cake and a wooden pen that looked like a fish). Children received a score of 1 in each trial for correctly answering both appearance and reality questions.

   (4) False-belief (hat-pen). In the appearance-reality task described above, false-belief questions were asked to assess children's understanding of another person's false-belief about the objects. Children were asked what their friend,

who had not touched the objects, would think the objects were before they played with them. Children received 1 point in each trial for correct responses to both the false-belief and reality questions.

(5) *Level-2 visual perspective-taking* (Flavell et al., 1981). The child and the experimenter sat on opposite sides of a table. Children were initially shown a 2-dimensional drawing of a turtle and asked to identify how it looked from their perspective and from the experimenter's viewpoint. The child and the experimenter then changed seats so that they could see the turtle from the opposite viewpoint. Children were then asked to report their new perception and the initial state. They received a score of 1 for correctly answering both their own perception and other's perception questions and another point for giving correct responses to both the post-transformation perception and initial state questions.

Analysis

Two trials were administered in most of the tasks, except for object substitution, pretend transformation and mental-reality distinction, action prediction and emotion prediction tasks. Following the procedures of Gopnik and Astington (1988) to create a comparable scale on all the measures, the object substitution scores were transformed by multiplying each score by 0.5, the pretend transformation and mental-reality distinction scores by 0.2, the action prediction scores and the emotion prediction scores by 0.6667. Due to illness, two children in the Singapore cohort did not complete all tasks so the numbers of children examined in individual analyses sometimes varies.

Results

The results are divided into three sections. Firstly, we compare both cohorts on all the naïve psychology tasks (non-representational and representational) to determine whether there are any cross-cultural similarities and differences. Secondly, we present data on the performance sequences on naïve psychology tasks in the two cultures. Finally, the coherence of concepts is examined in the two cultures.

Cross-cultural Task Comparisons

Mean scores for each of the non-representational tasks are shown in Table 3 and Fig. 3. A two-way 2 (culture)×7 (task) mixed-model analyses of variance

Table 3

Results comparing performance of naïve psychology tasks (M (SD)) between UK and Singapore cohorts

Mental states measure	UK cohort (*n*=43)	Singapore cohort (*n*=44)
Non-representational tasks		
(1) Attribution of pretend properties	1.65 (0.65)	1.80 (0.51)
(2) Object substitution	1.55 (0.52)	1.60 (0.48)
(3) Discrepant desire	1.24 (0.85)	1.56 (0.71)
(4) Action prediction	1.22 (0.68)	0.92 (0.63)
(5) Emotion prediction	1.13 (0.68)	1.27 (0.59)
(6) Level-1 visual perspective-taking	1.00 (0.76)	.93 (0.79)
(7) Pretend transformation and mental-reality distinction	0.92 (0.49)	.94 (0.41)
Representational tasks		
(1) Representational change (puppy-lemon)	0.53 (0.70)	0.57 (0.80)
(2) False-belief (puppy-lemon)	0.44 (0.63)	0.52 (0.80)
(3) Appearance-reality (hat-pen)	0.40 (0.62)	0.48 (0.63)
(4) False-belief (hat-pen)	0.44 (0.67)	0.40 (0.54)
(5) Level-2 visual perspective-taking	0.26 (0.54)	0.29 (0.64)

(ANOVA) was used to compare task performance between the two cultures on the non-representational tasks. There was no significant effect of culture, a significant effect of task (F(6, 486)=20.92, P=0.01, η^2=0.21) and no significant culture by task interaction. We next examined whether there was any impact of chronological age (CA) on the task performance. With CA as a covariate, the results showed no significant effect of culture, a significant effect of task (F(6, 474)=3.09, P<0.01, η^2=0.04), a significant culture by task interaction (F(6, 474)=2.25, P<0.05, η^2=0.03) and a significant CA by task interaction (F(6, 474)=2.24, P<0.05, η^2=0.03). These results show that although the children as a whole scored significantly higher in some of the non-representational tasks than others, there were no gross significant differences between the UK and Singapore cohorts on non-representational task performance. However, significant within-culture variations in task performance were found when CA was taken into account. Given the variety of different tasks in the battery and the fact that the previous literature suggests
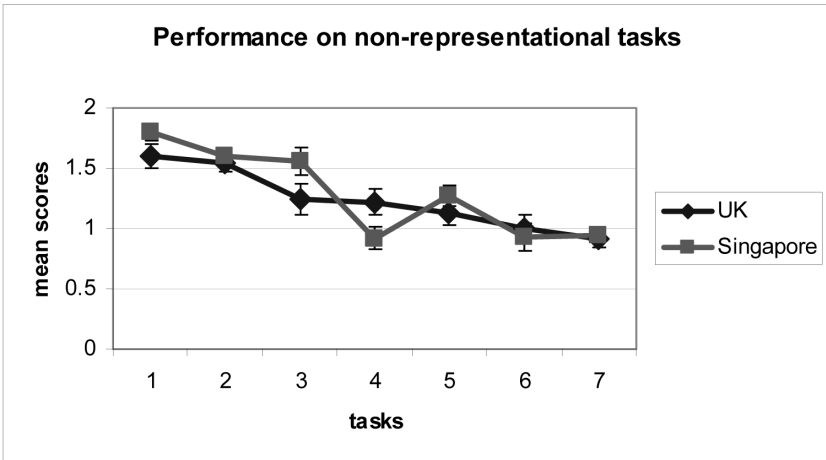
Figure 3. Performance on non-representational tasks of UK and Singapore cohorts. 1=Attribution of pretend properties; 2=Object substitution; 3=Discrepant Desires; 4=Action prediction; 5=Emotion prediction; 6=Level-1 visual perspective-taking; 7=Pretend transformation and mental-reality distinction.

that cross-cultural differences often appear at a relatively subtle level, further exploratory analyses were conducted to compare task performance between the two cultures on each of the individual non-representational tasks.

One-way between-group (UK and Singapore) ANCOVAs were used, again with CA entered as a covariate. The results revealed statistically significant differences on two tasks: discrepant desires ($F(1, 80)=3.98$, $P<0.05$, $\eta^2=0.05$) and action prediction ($F(1, 84)=5.34$, $P<0.05$, $\eta^2=0.06$). The mean scores for the discrepant desires task indicated that the Singapore cohort scored significantly higher ($M=1.56$, SD=0.71) than the UK cohort ($M=1.24$, SD=0.85) (Bonferroni corrected post-hoc comparison, $P<0.05$). On the other hand, mean scores indicated that the UK cohort scored significantly higher on action prediction ($M=1.22$, SD=0.68) than the Singapore cohort ($M=0.92$, $SD=0.63$) (Bonferroni corrected post-hoc comparison, $P<0.05$).

Separate two-way 1 (demographic variable)×7 (task) mixed-model ANOVAs were conducted to examine the effect of each demographic factor on task performance for each cohort. The results indicate that birth order, number of siblings, ethnic groups, parents' education, number of languages used and preschool programs (full-time or part-time) showed no effect on task performance.

Mean scores for each of the representational tasks are shown in Table 3 and Fig. 4. A two-way 2 (culture)×5 (task) mixed-model ANOVA was used to compare task performance between the two cultures on the representational
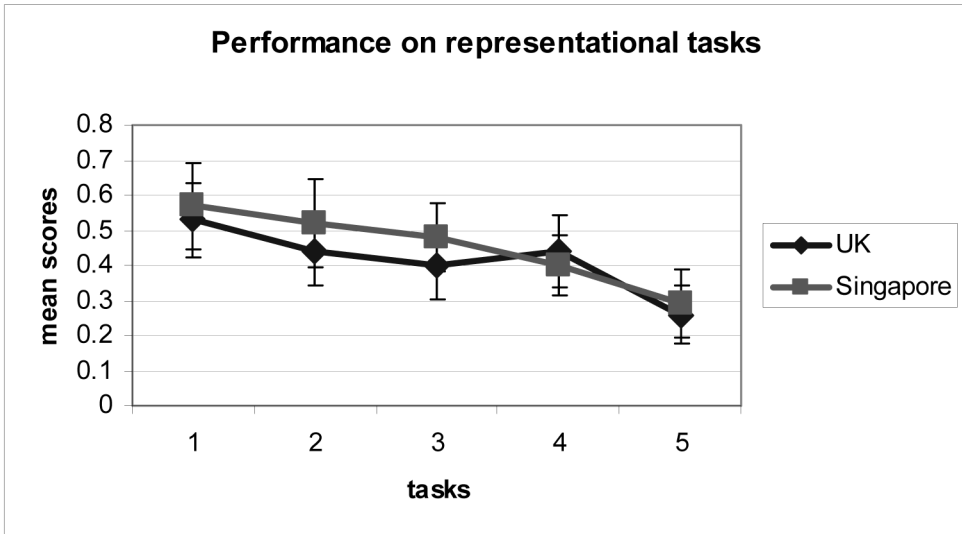
Figure 4. Performance on representational tasks of UK and Singapore cohorts. 1=Representational change; 2=False-belief (puppy-lemon); 3=False-belief (hat-pen); 4=Appearance-reality; 5=Level-2 visual perspective-taking.

tasks. The results showed no significant effect of culture, a significant effect of task ($F(4, 332)$=2.68, P<0.05, η^2=0.03) and no significant culture by task interaction. We next examined whether there was any impact of CA on the task performance. With CA as a covariate, there was no significant effect of culture or task and no significant culture by task and CA by task interactions.

Separate two-way 1 (demographic variable)×5 (task) mixed-model ANOVAs were conducted to examine the effect of each demographic factor on task performance for each cohort. The results indicate that birth order, number of siblings, ethnic groups, parents' education, number of languages used and preschool programs showed no effect on task performance.

Cross-cultural Comparisons of Task Performance Sequences

As shown in Table 3 and the non-representational task analyses above, the children achieved significantly higher scores in some of the seven non-representational tasks than others. This suggests that children acquire the conceptual understanding required to pass the different tasks at slightly different ages. Table 3 shows that, for children from both cultures, the attribution of pretend properties task was the easiest task, followed by the object

substitution task, then the discrepant desires task. The order of difficulty for the remaining four tasks differed for the two cultures. As the earlier analysis shows, however, these slight differences between the two cultures in order of task difficulty were not significant.

In terms of the representational tasks, Table 3 shows that there was an almost identical sequence of performance for the two cohorts. The order from the easiest to most difficult representational tasks for the UK cohort was: representational change, false-belief (puppy-lemon), false-belief (hat-pen), appearance-reality and level-2 visual perceptive-taking. The sequence is statistically similar for the Singapore cohort.

Another issue of interest is whether non-representational tasks were easier for the children than the representational ones. A two-way 2 (culture)×2 (task type) mixed-model ANOVA was used to compare non-representational and representational task performance between the two cultures. This showed a significant effect of task type ($F(1, 81)=329.11$, $P<0.001$, $\eta^2=0.80$) but no significant effect of culture or task by culture interaction. This significant effect of task type remained when CA was entered as a covariate. Overall, children in both cohorts scored significantly higher on the non-representational tasks ($M=1.27$, SD=0.30) than on the representational tasks ($M=0.43$, SD=0.40). For instance, paired-samples t-tests indicated that the children received significantly higher level-1 compared to level-2 visual perspective-taking scores ($t(42)=5.58$, $P<0.01$ and $t(41)=4.41$, $P<0.01$) for the UK and Singapore cohorts respectively. Their discrepant desires scores were also significantly better than appearance-reality scores ($t(41)=5.22$, $P<0.01$ and $t(40)=7.91$, $P<0.01$) for the UK and Singapore cohorts, respectively.

Cross-cultural Comparisons of Coherence in Task Performance

Another approach to investigating the relationship between tasks within cohorts is to look at correlations between the tasks. Several significant correlations were found among the measures after CA was taken into account. For the UK cohort, their attribution of pretend properties scores were significantly correlated with discrepant desires ($r(39)=0.42$, $P<0.01$). Their appearance-reality scores correlated significantly with false-belief (hat-pen) trial ($r(39)=0.75$, $P<0.01$).

A larger number of correlations were found for the Singapore cohort. Singaporean children's understanding of object substitution was significantly correlated to attribution of pretend properties, action prediction and representational change ($r(38)=0.38$, $P<0.05$, $r(38)=0.38$, $P<0.05$, $r(38)=0.34$, $P<0.05$), respectively. Emotion prediction scores were significantly correlated with discrepant desires scores ($r(38)=0.34$, $P<0.05$). Representational change

was significantly correlated with discrepant desires ($r(38)$=0.32, P<0.05). False-belief (puppy-lemon) scores were significantly correlated to level-1 visual perspective and representational change (r=0.35, P<0.05 and r=0.68, P<0.01, respectively). Lastly, appearance-reality scores were also significantly correlated with false-belief (hat-pen) scores (r=0.60, P<0.01).

The correlation patterns were supported by Cronbach's alphas indicating that the internal consistency for the seven non-representational tasks was higher for the Singapore compared to the UK cohorts (UK cohort: Cronbach's α=0.32 and Singapore cohort: Cronbach's α=0.52). Similar results were found for the five representational tasks (UK cohort: Cronbach's α=0.42 and Singapore cohort: Cronbach's α=0.68). It is noted that these values do not take into account differences in CA.

Discussion

Cross-cultural Similarities between UK and Singapore

The results show no gross cross-cultural differences in the development of naive psychology between UK and Singapore preschoolers. This is in agreement with Wellman et al. (2006) who revealed a common sequence of understanding of mental states across cultures. The findings also support Liu et al.'s (2008) meta-analysis that demonstrated a universal development of false-belief understanding from below- to above-chance performance of children in Hong Kong, a hybrid culture similar to Singapore.

In line with previous findings in Western cultures (e.g., Flavell et al., 1981; Wellman and Woolley, 1990; Harris and Kavanaugh, 1993; Repacholi and Gopnik, 1997), our findings show that by the age of 2 years, children's naïve psychology remains largely non-representational. Children develop a rudimentary understanding of four key aspects of naïve psychology, namely pretence, desires, emotions and perceptions. This pattern could be interpreted as a consequence of two distinct developmental stages suggested by Perner (1991), whereby 2-year-old children have simple conceptions of pretence, desires, emotions, perception and beliefs without understanding these mental states as representations. Only around 4 years of age, do children acquire a representational naïve psychology when they recognise mental states as representational and not simply as true state of affairs. Wellman (1990) also suggests two distinct shifts in theory formation: at 2 years of age, children acquire a 'simple desire psychology' and at 4 years of age when children acquire a 'belief-desire psychology', they understand that people's actions and behaviour are guided by their desires, thoughts and beliefs. Furthermore, the significant correlations

among the non-representational and among the representational mental states fit with Slaughter and Gopnik's (1996) suggestion that children's naïve psychology is a coherent system of interrelated concepts. The Theory Theory proposes that the cognitive path might be expected to converge at the same time for children, who begin with the same initial theory and undergo the same theory-formation processes (Gopnik, 2003).

A key issue is to identify commonalities between the cultures that might lead to similar developmental trends in naïve psychology task performance despite the apparent cultural differences. Children in both the UK and Singapore cohorts spoke English as their first language and the cohorts were matched in terms of birth order and family size. The two cultures did differ, though, in terms of number of languages used and average number of hours spent in preschools. From a young age, children in the Singapore cohort learn to switch between different languages when conversing with different adults. Frequent language switching and mixing are also observed in these bilingual children's conversations with peers during play and daily interaction. Research has shown the bilingual advantage on naïve psychology task performance of 3- to 4-year-old children (e.g., Goetz, 2003) so it is somewhat surprising that no large cultural differences were found in the present study. The fact that the number of languages used was not related to task performance suggested that children's understanding of naïve psychology concepts depends not only on linguistic abilities (Jenkins and Astington, 1996). Alternatively, it could be that bilingual benefits do not confer a more enhanced naïve psychology (Bialystok and Senman, 2004) or that they become evident.

Subtle Differences between UK and Singapore

The results showing no cultural differences in representational tasks are consistent with studies conducted in both the West (e.g., Wellman et al., 2001) and the East (e.g., Flavell et al., 1983b). However, there is some evidence of subtle differences in non-representational naïve psychology task performance. While the UK cohort performed significantly better on the action prediction task, the Singapore cohort achieved significantly better scores on the discrepant desires task. Both tasks assessed children's understanding of desires. In the action prediction task, children were asked to predict a puppet's action on the basis of the puppet's desires, while the discrepant desire task examined children's understanding of subjective desires by choosing between a desired and an undesired food. It is plausible that the Singapore cohort performed better on the discrepant task because they employed emotion-based experience to explain desires, as shown by the significant correlations between their emotion

prediction and discrepant desires scores, which was not found in the UK cohort. This result demonstrates that Singaporean children's understanding of conflicting desires might be confined to the notion that certain emotional expressions correspond to subjective desires. As highlighted by Perner et al. (2005), understanding the nature of subjectivity does not require an understanding of another person's viewpoint so the Singapore cohort might have selected the unappetising vegetables for the puppet based on their objective assessment that this food tasted good in the puppet's mouth. While the Singapore cohort developed a better understanding of subjective desires, their understanding that our motives for action is guided by our desires was still rudimentary. This finding is consistent with Meltzoff et al.'s (1999) explanation that children's understanding of directedness of mental states (i.e., different emotional expressions are directed at different objects), need not be identified with one's actions. Cross-cultural studies between the United States and China (e.g., Wang and Leichtman, 2000; Wang, 2001) have suggested that compared to American children, Chinese children made more references to the emotional states of other people suggesting that children in the two cultures differ in the degree to which they express empathy with respect to their cultural values and socialisation practices. While Western children are encouraged to be self-expressive and independent, Asian children are taught to be more sensitive about other people's feelings. Through a growing emphasis on other's emotional states in their everyday social interaction with peers and adults, the Singapore cohort in the present study may have developed a better appreciation of the subjective nature of desires. These daily interactions shape how children from different cultures acquire various aspects of naïve psychology, thus contributing to the subtle variations in task performance.

There were also cross-cultural differences in the coherence of task performance. Compared with the UK cohort, the Singapore cohort's performance was more consistent and interrelated for both non-representational and the representational tasks. This cultural difference suggests that for the Singapore cohort, the related mental states are closely integrated such that understanding of one mental state shapes the development of another mental state and that these mental states form together as a cohesive set of concepts. This pattern of results accords with the preschool curriculum guidelines set by the Singapore Ministry of Education, which focus on the integration of knowledge and skills across different subject areas in order to facilitate concept development and promotion of Asian values and national identity (Sharpe, 2000). The incorporation of interdisciplinary activities in the curriculum helps Singaporean children to understand how skills are linked together and

can be applied from one context to another (Singapore Ministry of Education, 2003). This highlights the need to consider the cultural context in order to investigate whether both cohorts will undergo a different process and whether they will reach the same goal at the same time. The correlations among the non-representational and representational mental state concepts suggest that it is possible that the non-representational skills have a role in subsequent understanding of representational mental states.

Limitations and Future Research

The results of this study must be considered in light of a few limitations. One limitation is that task performance might be influenced by the suitability and appropriateness of the task materials used. However, careful attempts were made to ensure that the materials were culturally relevant, familiar and age-appropriate for both cultures. Another limitation is that naïve psychology is a Western concept and the standard tasks were devised by scientists in the West: it is possible that these tasks may not draw on Eastern children's true abilities of understanding of mental states. While some cross-cultural studies (e.g., Avis and Harris, 1991) have taken cultural differences into consideration by modifying the procedures, we followed the same procedures as previous studies in order to determine whether we could duplicate the same results using the standardised tasks. It is also difficult to design tasks that are equally familiar across the two cultures and may require several pilot tests. Most previous studies conducted in the East employed an experimental approach, using a battery of naïve psychology tasks to examine children's understanding of various mental states. Prior research has shown that children talk about the mind using mental state verbs such as "want", "need", "know", "think" and "remember" (Bretherton and Beeghly, 1982; Shatz et al., 1983; Wellman, 1990; Bartsch and Wellman, 1995) to express desires, feelings, thoughts, knowledge and intentions from 2 years of age. Children acquire sentence forms involving mental state verbs and their complements between 3 and 4 years of age, which occurs simultaneously with children's attainment on standard false-belief tasks (Tager-Flusberg, 1992; Astington and Jenkins, 1999; de Villiers, 2007). Cross-cultural studies would benefit from a more detailed comparative analysis of children's everyday language in naturalistic settings. A final limitation of the present study is that the analysis is based on cross-sectional data. On the basis of the cross-sectional analysis it is not possible to predict how social and culture experiences might impact on the developmental pattern of naïve psychology in the longer term. However, this study is part of a wider longitudinal investigation, including both standardised measures and naturalistic observations of children's play, which may permit fur-

ther insight into how these variables influence children's naïve psychology development over the preschool years.

Conclusions

This paper has highlighted substantial cross-cultural similarities in the development of naïve psychology among 2-year-olds in the UK and Singapore. However, subtle and potentially important cultural differences were identified in performance on two tasks and also in the coherence of naïve psychology concepts. Our data support Wellman et al.'s (2006) point that an account of children's naïve psychology should address both universalities as well as social and cultural differences when examining factors influencing development. Further research is required to explore the impact of social and cultural influences on naïve psychology development during the preschool years.

Acknowledgements

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