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Proceedings of the Annual Meeting of the Cognitive Science Society

Title

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Permalink

<https://escholarship.org/uc/item/517499d2>

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 34(34)

ISSN

1069-7977

Authors

Mizuno, Ai
Koyasu, Masuo

Publication Date

2012

Peer reviewed

Children's understanding of hidden emotion, theory of mind, and peer relationship

Ai Mizokawa (aimizokawa@gmail.com)

Department of Psychology, Meiji Gakuin University
1-2-37 Shirokanedai, Minato-ku, Tokyo 108-8636 Japan

Masuo Koyasu (hgb03675@nifty.com)

Graduate School of Education, Kyoto University,
Yoshida-honmachi, Sakyo-ku, Kyoto 606-8501 Japan

Abstract

This study investigated correlations between understanding of hidden emotion and theory of mind. Five- and six-year-old children ($N = 105$, 48 boys and 57 girls) took hidden emotion tasks (TEC component 7), first- and second-order false belief tasks, and a vocabulary test. Teachers rated the children's social interactions in terms of peer relationships. Individual differences in children's understanding of first- and second-order false belief and understanding of hidden negative emotion were associated with differences in language ability. Individual differences in understanding of first-order false belief and understanding of hidden negative emotion were correlated, and this association remained after controlling age and language ability. The results also showed that children who were more advanced in understanding of first-order false belief are more likely to have fewer peer problems. These findings were discussed in terms of social and cognitive development.

Keywords: young children; hidden emotion; theory of mind; peer relationship.

Introduction

Over the past 30 years, researchers have demonstrated that children's ability to understand mental states (desires, thoughts, belief, and emotions) develops throughout their childhood (Astington, Harris, & Olson, 1988; Pons, Harris, & de Rosnay, 2004). One such ability, theory of mind, which is narrowly defined as the understanding of other's mind, such as false belief, dramatically develops between the ages of 3 and 6 (see Wellman, Cross, & Watson, 2001), while there exist some cultural differences. For example, several studies have shown that Japanese children lag significantly behind American and British children on false belief tasks (Hughes, Ensor, Allen, Devine, De Rosnay, Koyasu, Mizokawa, & Lecce, 2011; Lewis, Koyasu, Oh, Ogawa, Short, & Huang, 2009; Naito & Koyama, 2006). Another important element of social competence, understanding of hidden emotion (Saarni, 1979, 1999), also emerges during the preschool period, between the ages of 4 and 6 (Gross & Harris, 1988; Harris, Donnelly, Guz, & Pitt-Watson, 1986). It has been found that there are no differences in age in regards to understanding of hidden emotion between American, British, and Japanese children (Gardner, Harris, Ohmoto & Hamazaki, 1988).

Children's theory of mind ability is traditionally measured by their performance in false belief tasks. The first-order false belief task measures children's ability to

attribute a first-order false belief to a story character (e.g., a mistaken belief about an object's identity or location). Most children pass the first-order false belief task by the ages 6 (Perner, 1991; Wimmer & Perner, 1983). They then pass the second-order false belief task between the ages of 6 and 9 (Perner & Wimmer, 1985). The second-order false belief task measures children's ability to attribute a second-order false belief (i.e. a mistaken belief about a belief) to a story character. Recently, a less demanding second-order false belief task has been created, making it easier to understand for young children (cf. Sullivan, Zaitchik, & Tager-Flusberg, 1994).

To measure children's understanding of emotion, including hidden emotion, Test of Emotion Comprehension (TEC; Pons & Harris, 2000) has been widely used for over the past 10 years. The TEC is an extensive measure of emotion comprehension, which evaluates nine components of emotion understanding. Component 7 assesses whether children understand that one can hide an underlying, or true, emotional state. Pons et al. (2004) found that 50% of 5-year-olds and 65% of 7-year-olds were able to distinguish expressed emotion from actual, felt (hidden) emotion, while only 5% of the 3-year-olds were able to understand the hidden emotion. The hidden emotion tasks include both hidden negative emotion tasks, where the protagonist is motivated to hide inner negative emotion, and hidden positive emotion tasks, where the protagonist is motivated to hide inner positive emotion. To distinguish between expressed apparent emotion and hidden inner emotion, it is necessary to identify the actual emotion and to keep it distinct from the apparent emotion. This ability is also required in false belief tasks. For example, in the unexpected displacement task, which is one of the most popular false belief tasks, participants have to retain the original placement of an object in their mind as well as its present location. In this light, the cognitive ability to understand incongruence between apparent and hidden emotion may relate to the understanding of others' false belief that is not based on reality.

Banerjee and Yuill (1999) addressed 4- to 6-year-old children's understanding of false emotion (hidden negative emotion: hiding inner negative emotion and expressing apparent happiness or neutral emotion) with self-presentational and prosocial motivation, and its association with second-order mental state understanding. They found that only an appreciation of self-presentational false

emotional expression was associated with children's performance on the second-order false belief task. Mizokawa and Koyasu (2007) revealed the association between 4- to 6-year-olds' understanding of pretend crying (hidden positive emotion: hiding inner positive emotion and expressing apparent sadness) and performance of both first- and second-order false belief tasks. These associations between understanding of hidden emotion and development of theory of mind stem from the nature of emotion hiding, which includes the potential that the person who looked at the false emotional expressions would be deceived and adopt a false belief.

As noted above, TEC component 7 assesses children's understanding of the fact that one can hide an inner emotional state. Although this component has been used as a unific index of understanding of hidden emotion, it seems that the tasks in component 7 include some different aspects of mental state understanding. One salient feature is that this component is made up of two hidden positive and two negative emotion stories. Note that there are some findings demonstrating that the expressers' motivation to hide emotion affects children's performance in understanding of hidden emotion (cf. Banerjee & Yuill, 1999; Mizokawa, 2007). However, the protagonist's motivation to hide inner emotion is not clearly specified in each task of TEC component 7.

Previous research suggests that understanding hidden positive emotion (i.e. revealing negative or neutral emotion when one actually has positive emotion) is more difficult for children than understanding hidden negative emotion (i.e. revealing positive or neutral emotion when one actually has negative emotion) (Mizokawa, 2007). That may be because, in some social situations such as receiving unwanted gifts (Saarni, 1979), parents want and instruct their children to mask their negative emotion and express positive emotion to protect another's (i.e. the sender's) feelings. Thus, hiding negative emotion would be internalized through such socialization processes in their early life. Meanwhile, children are rarely "taught" in society to hide their positive emotion as not to hurt others feelings (e.g., it is not appropriate to celebrate too much when one wins a game and another loses the game). Moreover, the expression of positive emotion is likely to be considered as generally "good" and "desirable" in the sense of strengthening social bonds. Children are rarely asked to inhibit or hide positive emotion except in special social situations, such as funerals. So, it may be relatively difficult for children to guess or infer the motivation for hiding positive emotion because they do not have much experience in hiding positive emotion by themselves or being taught to hide positive emotion. From this perspective, children understand hidden negative emotion (i.e. the discrepancy between hidden negative emotion and expressed positive or neutral emotion) somewhat automatically, that is, they can understand that people hide negative emotion without consciously thinking about the effect that others' emotional expressions have on recipients' mental states, what the recipient of the apparent

emotional expression feel, or whether the recipient has a false belief about expresser's actual emotion after witnessing the apparent emotion. They simply need to identify the inner emotion and to keep it distinct from the apparent expressed emotion. After witnessing hidden positive emotion, on the other hand, they might need to think more deeply and make guesses about what is going on in the expresser's and the recipient's mind. We expected that there would be different associations between understanding of hidden emotion and development of theory of mind according to positive-negative valence of emotion. To address these issues, we tested links between young children's understanding of false belief, and hidden positive and negative emotion individually.

In the present study, we also explored the relationship between mental state understanding (first- and second-order false belief and hidden emotion) and peer relations. It has been shown that the development of theory of mind is central to successful social interactions. Some studies have shown that the development of theory of mind is related to important aspects of children's social interactions (cf. Astington & Jenkins, 1995; Dunn & Cutting, 1999; Walker, 2005). As for emotion understanding, it has been revealed that children with greater emotion knowledge demonstrate more empathic and prosocial behaviors and popularity with peers (cf. Cassidy, Parke, Butkovsky, & Braungart, 1992; Denham, 1986; Garner, 1996; Walden & Field, 1990). However, there is little research addressing the link between understanding of hidden emotion and social interaction. We tested the association of individual measures of mental state understanding (first- and second-order false beliefs, hidden positive emotion, and hidden negative emotion) to peer problems. We hypothesized that children's theory of mind and their ability to understand hidden positive emotion would be negatively related to peer problems.

Overall, in the present study, we tested the difference between children's understanding of hidden positive emotion and understanding of hidden negative emotion, the association between hidden emotion and first- and second-order false belief understanding, and association between these mental state understandings and rated peer problems.

Method

Participants

One hundred and five Japanese children (48 boys and 57 girls, mean age = 6:1) and twelve teachers (11 women and one man) participated in this study. All were native Japanese speakers.

Materials and Procedures

Tasks for children were administered individually by the experimenter (the first author) at their school in a quiet room. These children were also examined in a cross-cultural study by Hughes et al. (2011). The children's homeroom teachers rated each child's social interactions in terms of

peer relationships. The order of study tasks for children was counterbalanced across the participants.

PVT-R The children's language ability was assessed using PVT-R (Ueno et al., 2008), which requires them to select the picture named by the experimenter from an array of four pictures.

False belief tasks The children's understanding of first- and second-order false belief was assessed via four stories (cf. Hughes, Adlam, Happe, Jackson, Taylor, & Caspi, 2000). These included two first-order false belief tasks (Harris, Johnson, Hutton, Andrews, & Cooke, 1989), and two second-order false belief tasks (Sullivan et al., 1994).

In the first-order false belief tasks, participants were shown puppet-based stories that involved a nice surprise story and a nasty surprise story, and were required to answer the protagonist's first-order false belief question, a reality question, and control questions.

Following is an example of a story and questions used in the first-order false belief task (a nice surprise story): *I'm going to tell you a little story about Monty and his lunch box. Look, here's Monty. He wants Freddie to put an apple in his lunch box to take to school. But Freddie says there are no apples left, so he'll have to take a pear instead. Monty doesn't like pears at all. He really wanted an apple! He's so cross about the pear that he stamps all the way upstairs. [Q1 (control 1): How does Monty feel when he gets a pear? Does he feel happy or not happy?] [Q2 (control 2): How does Monty feel when he gets an apple? Does he feel happy or not happy?] But look, while Monty is out of the kitchen, Freddie finds one apple left in the cupboard. He decides to give Monty a nice surprise, and so takes out the pear, and puts an apple in Monty's lunchbox instead. Then he puts the lunchbox in Monty's bag. Monty comes back, picks up the bag and hurries off to school. So Monty doesn't see what's inside his lunchbox. Now it's lunchtime. Monty takes out his lunchbox. [Q3 (first-order false belief): What does Monty think is in the box, an apple or a pear?] [Q4 (reality): What is in the box really, an apple or a pear?]*

In the second-order false belief tasks, participants were shown picture-based stories and asked to answer first- and second-order false belief questions, a reality question, and memory control questions.

Following is an example of a story and questions used in the second-order false belief task: *This is Peter. Today is his birthday, and Peter's Mum is going to surprise him by giving him a puppy. She has hidden the puppy in the shed until it's time for Peter's birthday party. Peter says "I really hope you've got me a puppy for my birthday, Mum." But remember, Mum wants to surprise Peter. So instead of telling Peter she has got him a puppy, Mum says, "Sorry, I didn't get you a puppy, Peter. Actually, I've got you a really good toy for your birthday." [Q1 (first-order false belief): So, what did Peter think he was getting for his birthday?] [Q2 (reality): What was his Mum giving him really? (If child passes both Q1 and Q2, continue story. If child fails, stop story here.) Now Peter decides to go outside to play.*

On his way out, he goes into the shed to get his bike, and he finds the birthday puppy! Peter says to himself, "Wow! Mum didn't get me a toy, she really got me a puppy for my birthday!" Mum didn't see Peter go to the shed, so she doesn't know he found the birthday puppy. Inside, the telephone rings. It's Peter's Granny, calling to find out what time the party is. Granny says to Mum, "What does Peter think you've got him for his birthday?" [Q3 (second-order false belief): What does Mum say to Granny?] [Q4 (memory control): Did Mum see Peter go into the shed?] [Q5 (memory control): What has Mum really got Peter for his birthday?]

For the two first-order false belief tasks, the children's responses were judged as correct when they answered all the four questions correctly (a first-order false belief question, a reality question, and two control questions). Each of the two second-order false belief tasks included first- and second-order false belief questions, a reality question, and memory control questions. When children passed both a first-order false belief and a reality question, they got 1 point for first-order false belief understanding. When they passed a second-order false belief question and memory questions, they got 1 point for second-order false belief understanding. These tasks yielded two scores: the children's understanding of first-order false belief was indexed by summing the scores across the four tasks (scores ranged from 0 to 4), and their understanding of second-order false belief was indexed by summing the two tasks (scores ranged from 0 to 2).

Hidden emotion tasks The children's comprehension of hidden emotion was assessed by means of the TEC (Pons & Harris, 2000), component 7 (Hiding). The children were read four picture-based stories and asked to attribute an emotion to a character, who was motivated to hide his or her real emotion from another child and express a different emotion. These four stories were made up of two hidden positive emotion stories (hide inner positive emotion and express sad or neutral emotion) and two hidden negative emotion stories (hide inner negative emotion and express happy emotion). In the hidden positive emotion scenario, the story character gets a new bicycle, but he tries to hide how he feels inside in front of his friend, who does not have his own bicycle (positive 1), and the story character wins a game but she tries to hide how she feels inside in front of her friend who loses the game (positive 2). In the hidden negative emotion stories, the story character falls over in front of his friend, and he tries to hide how he feels inside (negative 1), and the story character is teased by her friend and tries to hide how she feels inside (negative 2). In TEC component 7, the children were asked to attribute an emotion to characters in each of the four stories. They were given 1 point if they attributed the appropriate emotion to each story character (ranging from 0-2).

SDQ-Peer Problems subscale Teachers completed a shortened version (in Japanese) of the Strengths and Difficulties Questionnaire (Goodman, 1997) that contained five items. For each item, they rated children's social

interactions using the 3-point Likert scale (not true, somewhat true, or certainly true). The five items were: (1) Rather solitary, tends to play alone; (2) Has at least one good friend; (3) Generally liked by other children; (4) Picked on or bullied by other children; (5) Gets on better with adults than with other children. 'Somewhat true' was scored as 1. 'Not true' was scored as 0 in item 1, 4, and 5, and scored as 2 in item 2 and 3. 'Certainly true' was scored as 2 in item 1, 4, and 5, and scored as 0 in item 2 and 3.

The total score is generated by summing the scores from the five items (scores ranged from 0 to 10). Note that a higher score indicates greater difficulties in the child's peer relationships.

Results

There were no significant gender differences in any of the study measures. Table 1 shows the descriptive statistics for each study measure.

Table 1: Descriptive statistics for all measures

Measure	<i>M</i>	<i>SD</i>
Age (months)	73.29	3.96
PVT-R	28.87	3.63
HE positive	1.09	0.82
HE negative	1.18	0.83
FB (1st)	2.71	1.36
FB (2nd)	0.57	0.73
Peer problem	1.76	1.87

Note: HE= hidden emotion, FB = false belief.

Hidden Positive Emotion vs. Hidden Negative Emotion

There was no significant difference between the mean scores of hidden positive emotion tasks and hidden negative emotion tasks (*n.s.*).

Association between the Study Measures

Correlation and partial correlation coefficients between the different pairs of measures were calculated. Table 2 shows the correlation coefficients and partial correlation coefficients between language ability (PVT-R score), the hidden positive and negative emotion score, the first- and second-order false belief score, and the peer problem score.

Table 2: Correlation coefficients and partial correlation coefficients between study measures

	1	2	3	4	5	6
1 PVT-R	-	.09	.27**	.52**	.36**	-.15
2 HE positive	-	-	.25*	.08	.13	.11
3 HE negative	-	.23*	-	.32**	.11	-.10
4 FB (1st)	-	.05	.21*	-	.59**	-.24*
5 FB (2nd)	-	-.10	.01	.50**	-	-.11
6 Peer Problem	-	.11	-.08	-.19†	-.08	-

Note: The upper off-diagonal elements represent correlation coefficients, while the lower off-diagonal elements are partial correlation coefficients controlling age, and PVT-R score. ***p* < .01, **p* < .05, †*p* < .10. HE = hidden emotion, FB = false belief.

Language ability and mental state understanding (hidden emotion and false belief) There were significant correlations between language ability (PVT-R score) and the understanding of hidden negative emotion ($r = .27, p < .01$). Children's language ability was clearly related to first- and second-order false belief understanding (first-order: $r = .52, p < .01$; second-order: $r = .36, p < .01$). There was no significant link between language ability and understanding of hidden positive emotion (*n.s.*).

Hidden emotion and false belief There was a significant correlation between understanding of hidden negative emotion and first-order false belief ($r = .32, p < .01$). Significant partial correlations were also found between the dyads when age, and PVT-R score were partialled out ($r = .21, p < .05$). There was no significant link between understanding of hidden positive emotion and understanding of first-order false belief, and between understanding of both positive and negative hidden emotion and understanding of second-order false belief (all: *n.s.*).

Relation of Understanding of Hidden Emotion and False Belief to Peer Problems

Teachers rated 101 of 105 children's social interactions. Thus the data of 101 children-teacher pairs were used for the analysis. As shown in Table 2, there was significant negative correlation between the scores for peer problems and performance in first-order false belief tasks ($r = -.24, p < .05$). Significant partial correlations were also found between the dyads when age, and PVT-R score were partialled out ($r = -.19, p = .05$). That is, the children who were good at understanding other's first-order false beliefs have fewer difficulties in their peer relationships. There was no significant link between the scores for peer problems and any other mental understanding measures (second-order false belief, hidden positive emotion, and hidden negative emotion) (all: *n.s.*).

Discussion

This study investigated differences between children's understandings of hidden positive and hidden negative emotions and examined associations between their understanding of hidden emotions and theory of mind. We also addressed the link between understandings of mental states and peer relationships. Individual differences in children's understandings of hidden negative emotions and first- and second-order false beliefs were clearly associated with differences in language ability. This result supported previous research demonstrating an important role for language in the development of theory of mind (Happé, 1995).

We found no significant differences between the mean scores for hidden positive emotion tasks and hidden negative emotion tasks, but did find a correlation between children's understandings of hidden positive and hidden negative emotions. The result was not consistent with that of a previous study, which reported that understanding hidden

negative emotions was more difficult than understanding hidden positive emotions (Mizokawa, 2007). This inconsistency may be attributable to differences between the tasks used in the previous study and those used in the current study, especially with respect to those used to address hidden positive emotions. In component 7 of the Test of Emotion Comprehension (TEC), each protagonist in the hidden positive emotion tasks had a motivation to “hide” happiness. On the other hand, because Mizokawa’s study focused on fake crying, each protagonist in the hidden positive emotion tasks had a motivation to “hide” happiness and “express” sadness. Given that the expression of negative emotions is generally construed to be undesirable, the TEC hidden positive emotion tasks used here may have been easier than those used in the previous study.

Although we found no significant difference between children’s scores on hidden positive and hidden negative emotion tasks, the two kinds of hidden emotions (positive and negative) differed in their relationships to aspects of theory of mind. However, the direction of this correlation was opposite to our expectation. We found an association between understanding of others’ minds and hidden negative emotions, whereas no significant link between children’s performances on hidden positive emotion tasks and false belief tasks was observed. One possible explanation of the association between these dyads may be that language ability facilitates children’s understanding of both first-order false beliefs and hidden negative emotions. However, this seems unlikely because these associations remained even after controlling for language ability and age. Although we had expected children to think deeply and make guesses about what was going on in the expresser’s and recipient’s minds when in the presence of someone else’s hidden positive emotion, the results revealed the opposite pattern. It is necessary to conduct further investigations into how children use their ability to understand what is going on in others’ minds in hidden emotion tasks to clarify the meaning of this finding.

In terms of children’s social interactions, the data indicated that children who were more advanced in their understanding of first-order false beliefs were more likely to have and be liked by peers. No association was found between understanding hidden emotions and peer problems. Children who understand first-order false beliefs may have more sophisticated communication skills based on their understanding of others’ minds. Interestingly, language ability *per se* was not associated with children’s peer relationships. These findings suggest that the development of theory of mind transforms and/or is transformed by children’s social interaction skills, as Hughes and Leekam argued (Hughes & Leekam, 2004). Moreover, these results also suggest the possibility that training related to understanding first-order false beliefs leads to fewer peer problems (cf. Ozonoff & Miller, 1995; Slaughter, Dennis, & Pritchard, 2002).

The findings of our study also suggest that understanding hidden emotions, as measured by component 7 of the TEC,

is not a unitary concept. That is, understanding hidden positive and hidden negative emotions should be viewed as related but distinct aspects of emotional understanding. In the hidden positive emotion tasks in component 7 of the TEC, children need to think more deeply and make guesses about another’s mind, which differs from the requirements of the hidden negative emotion tasks. We found no relationship between children’s performance on the hidden emotion tasks and their performance on the second-order false belief tasks or between peer problems and performance on the second-order false belief tasks. This may be due to a floor effect in the second-order false belief tasks.

Our study found a relationship between children’s understandings of first-order false beliefs and their understanding of hidden negative emotions. Although these measures are correlated with each other, only the understanding of first-order false beliefs was linked to peer relationships. When we observe children’s communication with peers, we can see that children who are good at understanding how people control emotional expression have complex relationships (e.g., those involving negotiation) with their peers. It may be expected that aspects of social interactions other than peer problems are linked with understanding hidden emotions. Future research is needed to reveal whether and how children’s understandings of mental states such as hidden emotions come to be reflected in their social interactions.

Acknowledgments

This research was supported by a grant from MEXT to Masuo Koyasu (grant 70115658). We would like to express our thanks to the children who participated in this study and their parents and teachers.

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