



## Mind-mindedness in children: Individual differences in internal-state talk in middle childhood

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Children's use of internal-state language during 2 tasks (book narration and describing a best friend) was investigated in a sample ( $N = 38$ ) of 7- to 9-year-olds. Proportional use of internal-state talk on the two tasks was highly positively correlated, a relation that was independent of verbosity, age, verbal ability and the use of non-internal-state language. Theory of mind (ToM) performance, assessed using Happé's (1994) strange stories task, was not related to children's proportional use of internal-state language on either task. We suggest that these cross-task relations provide evidence of individual differences in children's spontaneous use of internal-state language that are independent of their capacities for representing those internal states.

A growing corpus of research findings has documented associations between talk about mental states and children's developing capacities for representing and reasoning with such mental states (for reviews, see Carpendale & Lewis, 2004; Symons, 2004). Research on links between internal-state language and children's theory of mind (ToM) has focused both on how children become exposed to this form of language during family interactions, and on the child's own talk about emotions and mental states. In one early investigation, Dunn, Brown, Slomkowski, Tesla, and Youngblade (1991) reported that families' tendency to talk about feelings and causality when children were aged 33 months was positively related to children's understanding of false belief 7 months later. Ruffman, Slade, and Crowe (2002) argued for a causal link between mothers' use of internal-state language during a picture-describing task and 2- to 4-year-olds' subsequent understanding of mind. Although the vast majority of studies in this area have focused on the preschool years, recent research on maternal mind-mindedness (Meins, 1997) suggests that exposure to internal-state language even in the first year of life is similarly predictive of children's subsequent ToM understanding.

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Meins *et al.* (2002) reported a link between superior ToM performance between 45 and 48 months and maternal mind-mindedness at age 6 months. Mind-mindedness was operationalized as mothers' use of internal-state language to comment appropriately on their infants' putative states of mind and emotion during free-play interactions. Such appropriate mind-related comments can be seen as an index of the mothers' ability accurately to 'read' her infant's internal states (e.g. commenting that the infant is content while quietly playing with a toy, or that the infant is thinking while looking pensive). In contrast, some mothers appear to misread their infants' internal states, and comment inappropriately on their states of mind or emotion (e.g. saying that the infant is upset or bored when the accompanying behaviour indicates no such internal state). Meins, Fernyhough, Fradley, and Tuckey (2001) reported considerable individual differences in mothers' use of appropriate and inappropriate mind-related comments while interacting with their 6-month-olds, with a higher proportional use of appropriate mind-related comments indicating greater mind-mindedness. In subsequent follow-up work, maternal mind-mindedness during the first year of life was found to be a stronger predictor of children's ToM performance than was concurrent mind-mindedness (Meins *et al.*, 2003).

Similarly, children's own use of internal-state language has been considered to be a precursor of later ToM development (e.g. Bretherton & Beeghly, 1982). Dunn *et al.* (1991) found that children's feeling-state talk during interactions with siblings and mothers at 33 months predicted their ToM performance at 40 months. Nielsen and Dissanayake (2000) reported a correlation between 3- and 4-year-olds' use of mental-state language during symbolic play with parents and their concurrent ToM performance. Similar findings were reported by Hughes and Dunn (1998), who investigated how children's internal-state language in conversations with friends related to later and concurrent ToM. Positive correlations were found both concurrently and predictively between amount of internal-state language and ToM performance. Thus, internal-state talk with a range of partners, and not only with caregivers, appears to relate to children's ToM performance. Indeed, children's interactions with caregivers might not give the best indication of their tendency to engage in internal-state talk. For example, Brown, Donelan-McCall, and Dunn (1996) assessed the frequency of conversational turns that included mental state references in interactions between children and their mothers, siblings and friends. The mean mental-state turns per hour ranged from 2.8 turns for child-mother conversations, through 5.1 turns for child-sibling conversations, to 13.4 for conversations between the child and a friend. The findings of this study highlight the potential difficulty of assessing the precise extent to which any particular child tends to use internal-state language in interactional contexts, since many uses of such terms during social interaction are likely to be responses to the social partner's own focus on mind or emotion.

Although a considerable number of studies have investigated associations between use of internal-state talk in interactional contexts and children's later ToM understanding, only two have addressed links between ToM and children's use of internal-state language during non-interactional tasks. In contrast to the consistent pattern of positive associations seen between interactional internal-state language and ToM, neither of these studies found any relation between ToM performance and children's off-line use of such language. For example, in a study of the narrative abilities of children with autism, which included 17 typically developing 7- to 10-year-olds, Tager-Flusberg and Sullivan (1995) found no relation between the typically developing children's use of internal-state terms during a wordless book-narration task and their

understanding of false belief. Similar findings were reported by Charman and Shmueli-Goetz (1998) in a sample of 40 typically developing 6- to 8-year-olds. In this study, children's use of internal-state terms while narrating a wordless book was unrelated to a composite measure of ToM obtained from summing scores on a second-order false-belief task (Perner & Wimmer, 1985) and a belief-desire reasoning task (Harris, Johnson, Hutton, Andrews, & Cooke, 1989).

The results of these two studies suggest that having a ToM is somewhat different to spontaneously using one's ToM abilities to describe, explain and interpret the behaviours of others. Indeed, given the research on maternal mind-mindedness, such a gap between ToM competence and the spontaneous use of such competence should come as no surprise. Recall that Meins *et al.* (2001) found that not all mothers were willing or able to comment appropriately on their 6-month-olds' likely internal states, despite the fact that, as healthy adults, all of these mothers would presumably have sophisticated ToM understanding. However, further research is required before one can be confident that the results of Tager-Flusberg and Sullivan (1995) and Charman and Shmueli-Goetz (1998) provide evidence for a similar gap in children between ToM competence and spontaneous use of such capacities in accounting for the behaviour of others.

It is possible that methodological issues account for the contradictory nature of the relations between interactional versus non-interactional internal-state language and ToM understanding. First, studies assessing interactional internal-state language have typically focused on use of this language during the preschool years, whereas the children in the non-interactional studies were aged between 6 and 10 years. This disparity in ages has arisen due to the fact that the demands of non-interactional tasks such as book narration render them unsuitable for children below 5 or 6 years. These age differences necessitate the use of different types of ToM assessment, which may also have contributed to the different pattern of findings between the two sets of studies. Second, the studies on internal-state language used in social interactions included mental and emotional terms attributed to both self and others across a broad range of contexts. In contrast, in the non-interactional studies, children's use of internal-state language was constrained to describing and explaining the actions of characters in a story-book.

The study reported here sought to investigate links between ToM and children's use of internal-state language during non-interactional contexts in order to help clarify whether having and using ToM abilities can usefully be distinguished. Due to the scarcity of research on children's ToM during middle childhood, and the problems of obtaining meaningful assessments of non-interactional use of internal-state language in 4-year-olds (the age at which children typically begin to pass false belief assessments of ToM), we set out to investigate how 7- to 9-year-olds' ToM understanding related to their use of internal-state language during two different non-interactional tasks: wordless book narration, and a new task in which children were asked to describe a best friend. We chose the book-narration task in order to replicate and extend previous research on the link between ToM and internal-state language. One challenge is to show that the lack of an association between these factors reported by Tager-Flusberg and Sullivan (1995) and Charman and Shmueli-Goetz (1998) generalizes to other non-interactional tasks. If children's use of internal-state language on a different type of task were found to be similarly unrelated to their ToM performance, then this would lend support to the argument that ToM competence and the spontaneous use of one's ToM abilities can be distinguished in primary school age children. In addition, use of two different

non-interactional tasks enabled us to investigate whether children's engagement in internal-state language generalizes across different contexts.

We developed the describe-a-friend task for a number of reasons. First, the book-narration task is constrained by the nature of the book in question, while describing a friend is more open-ended. Second, a possible unwillingness on the part of children to attribute internal states to animals and characters in a story may mean that book narration underestimates their use of internal-state language. However, children should show no such reluctance to ascribe internal states to their human friends. Third, we chose to ask children to describe a best friend, rather than another social partner, on the basis of an expectation that they would know a considerable amount about their close friends' emotions, thoughts and desires. One reason for this expectation is the finding, noted above, that interactions with peers are a particularly good source of internal-state language (Brown *et al.*, 1996). By investigating individual differences in children's descriptions of friends, the study reported here was able to speak to the interesting question of when individuals begin to differ in their tendency to focus on mentalistic qualities when describing someone whom they know well. Would 7- to 9-year-olds show individual differences in their proclivity to engage in mentalistic descriptions of a best friend, and if so, to what extent are such differences governed by their ToM understanding?

The aim of the study reported here was to investigate individual differences in children's use of internal-state language in two different contexts: book narration and describing a best friend. Given previous findings, we predicted that there would be no association between ToM performance and children's use of internal-state language during the book-narration task. No directional hypothesis was made regarding the relation between ToM performance and children's tendency to describe a best friend in terms of their internal states. The relation between children's use of internal-state language on the book-narration and describe-a-friend tasks was also investigated. Once again, no directional hypothesis was made for this relation.

## Method

### Participants

Participants were 38 children (17 boys, 21 girls) aged between 7 and 9 years ( $M = 8;4$ ; range = 7;5 months to 9;4). Children were from working- or middle-class backgrounds, and were drawn from two primary schools in the north of England. Letters were sent to the parents of all children aged between 7 and 9 years in both schools seeking consent to participate in the study. Around 40% of the parents approached agreed for their children to take part. Two of the children were Asian, and the remainder were white. All participants had English as their first language or were equally proficient in English and another language.

The somewhat low response rate is likely to be due partly to the fact that all testing had to be carried out in a 2-week period, giving no time to contact parents who had not returned the consent forms by the given deadline. The participating children did not differ significantly from the whole group approached in terms of ethnicity or socio-economic status.

### Procedure

Children were tested individually in a quiet room in their school. Tasks were administered in random order and testing took place over two sessions, with each

session lasting a maximum of 25 minutes. One child did not complete the ToM assessment, and data for the describe-a-friend task are missing for another child due to a technical problem with the recording equipment.

### **Theory of mind assessment**

#### *Strange stories*

Children received a version of Happé's (1994) strange stories task. The original task consisted of 24 short vignettes, accompanied by a picture and two test questions, which were designed to assess ToM in older children and adults. The typically developing children in Happé's study were aged between 6 and 9 years, making this task appropriate for the present sample. The study reported here used 8 of the vignettes, which in total represented the full range of story types in the original version: pretence, joke, lie, white lie, figure of speech, double bluff, irony and persuasion. We chose to administer only 8 of the original 24 vignettes in order to reduce fatigue and minimize the length of the testing session.

The experimenter introduced the task to the child, saying, 'Here are some stories and some questions. I'd like you to listen carefully and help me with the questions at the end of each story' (Happé, 1994). Each story was read aloud, with a copy of the story and picture placed in front of the child for reference. At the end of each story, the child was asked two questions: (a) a comprehension question, and (b) the test question to assess whether the child understood the mental manipulation covered in the story. If children responded incorrectly to the comprehension question, the story was repeated using additional prompts, before the test question was presented. None of the children failed the comprehension question on the second time of asking. Children's answers to each test question were scored as correct or incorrect, giving a total score of between 0 and 8. A correct answer required the child to justify the character's response with reference to his or her context-appropriate mental or emotional state, or in the case of the figure of speech vignette, recognition that what the person said was 'just a saying'.

### **Internal-state language assessments**

#### *Book narration*

Children were asked to narrate a wordless picture book, *Frog on his own* (Mayer, 1973), which tells the story of a pet frog who escapes from the little boy who owns him and has various adventures. This book was chosen because the story involves mistaken identity, deception and shows the protagonists' emotional reactions to events, thus providing the child with ample opportunity to talk about internal states. The experimenter introduced the child to the main storyline and characters, and children were given as long as they wished to familiarize themselves with the book. The experimenter then asked the child to use the book as a guide to tell her the story, picture by picture, in as much detail as possible. When a prompt was occasionally needed, the experimenter merely asked, 'What's happening on this page?' Only two children needed such a prompt. Children's narratives were audiotaped and transcribed verbatim.

The scoring procedure for the book narration was adapted from schemes used by Bartsch and Wellman (1995), Dunn, Bretherton, and Munn (1987), Dunn *et al.* (1991) and Meins *et al.* (2001). The coding scheme adopted here was different from those of Tager-Flusberg and Sullivan (1995) and Charman and Shmueli-Goetz (1998) for



a number of reasons. First, Tager-Flusberg and Sullivan's scheme focused on children's use of emotional language and the linguistic complexity of narratives, whereas we were interested in children's talk about all types of internal states (e.g. thoughts, beliefs, inferred intentions) and not only feeling-state talk. Second, Tager-Flusberg and Sullivan coded behavioural emotion terms (e.g. smile, cry) and physiological terms (e.g. tired), and Charman and Shmueli-Goetz's scheme subsumed these behavioural and physiological terms within their internal-state language category. In the study reported here, such behavioural and physiological emotion terms were not categorized as internal-state language because they do not necessarily imply any mentalistic inference (cf. Meins, Fernyhough, Russell, & Clark-Carter, 1998). Finally, we wished to investigate whether any observed relation between children's internal-state language on the two tasks was specific to their talk about mental and emotional states, or generalized to their use of other types of language. Our coding scheme therefore included categories for types of language other than pure internal-state talk. Having an exhaustive coding scheme also enabled us to investigate whether any observed relation between internal-state language and children's ToM performance was specific to talk about mind and emotion, or generalized to other language categories.

Children's narratives were broken down into individual, discrete comments (phrases or sentences), and placed into one of the following exhaustive and exclusive categories:

(a) *Internal state comments* – any references to the characters' epistemic states, beliefs, knowledge, desires, mental activities and emotions (e.g. 'he thought it was a fly but it's a bee', 'she thinks she's feeding the baby, but she's doing it to the frog', 'the lady was shocked'). Characters' intentions were also included, but only if the goal state did not happen in the story. For example, 'she was going to give it to the baby, but the frog got it' was coded as *internal state* because the picture only showed the mother preparing the bottle of milk and the child had to infer that she was intending it to be for the baby and not the frog, but 'the cat's trying to climb up on the pram' was coded as an *attempt* comment (see below) since the picture showed the cat standing up against the pram. Instances where the child spoke on behalf of the story character were classified as internal state (e.g. 'he thought, "Mm, that looks tasty!"; 'he thought, "Mm, I might want some food"').

(b) *Perception comments* – any references to a character's direction of gaze or visual attention, hearing, or sense of touch (e.g. 'the cat's just watching them', 'she feels the frog').

(c) *Attempt comments* – any references to a character's intentions when the goal state was covered explicitly in the story (e.g. 'and tries to eat it', 'the dog went to chase the cat away').

(d) *Self-referential comments* – references to the child's own internal states, rather than those of the characters. In all such cases, comments took the form 'I think. . .'

(e) *Distancing comments* – utterances qualified with a term indicating that the child was unsure about what was happening (e.g. probably, might, looks like).

(f) *General description* (e.g. 'he's going into the park', 'he sits next to the baby').

Children received a score for the overall number of comments produced during the book narration. A randomly selected 25% of transcripts was coded by a second researcher who was blind to all other details of the study, and inter-rater reliability was  $\kappa = 0.90$ . In order to control for differences in verbosity, scores for each of the separate categories were expressed as a proportion of the total number of comments made.

#### *Describe-a-friend*

Children were given a short interview adapted from Meins *et al.*'s (1998) maternal mind-mindedness interview. Each child was asked the following questions: (a) do you have a best friend?, (b) what is your best friend's name?, (c) can you describe [friend] for me?, (d) what do you like about [friend]?, (e) what sort of person is [friend]? and (f) is there anything else you'd like to tell me about [friend]? All children had no problem in identifying a best friend. One child identified three best friends, and so was asked to choose who was her best friend out of these three.

Children's descriptions were audiotaped and transcribed verbatim. The transcripts were coded using Meins *et al.*'s (1998) scheme. This scheme was chosen because it deals explicitly with descriptions of real people and is therefore ideal for coding children's descriptions of friends. Given that the way children described their best friends was naturally different from the way in which they narrated a story, it was impossible to use the same coding scheme for both of the non-interactive tasks reported here. Each descriptor was placed into one of four exhaustive and exclusive categories:

(a) *Mentalistic*: any references to mental life and intellect (e.g. 'she's always thinking about him', 'he's a clever person'). References to likes and dislikes were only included if they did not focus exclusively on the friend's behaviour (e.g. 'she likes blue' and 'she doesn't like her brother or her sister using her stuff' were coded as mentalistic, but 'she likes playing football' was coded as behavioural). Also included were references to the friend's responses to the child's emotions (e.g. 'she plays with me when I'm feeling sad'), and to the friend's own emotions, but not their external manifestations (e.g. 'she's always really happy', but not 'always smiling').

(b) *Behavioural*: any comment about activities or interactions with others that could be interpreted on a purely behavioural level (e.g. 'he plays with me', 'we always go to school together'). The following characteristics were also included: friendly, nice, kind, bossy, funny, polite, helpful.

(c) *Physical*: references to any physical characteristics, age or position in the family (e.g. 'she has freckles on her face', 'she's got glasses on').

(d) *General*: any comment that did not fit into the above categories (e.g. 'he lives round the block to me').

Children received a score for the overall number of descriptions produced, and a score for each category expressed as a proportion of the total number of comments. A randomly selected 25% of transcripts was coded by a second researcher, and inter-rater reliability was  $\kappa = 0.86$ .

*Children's Receptive Verbal Ability* was assessed using the British picture vocabulary scale II (BPVS II; Dunn, Dunn, Whetton, & Burley, 1997). This standardized language assessment was included because receptive verbal ability has been found to relate to children's ToM performance (e.g. Astington & Jenkins, 1999; Meins *et al.*, 2002; Ruffman *et al.*, 2002). The verbal nature of the internal-state language assessments also meant that it was important to control for individual differences in children's verbal ability.

## Results

### *Descriptive statistics and preliminary analyses*

First, the numbers of children producing each of the different types of comment during the two tasks were analysed. On the book-narration task, 33 (87%) used at least one internal state comment, 36 (95%) used at least one perception comment, 17 (45%) used

an attempt comment, 5 (13%) used a self-referential comment, 9 (24%) children used at least one distancing comment and all 38 children used general description. A total of 5 self-referential comments were produced by the five children who used them, and a total of 11 distancing comments were produced by the 9 children who used this type of comment. The infrequency of self-referential and distancing comments meant that these types of talk were not analysed further.

With respect to children's descriptions of a best friend, 20 (54%) mentioned a mentalistic attribute, all 37 children used behavioural attributes, 29 (78%) mentioned a physical attribute and 7 (19%) described the best friend in general terms. A total of 9 general comments were produced by the 7 children who used such descriptions, and thus this category was not analysed further.

These data, together with the ranges of comments in the individual categories shown in Table 1, highlight considerable individual differences in children's use of internal-state language to interpret and explain the actions of story-book characters, and to describe a best friend.

Potential limitations in power to detect associations between variables (due to a relatively small sample size) mean that effect sizes, using Cohen's (1988) convention for interpreting the size of correlational effects, have been included throughout the analyses. The high risk of family-wise error in investigating a large number of correlations among variables is another reason for emphasizing practical rather than statistical significance in the following. Effect sizes were based on Pearson's  $r$ , with small, medium and large effect sizes indicated respectively by the following  $r$ s: .10, .30, .50 (Cohen, 1988).

Table 1 shows children's mean scores on the book-narration, describe-a-friend and strange stories tasks, as well as standardized BPVS II scores. Table 2 shows the mean proportional scores for the variables derived from the book-narration and describe-a-friend tasks. Preliminary analysis showed that skewness and kurtosis statistics for scores on the strange stories task and the proportional scores for all the describe-a-friend and book-narration variables were acceptable (skewness,  $z$ s < 2.00; kurtosis,  $z$ s < 1.31). The only exception concerned the proportional scores for attempt comments in

**Table 1.** Mean and range scores for all variables

	Mean	Range
<i>Book narration</i>		
Internal state comments	3.89 (4.26)	0–20
Perception comments	4.71 (2.66)	0–12
Attempt comments	0.92 (1.38)	0–6
General description	28.18 (10.6)	16–68
Total number of comments	37.87 (15.0)	20–97
<i>Describe-a-friend</i>		
Mentalistic attributes	1.30 (1.51)	0–5
Behavioural attributes	4.14 (2.41)	1–13
Physical attributes	2.49 (2.10)	0–9
Total number of attributes	8.19 (3.70)	1–19
<i>Strange stories</i>	3.11 (1.15)	1–6
<i>British picture vocabulary scale II</i>	104.4 (12.3)	79–133

Standard deviations are given in parentheses.



**Table 2.** Mean and range proportional scores for the book-narration and describe-a-friend variables used in the analyses

	Mean	Range
<i>Book narration</i>		
Internal state comments	0.09 (0.07)	0–0.30
Perception comments	0.13 (0.06)	0–0.27
Attempt comments	0.03 (0.04)	0–0.16
General description	0.75 (0.09)	0.60–1.00
<i>Describe-a-friend</i>		
Mentalistic attributes	0.14 (0.15)	0–0.45
Behavioural attributes	0.53 (0.22)	0.14–1.00
Physical attributes	0.30 (0.22)	0–0.75

Standard deviations are given in parentheses.

the book narration (skewness,  $z = 4.57$ ; kurtosis,  $z = 5.09$ ), which included a high proportion of zero scores. Accordingly, non-parametric statistics were calculated for all relations with this variable.

#### **Relations among internal-state language, theory of mind and control variables**

Table 3 shows the correlation matrix for relations among the scores for the book-narration, describe-a-friend and ToM tasks, together with children's chronological age and their standardized scores on the BPVS II. As Table 3 shows, the internal-state language scores on neither the book-narration nor describe-a-friend tasks were related to age or BPVS II scores, with small effect sizes for all relations. The only exception was that between age and children's proportional use of mental attributes to describe a friend, which produced a medium-sized effect. This suggests that older children were more likely to describe a best friend with reference to their mentalistic attributes. Table 3 also shows that performance on the strange stories task was not related to age, but was positively correlated with BPVS II scores (large effect).

A further point of interest in Table 3 is that the total number of comments produced by children on both the book-narration and describe-a-friend tasks was positively correlated with children's strange stories scores, with large effect sizes for both relations. These relations were independent of children's receptive verbal ability, since the positive correlations were maintained when children's BPVS II scores were partialled out: for the relation between strange stories scores and total number of comments during the book narration,  $r(35) = .58$ ,  $p < .001$ , two-tailed; for the relation between strange stories scores and total number of descriptions of friend,  $r(35) = .47$ ,  $p < .005$ , two-tailed.

#### **Relations between internal-state language measures**

As Table 3 shows, children's scores for internal state comments during the book narration were significantly positively correlated with those for mentalistic attributes during the describe-a-friend task, with a very large effect size for this relation. This effect was maintained when chronological age and BPVS II scores were partialled out,  $r(34) = .70$ ,  $p < .001$ , two-tailed. Thus, controlling for age and verbal ability, children

**Table 3.** Intercorrelations (Pearson's *r*) among all variables

	1	2	3	4	5	6	7	8	9	10	11
<i>Book-narration</i>											
1. Internal state proportion											
2. Perception proportion	.10										
3. Attempt proportion	-.36*	-.30									
4. Description proportion	-.62†	-.48**	.12								
5. Total comments	.77†	.56†	-.07	.96†							
<i>Describe-a-friend</i>											
6. Mental proportion	.67†	.40*	-.38*	-.52†	.17						
7. Behavioural proportion	-.06	-.08	.06	.14	-.33*	.29					
8. Physical proportion	-.34*	-.04	.16	.18	-.25	-.75†	.03				
9. Total attributes	.23	.47**	-.06	.17	.28	.51†	.77†	.50†			
<i>Theory of Mind</i>											
10. Strange stories task	.19	.22	-.07	-.45**	.47**	.03	-.03	.09	.48**		
<i>Control variables</i>											
11. Chronological age	-.02	.05	-.35*	.01	-.04	.29	.02	-.18	.13	.08	
12. BPVS II score	.21	.34*	-.11	-.46**	-.04	.20	-.11	-.06	.19	.46**	-.14

Two-tailed probabilities: \* $p < .05$ , \*\* $p < .005$ , † $p < .001$ . Note that correlations with 'attempt proportion' are non-parametric, and values are for Spearman's rho. Correlations relevant to hypotheses are given in bold.

who tended to use internal-state language during the book narration were more likely to describe their friends with reference to mentalistic attributes.

The specificity of the relation between use of internal-state language in the two assessments was also investigated. As Table 3 shows, children's use of internal state comments during the book narration was negatively correlated with their use of physical attributes to describe a friend, with a medium effect size for this relation. Children's proportional use of mental attributes to describe a friend was (a) positively correlated with their proportional use of perception comments during book narration, with a medium effect size for this relation; (b) negatively correlated with their proportional scores for attempt comments during the book narration, with a medium effect size for this relation; and (c) negatively correlated with their proportional use of general description during book narration, with a large effect size for this relation. Thus, children who used a higher proportion of mentalistic attributes when describing a best friend used proportionately more perception-related talk in the book narration, and proportionately less general description of the scene or the characters' actions in the book. As Table 3 shows, no cross-task associations were found for scores on the categories that did not involve reference to internal states.

Given the positive correlation between children's proportional scores for mentalistic descriptions of friends and use of perception comments during the book-narration task, it was important to establish whether the relation between internal state comments during the book narration and mentalistic descriptions of friends was independent of children's use of perception comments. A further partial correlation analysis was therefore carried out. Since the proportional scores for internal state comments and perception comments were both obtained from the same task, they were not independent of one another. A non-parametric partial correlation was therefore performed using Kendall's tau. Partialling out age, BPVS II scores and proportional scores for perception comments, the large positive correlation between the two internal-state language measures was maintained:  $\tau(33) = .56, p < .001$ , two-tailed. Thus, controlling for age, verbal ability and the use of perception comments during the book narration, children's tendency to use internal-state language during the two tasks was highly positively correlated.

Finally, given that one aim of the study reported here was to investigate whether describing and explaining behaviour with reference to internal states involves motivational and/or personality elements that interact with, but do not reduce to, ToM capacities, it was important to establish that the relation between use of internal-state language during the book-narration and describe-a-friend tasks was independent of children's ToM understanding. Consequently, this association was recomputed, partialling out children's scores on the strange stories task in addition to the other control variables. The strong relation between internal state comments during the book narration and mentalistic descriptions of friends was maintained,  $\tau(32) = .60, p < .001$ , two-tailed. Thus, the relation between these two measures was independent of children's age, verbal ability, use of perception comments during the book narration and their ToM performance.

#### **Relations between internal-state language and theory of mind**

Table 3 shows the relations between internal-state language during the book-narration and describe-a-friend tasks and children's performance on the strange stories task. Children's proportional scores for internal state comments during the book narration

were not significantly related to performance on the strange stories task, with a small effect size for this relation. The effect remained small when age and BPVS II scores were partialled out:  $r(34) = .10$ , *ns*. Scores for mentalistic descriptions of a friend were unrelated to strange stories performance, and again the small effect size was maintained with age and BPVS II scores partialled out:  $r(34) = -.19$ , *ns*.

Table 3 also shows relations between ToM performance and the other indices obtained from the book-narration and describe-a-friend tasks. As Table 3 shows, children's proportional use of general description during the book narration was negatively correlated with their performance on the strange stories task, with a medium to large effect size for this relation. However, this relation disappeared when age and BPVS II scores were partialled out,  $r(34) = .01$ , *ns*, showing that this effect was not independent of age and verbal ability.

## Discussion

The study reported here sought to determine whether there was stability in children's use of internal-state language across two non-interactive contexts, and to establish whether use of such language related to children's concurrent ToM performance. The results demonstrated high cross-task stability in children's proportional use of internal-state language while narrating a wordless book and in describing a best friend. This relation was independent of children's overall verbosity, age, verbal ability and proportional use of perception comments during the book narration. Moreover, this association was also independent of children's ToM understanding as assessed on an age-appropriate task. In contrast to the strong relation between proportional use of internal-state language in these two different contexts, there was no association between children's ToM performance and their proportional use of internal-state language on either task. These results therefore replicate previous findings of a lack of association between non-interactive internal-state language and ToM performance (Charman & Shmueli-Goetz, 1998; Tager-Flusberg & Sullivan, 1995).

Before considering potential interpretations, a number of subsidiary findings are worthy of mention. First, children's performance on the strange stories task was highly positively correlated with their receptive verbal ability, mirroring the previously reported association between ToM and language skills in preschoolers (e.g. Astington & Jenkins, 1999; Meins *et al.*, 2002; Ruffman *et al.*, 2002). These findings suggest that ToM and language ability may continue to be linked in middle childhood. Second, performance on the strange stories task was positively correlated with children's overall verbosity during both the book-narration and describe-a-friend tasks, and these relations were independent of receptive verbal ability. Thus, it would appear that, in the 7- to 9-year-olds studied here, ToM understanding is linked not only to general verbal ability, but also to children's volume of narrative during descriptive tasks.

One of the most interesting findings of the present study is the lack of association between use of internal-state language and ToM. An obvious explanation for this finding is that our sample size is relatively small, and that the present study suffers from the same problems of statistical power that might have affected previous studies in this area (Charman & Shmueli-Goetz, 1998; Tager-Flusberg & Sullivan, 1995). The results reported here should therefore be regarded as somewhat preliminary until they have been replicated on a larger sample. That said, the effect sizes for the relations between children's scores on the strange stories task and both measures of internal-state language

were small, indicating that there is only a weak relation between our measures of ToM and internal-state language. The present study's findings therefore support those of Charman and Shmueli-Goetz and Tager-Flusberg and Sullivan, who also failed to find an association between ToM and children's use of internal-state language during a book-narration task. The fact that we found a similar lack of association between ToM and children's proportional use of internal-state language during the describe-a-friend task suggests that these earlier null findings cannot be explained simply in terms of the characteristics of the book-narration task.

The small effect size for the relation between ToM and internal-state language stands in stark contrast to the very robust association between children's proportional use of internal-state language during the book-narration and describe-a-friend tasks. This finding suggests that children's tendency to focus more on internal states when describing, interpreting and explaining people's behaviour generalizes across contexts. Furthermore, our findings give us some reason to conclude that individual differences in this tendency are independent of children's cognitive capacity to represent and reason with the mental states of others. If this conclusion is justified, children's proportional use of internal-state language in non-interactive contexts can be thought of more as a measure of children's spontaneous *use* of their ToM capacities than of those capacities themselves. In addition, children's proportional use of internal-state language during both the book-narration and describe-a-friend tasks was shown to be largely independent of their age and verbal ability (both known to be associated with ToM), providing further support for the idea that the tendency to focus on internal states taps into different underlying capacities to those that determine ToM performance.

The findings on inter-relations among children's proportional use of different types of language across the book-narration and describe-a-friend tasks are also of interest. While the proportion of mentalistic descriptions of friends was positively correlated with the proportion of talk about the book characters' internal states and perceptual experiences, scores for mentalistic descriptions of friends were negatively correlated with those for general description of events and talk about intentions when the goal state was explicitly covered in the book. These results suggest that certain individuals' tendency to focus proportionately more on people's internal states and experiences generalizes across contexts, while the same is not true of the tendency to talk about people or events without reference to mind or emotion.

A further aim of the study reported here was to investigate whether children aged between 7 and 9 years differed in their tendency to focus on mentalistic qualities when describing a best friend. Our findings suggest that children of this age show similar individual differences to adults in their tendency to describe other people and interpret their behaviour with reference to internal states. Recall that Meins and colleagues found considerable variability in mothers' ability accurately to 'read' their infants' internal states (Meins *et al.*, 2001), and in mothers' tendency to describe their preschoolers with reference to their mental characteristics (Meins *et al.*, 1998). As normal adults, all of these mothers would presumably have functioned close to ceiling on any ToM assessment. That said, only some of them described their children and interpreted their behaviour in terms of internal states. The results reported here might be regarded as evidence for similar individual differences in mind-mindedness in children. Taken together with the findings on maternal mind-mindedness, our findings suggest that having a ToM is different from using one's ToM capacities to describe other people and explain their behaviour.

A similar analysis of cognitive, motivational and personality contributions to adults' mind-mindedness is clearly a challenge for future research. In the meantime, it is interesting to consider how the present findings accord with other evidence that having a ToM and employing it are two different things. In their study of adults' responses to another adult's directions to move an object around a grid, Keysar, Lin, and Barr (2003) found that adults frequently took as the referent of the director's utterance an object whose identity the director could not possibly have known. They concluded that, as far as adults are concerned, possessing a cognitive capacity does not necessarily entail that one will use it in on-line reasoning about mental states. We suggest that we need to learn much more about what motivates individuals to employ their ToM capacities in reasoning about human behaviour. Such research may be particularly important if mind-mindedness, a feature of adults' interactions with their infants that has been shown to be important for children's developing ToM, turns out to be as much a measure of motivational and personality differences as it is an index of an underlying cognitive capacity.

Our findings raise a number of interesting questions to be addressed by future research. First, it is important to establish whether children's internal-state talk during interactions with social partners relates to their use of such language in non-interactive contexts, such as those examined here. Such a relation has been demonstrated longitudinally, although not concurrently, for adults' mind-mindedness (Meins *et al.*, 2003). Given that children's internal-state talk varies widely between different conversational partners (Brown *et al.*, 1996), it may turn out that any such association is highly dependent upon the type of social context in which interactive measures of internal-state language are investigated. Second, future research in this area would benefit from a careful analysis of the specific cognitive capacities that are tapped by different ToM tasks.

Another challenge for future research is to establish whether parental and child mind-mindedness are related, both in terms of children's interaction-based use of internal-state language and their tendency to invoke internal states in describing and explaining the behaviour of others during non-interactive tasks. As noted previously, interactive measures of internal-state talk are likely to be confounded by the tendency of the child's interactive partners to focus on internal states. Similarly, it may be that the individual differences in children's non-interactive use of internal-state language will be determined, in part, by parents' tendencies in this direction. For example, if the use of mental-state explanations and descriptions turns out to be part of an individual's social-cognitive style, influenced by motivational and personality factors as much as by cognitive competence, then one might expect that it would be heavily influenced by the modelling provided by one's family and friends.

Finally, we return to the question of why interactive measures of internal-state language have been found to relate to ToM while non-interactive measures do not. One possible explanation relates to the point made earlier about the different ages at which these associations have been studied. Recall that interactive measures of internal-state talk have typically been obtained in the preschool years, presumably before the acquisition of a fully-fledged representational ToM. In contrast, studies employing non-interactive measures have, primarily for methodological reasons, been conducted with older children. It seems likely that, while ToM is still being acquired, children's ability to employ their internal-state reasoning capacities will indeed be constrained by those capacities themselves. On the other hand, measures of internal-state language in children for whom the first stages of representational ToM acquisition



are largely complete, may index children's tendency spontaneously to employ their ToM capacities in a way that is not directly constrained by their level of ToM understanding. The potential success of this as an explanation relates in part to the question of how different ToM tasks at different ages tap into different constituent mental-state reasoning capacities.

A further possibility is that, in interactional contexts during the preschool years, any relation between children's internal-state language and their ToM may not simply be a question of some children having superior ToM, and thus being better able to employ internal-state talk in describing and explaining behaviour. Rather, the association between children's interactional internal-state talk and ToM may be mediated by the mind-mindedness of their interactional partners. In studies where preschoolers' use of internal-state talk is assessed in the context of interactions with caregivers, greater mind-mindedness on the part of those caregivers will have two simultaneous effects. First, it will lead to higher levels of internal-state talk by the children, as mental states will be more likely to be the focus of conversation. Second, greater mind-mindedness on the part of caregivers will give children richer opportunities to learn about mental states, opportunities that have been shown to relate to subsequent ToM development (e.g. Meins *et al.*, 2002). A challenge for future research, then, is to consider further how internal-state talk, shared with caregivers but also actively contributed to by children, not only reflects children's nascent ToM capacities, but actually plays a causal role in the development of those capacities.

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