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The Effects of Adding Metacognitive Language to
Story Texts

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Abstract

This study investigated whether exposing Kindergarten children to metacognitive language results in a greater conceptual understanding of mental states, and increased production and comprehension of metacognitive vocabulary. Over a 4 week period, parents, teachers and graduate assistants read about 70 picture books to each participant (N = 48, mean age 4;6). The experimental group received books with text rich in explicit metacognitive terms. The control group received the same books with no metacognitive language but with most stories and accompanying illustrations implicitly requiring children to think about alternative perspectives. Results from pre-test to post-test show firstly, that exposing children to explicit metacognitive vocabulary resulted in significantly more metacognitive verb production in story telling but no improvement in metacognitive language comprehension. This demonstrates Nelson's (1996) notion that children "use" such vocabulary before fully understanding the concepts. A second finding was that the control group children outperformed the experimental group on a false-belief explanation battery. This suggests that hearing numerous metacognitive terms in stories is less important than having to actively construct one's own mentalistic interpretations from illustrations and text that implicitly draw attention to mental states.

The effects of adding metacognitive language to story texts

In recent research on children's understanding of their own and other people's mental states, there has been an interest in the causal mechanism of language in the development of a theory of mind. The results of many studies have supported the argument that theory-of-mind development may be related to, and advanced by, general language ability (e.g., Astington & Jenkins, 1999; de Villiers & de Villiers, 2000; Jenkins & Astington, 1996; Tager-Flusberg, 2000). Now attention has turned to the role of explicit metacognitive terms in fostering a representational understanding of the mind.

Experimental work has documented the increasing competence with metacognitive language as children move through the school years. By the age of 4 years children comprehend "mental verbs" such as *know* and *think*. They begin to understand that the difference between "Mary *knows* that..." and "John *thinks* that..." is that only Mary has unambiguous evidence for the statement (Moore & Furrow, 1991). And they understand that *remember* implies prior knowledge, and *guess* implies absence of knowledge (e.g., Astington, 2000; Johnson & Wellman, 1980; Miscione, Marvin, O'Brien & Greenberg, 1978; Wellman, 1990). Although children start to use these terms in the preschool years, they do not sort out all the distinctions between them until the early school years when we increasingly use the language of thinking, for instance, "I used to *think* a bat was a bird but now I *know* it's a mammal." In the intermediate and later school years there is the developing understanding of high-level metalinguistic and metacognitive terms such as *infer*, *imply*, *predict*, *doubt*, *estimate*, *concede*, *assume*, and *confirm* - terms used in scientific and historical thinking (Astington & Olson, 1990; Olson & Astington, 1986).

An important issue at the preschool level is whether exposure to an explicit metalanguage will result in a greater conceptual understanding of one's own and other people's beliefs or whether this understanding develops more implicitly. Some theorists have argued that theory-of-mind development is dependent on the acquisition of the metacognitive terms that refer to these beliefs (Olson, 1994). Scholnick and Hall (1991) claim that every meaningful use of a mental state term indicates an act of metacognition, but the reverse is still in question: Does metacognitive talk help bring cognition into consciousness, allowing children to gain access to these internal states?

Researchers and theorists continue to debate the strength of, as well as the kind of, effects that language has on children's developing conceptual understanding of the world (e.g., Gopnik, 2001; Carey, 2001). As an early advocate of the strong view of the role of language in concept formation, Vygotsky (1987) stated that the verbal definitions of concepts "restructure and raise spontaneous concepts to a higher level" (p. 220). Somewhat more controversially, Whorf (1956) proposed that language influences how people perceive their reality; that is, language coerces thought. According to this view, the elaboration of a set of terms raises consciousness of the distinctions between them. The learning of explicit metacognitive terms may provide a rich conceptual net enabling children to observe connections that they had not yet perceived.

In addition to the semantic component, explicit mental state vocabulary items have a peculiar syntactic similarity. Metacognitive talk that contrasts mind and world, such as, "Jane thinks that her boots are in the laundry room" involves a syntax of object complementation whereby the "boots are in the laundry room" is a subordinate clause that acts as the object complement of the verb "thinks." As deVilliers and deVilliers (2000) argue, it is possible that this syntactic aspect of metacognitive verbs contributes to theory-of-mind understanding by providing the format for representing an agent's attitude to a proposition which may be false.

Hence, the use of metacognitive verbs might provide both a semantic and syntactic form of scaffolding in children's acquisition of a representational understanding of mind.

Most of the studies that have examined the importance of metacognitive talk in children's theory of mind have been correlational in nature. Moore, Pure and Furrow (1990) report significant correlations between preschool children's theory-of-mind scores and their understanding of certainty distinctions between the metacognitive terms, *think*, *know* and *guess*, although this research did not control for general language ability. When Hughes & Dunn (1997) controlled for general verbal ability they found no relationship between frequency of metacognitive talk in preschoolers' pretend play and their theory-of-mind performance. However, success on theory-of-mind tasks one year later was predicted by metacognitive language (Hughes & Dunn, 1998). Ruffman, Slade, and Crowe (2002) also concluded that mothers' use of mental state terms was correlated with later theory-of-mind understanding. Astington (2000) found that general language and metacognitive language made independent contributions to variability in Kindergarten children's false-belief understanding, but that metalanguage did not make an independent contribution to variability in second-order theory-of-mind understanding. Similarly, Charman and Shmueli-Goetz (1998) found no correlation between 7-year-old children's performance on second-order false-belief tasks and their use of mental state terms.

Correlational studies, however, cannot be interpreted as causal in nature, as it is difficult, if not impossible, to control for all variables. A causal role can only be determined through an intervention study, if greater gains are demonstrated for the participants in the treatment group.

There have been various studies which trained children to perform theory-of-mind tasks. The training was generally in the form of explanations regarding children's correct or incorrect responses to specific false-belief items (Appleton & Reddy, 1996; Clements, Rustin & McCallum, 2000; Slaughter & Gopnik, 1996). Although these studies involved one or more metacognitive terms in the training, such as, "He doesn't know that Nelly moved it" (Clements et al., 2000), the focus was on children's conceptual understanding of specific false-belief tasks and one cannot separate the role of the metacognitive vocabulary from the rest of the training.

An intervention study, which specifically targeted metacognitive vocabulary, is reported by Naigles (2000). Preschoolers watched the ten episodes of the television show, "Barney and Friends" that had been ranked as including the highest number of mental state verbs of certainty: *think* (63 tokens), *know* (106 tokens), and *guess* (22 tokens). Interestingly the children who watched these episodes showed a poorer understanding of the certainty distinction between these three verbs than those who did not watch these episodes. This was attributed to the frequent certain use of *think* and *guess*, which reinforced, rather than differentiated, their similarity to *know*.

In the current study the use of the metacognitive terms was more controlled. Children's picture books were rewritten specially for the study so that the texts were rich in explicit metacognitive vocabulary, such as *think*, *know*, *remember*, *wonder*, *figure out*, and *guess*, in both the texts and text questions. The children in this explicit metacognitive condition were compared with a control group that received the identical picture books, with a similar number of words and questions, but not a single instance of metacognitive vocabulary. Furthermore, unlike the training studies described above, the present intervention was ecologically valid in that story reading is usually a natural activity for children, and the changes to the texts were quite unobtrusive.

While the control group stories were stripped of metacognitive vocabulary, implicit mentalistic concepts, however, occur with great frequency in picture books (Cassidy et al., 1998;

Dyer, Shatz & Wellman, 2000). These include emotional state terms, desire state terms and terms of volition, as well as implicit references via pictures and ironic situations (Dyer et al., 2000.) These authors found a mental state token occurring on average every three sentences in picture books that they examined for 3- to 4-year-olds. In the books chosen for the current study, while explicit metacognitive verbs were removed from the control group, all of the stories required the children to think about the characters' mental states broadly defined by Dyer et al. (2000), and most of the stories implicitly required the children to think about the characters' cognitive states. For instance, "Rosie's Walk" involves Rosie the hen, who walks around a farm, unaware that she is being followed by a fox, who suffers numerous misadventures. In this way the experimental group whose texts were enriched with explicit metacognitive terms was compared to a control group where the allusions to cognitive states were implicit.

A secondary issue that was addressed in this study was whether intense exposure to explicit metacognitive verbs results in greater comprehension and increased use of these terms. Families differ in the extent to which they use metacognitive vocabulary, with some parents more inclined to reason with their child, to consider the child's point of view and explain different points of view. In these families, altercations are often met with references to motivations and thoughts involving metacognitive terms, such as, "John didn't know you wanted the ball." Or, "He thought the blue ball was his." As research has shown an association between socio-economic status and metacognitive language use (Brown, Donelan-McCall & Dunn, 1996), children from disadvantaged backgrounds may be less familiar with these ways of talking about thinking.

Correlations have been found between parental use of metacognitive terms and children's own use. Scholnick and Hall (1992), studying children who differed in ethnicity and social class, found a strong relation between the amount of metacognitive language heard in the home and the child's own production. In addition, Moore, Furrow, Chiasson and Patriquin (1994) found that preschoolers whose mothers used more metacognitive terms when the children were 2 years, were more likely to understand and produce such terms at 4 years; Sabbagh and Callanan (1998) found a marginal relationship between parents' use of mental state terms and 3- to 5-year-old children's own tendencies to talk about mental states.

But again these are correlational studies which may not tell us anything about causation. The correlation may be a result of some quite different factor which mediates both the parent's and the child's language production. Therefore, a secondary purpose of the current intervention study was to determine whether, if children's environments are enriched with metacognitive language, the children will have a better understanding of this vocabulary and will use these metacognitive verbs themselves.

Some studies have shown that story reading can benefit vocabulary development: Robbins and Ehri (1994) found that story listening contributes modestly to the vocabulary growth of Kindergarten children. And Beck and McKeown (2002) found that, when 22 difficult words were targeted and explained during story reading, Kindergarten and first graders in districts with low SES populations learned significantly more of these words than the control group.

In the present intervention study the participants consisted of Kindergarten children attending schools in low income neighborhoods. It has been shown that disadvantaged preschoolers demonstrate substantial lags in their theory-of-mind understanding (Cutting & Dunn, 1999; Holmes, Black, & Miller, 1996). It has also been shown that children as young as 6 years from low-income families know only half the number of words as children from higher

socioeconomic groups, and that this decreases to a quarter by the end of high school (Graves, Brunetti, & Slater, 1982; Graves & Slater, 1987). Children whose parents do not provide a rich lexicon for distinguishing language about perceiving, thinking, and evaluating might make important gains from hearing and talking such talk in their everyday story reading. A rich vocabulary, more than any other measure, is related to school performance (Booth & Hall, 1994; Cunningham & Stanovich, 1998).

A recent intervention program aimed at improving the narrative skills of children from poor families showed success when it involved parents, but no effect when attempted only in preschool classrooms (Peterson, Jesso & McCabe, 1999). These results were attributed to the greater amount of one on one interaction, as well as the emotional intimacy of the parent-child relationship. Furthermore, reading research has shown that *how* the reader mediates the text is more important than the frequency of reading, and that an important interactive reading behaviour involves the child responding to the reader's questions (Morrow, 1990; Senechal, Thomas & Monker, 1995; Scarborough & Dobrich, 1994). Therefore, in the present study, parents as well as teachers and graduate students read the texts to the children, and questions containing mental state verbs were incorporated right into the text.

A concern in naturalistic intervention studies on reading is that between-teacher variation has usually proved to be greater than between-method variation (Taylor, Anderson, Au & Taffy, 2000). This difficulty was resolved by choosing schools where one teacher taught two half-day Junior Kindergarten classes, one in the morning and one in the afternoon. In this way, the same teacher read the books enriched with explicit metacognitive terms to one of her classes, and read the books with only implicit references to mental states to her other class.

To summarize the aims of the study, the first aim was to examine whether exposure to explicit metacognitive terms in story texts results in a greater conceptual understanding of one's own and other people's beliefs or whether this understanding develops more implicitly. A secondary aim was to investigate whether hearing dramatically increased numbers of metacognitive terms in stories and in the talking about these stories, results in greater comprehension and production of such metacognitive language.

Method

Participants

Participants consisted of 48 children in Junior Kindergarten, the entering year for children who will be 4 years by the end of the calendar year. The control group consisted of 24 children, 11 girls and 13 boys; mean age during the pre-test, 4-7, range 4-1 to 4-11. The experimental group consisted of 24 children, 10 girls and 14 boys, mean age during the pre-test, 4-5, range 4-1 to 5-0. These participants were chosen from a total of 107 children, who had parental consent, in eight classrooms in schools situated in low income neighborhoods of Toronto. Toronto is a very multicultural city with a high proportion of ESL students speaking a diverse assortment of languages, and a concern in the study was that the children's English language skills might not be adequate to understand the tasks. While 70% of the final sample spoke another language in addition to English at home (75% experimental; 67% control), there were four safeguards to ensure English competence: 13 children were not tested at all as a result of teacher concerns about language; of those who had the pretest, 6 children were excluded for failing the criterion of both control questions correct on at least one of the false-belief location change tasks; 3 children were excluded as they did not produce a story in the story telling task, and 3 children were not chosen as they scored below our criterion of a 3 year, 8 months "Age Equivalent" score on the TELD-3 Receptive language subtest (Hresko, Reid & Hammill, 1999).

It was also important to exclude children who performed too highly on any of the pretest measures so that there was room for improvement on all five measures. Therefore, a further 23 children were excluded as they obtained a score of either 3 or 4 out of a possible 4 on the false-belief prediction battery; and 8 children were excluded for having a score at ceiling or just below on both the false-belief explanation battery and the comprehension task. Finally 3 children were excluded as there was either certainty or a possibility that they would be moving schools or classrooms during the intervention.

The focus of the study was on the performance of subjects who received - versus did not receive - explicit metacognitive language, and the priority was to ensure that this comparison was tightly controlled. Although the original subject pool consisted of the children in eight classrooms, after all the exclusions, as described above, 48 participants remained, enough children for an experimental and one control group. Hence, while it would have been ideal to have had a second control group for whom the intervention did not involve story reading at all, this was superseded by the decision to have strict restraints on participation.

Design and Procedure

Four teachers were involved, each of whom taught roughly 12 of the final participants, 6 in the control group and 6 in the experimental group. Two of the teachers taught the experimental group in the morning and control group in the afternoon. For the remaining two teachers this was the reverse. Whether the teacher's morning or afternoon class was designated either a control or experimental group, was determined by the decision to match the experimental and control groups in terms of their total scores on the TELD-3 Receptive language pre-test. One of four graduate assistants was assigned to each teacher so that the same person tested both the experimental and control groups both for the pre-and the post-test. In this way there was control for teacher effects, tester effects, time-of-day effects, as well as language understanding.

Between the pre- and the post-test there was a 4-week intervention. The post-test occurred within 1 to 10 days of completion of the reading sessions. The intervention was kept very short in order to avoid the natural development of a theory of mind, which would be expected by the time many of these low SES children were 5 years old. It was, however, intense involving (1) the teacher reading two of the books to the whole class three times a week (2) a graduate assistant withdrawing participants in small groups of 3 from the classroom and reading three of the books to them on the remaining 2 days a week; and (3) parents reading the books at home to each child individually. The 48 children chosen to be part of the study all received a set of the books to take home and keep. The families were given a colorful, magnetized sheet displaying a table divided into the four weeks vertically and the names of the books horizontally, plus a set of 24 stickers on the side. They were asked to attach the sheet to their refrigerator and place a sticker against the name of the book each time a family member read it to the child. Prior to the pre-testing, parents had agreed to read to their child between four and six times a week in order to be part of the study. Almost all the families complied, with the readings fairly evenly spaced over the four weeks, and some read to their children so often that they ran out of the stickers and used their own stickers or checkmarks.

Picture Books

Six picture books were chosen, based on their attractive illustrations (three of them had won book awards) and also because the pictures lent themselves to the writing of text rich with metacognitive terms. For instance, in "Toby, where are you?" Toby's parents don't know where he's hiding, and in "Would they love a lion?" Anna dresses up as different characters, which often results in her not being recognized by the rest of the family.

After requesting permission from the publishers, each story was then rewritten, first with numerous metacognitive verbs, and then rewritten again for the control group, taking care to remove all metacognitive verbs, but ensuring that the story length and number of questions was similar to the experimental group version of each story. The texts were pasted surreptitiously over the original writing.

Below are two samples of text, one taken from near the beginning and one from the end, of the story, “Rosie’s Walk,” in the two versions. Metacognitive terms italicized for present purposes only.

(Control group implicit version) Fox is not careful and bumps into a rake. Rosie hears the loud BUMP but does she turn around? No, she keeps her eyes right on the road. She doesn't look left and she doesn't look right. Watch out, Rosie.

(Experimental group explicit version) Did you *know* that Fox would bump into a rake? Rosie heard the loud BUMP but did she *figure out* that it was hungry Fox behind her? No, she didn't turn around. She doesn't *know* that he's behind her. Watch out, Rosie!

(Control group implicit version) "Oow-eeee!" Fox cries as the bees chase after him. Do the bees sting him? Yes, they do, again and again. "Oow-eeee!" Fox cries as he runs away as fast as he can. Does Rosie turn around? No, Rosie just keep on walking slowly along... And she gets home just in time for dinner.

(Experimental group explicit version) Does Fox *know* that the bees are following him? Yes, he *knows*! "Oow-eeee!" Fox cries again and again. But does Rosie *know* that Fox has been following her? No, Rosie doesn't *know*. She doesn't even *guess*. Rosie just keeps on walking until she reaches her home. She is just in time for dinner.

From these extracts one can see that, although the control group story includes no explicit metacognitive terms, Rosie's lack of knowledge is made perfectly clear by implicit mentalistic concepts such as the use of perceptual terms, as well as from the illustrations.

As another example of the stories, the first four pages of "Toby, where are you?" can be seen in Appendix A. In the explicit versions of all the stories the average number of metacognitive terms in the stories was 26.5 (range 23 to 30) and metacognitive terms made up an average of 5.77% (range 3.59% to 7.82%) of the total number of words used. *Know* and *think* occurred very frequently; *wonder*, *figure out*, *guess*, *remember*, *forget*, *decide*, and *understand* occurred quite frequently; and there were occasional occurrences of *explain*, *pretend*, *imagine*, *surprise*, *expect*, and *be sure*. Teachers and graduate assistants were encouraged to use metacognitive terms in discussing the books with the experimental groups but not with the control groups and visits by the two principal investigators suggested that this was being adhered to.

Pre- and Post-test Measures

The pretest consisted of five measures, and the post-test consisted of different versions of these same five tests.

Language. TELD-3 test of early language development (Hresko et al. 1999). Form A was used for the pre-test and Form B for the post-test.

False-belief prediction battery. This consisted of (a) two false-belief location change tasks based on the study by Wimmer and Perner (1983). For instance, a boy character doesn't know that his mother has moved his toy dinosaur to a different location, and the subject is asked, "Where does the boy look for the dinosaur? (experimental question) followed by two control questions, "Where is the dinosaur really?" and "Where did he put the dinosaur before he went for a snack?" and (b) one unexpected contents task based on the study by Gopnik and Astington (1988). For instance, the child is asked what she thinks is inside a closed crayon box. She then opens the box to find, not crayons, but a toy mouse inside, and she is asked two experimental questions, "What did you *think* was in here *before* you opened it? (self condition) as well as

"Michael hasn't seen inside here yet. When he comes in here, what will he *think* is in here *before* he opens it?" (other condition).

False-belief explanation battery. This battery was specially developed for this study. It involved four scenarios with accompanying pictures and then a question which assessed the participants' conceptual understanding that a story character may be ignorant of a situation that the participant knows to be true. The texts of the four stories are the following:

1. This is Jason. He finds a little ball on the floor. It looks like a candy but it's really a little ball. Jason is putting it in his mouth. He's trying to eat it. Why is he doing that?
2. This is Michael. He's lost his kitty cat. The kitty cat ran into the kitchen, but Michael is looking for her in the living room. He's looking under the sofa. Why is he doing that?
3. It's Kelly's birthday tomorrow. Mom sneaked out and bought her a birthday cake. She hid it in a shopping bag. But Kelly saw Mom with the bag. She asked Mom, "What did you buy?" Mom said, "Oh just some bread!" Why did Mom say that?
4. This is Jenny. She's got a box of chocolate. She puts it in the cupboard and goes outside to play. Then her brother comes in and eats up all Jenny's chocolate. Now the box is empty. Then Jenny comes back. She's happy. She's ready to eat her chocolate. Why is Jenny happy?

If the child's answer referred to - or implied - a mental state, such as, in story 1: "He thinks it's a candy," or "He doesn't know it's a candy," or "He wants to see if it's a candy," the experimenter advanced to the next question. If not, the child was given a prompt consisting of a repetition of part of the story while pointing to the pictures (i.e., "It looks like a candy but it's really a little ball. So why is Jason trying to eat it?")

The post-test versions of all tasks had different illustrations, characters, character names and objects, but were essentially the same stories.

Metacognitive verb comprehension. This test was based on the comprehension test in Astington and Pelletier (2003). After preliminary training on how to answer forced choice questions, children were told a story with accompanying pictures and eight questions each of which required differentiation between two metacognitive verbs. For instance, the text accompanying the first question was the following:

1. Now John takes a bag of jelly beans out of the cupboard. In the bag there are red ones, green ones and yellow ones. John says to Kate, "Shut your eyes and I'll give you one. Don't peek." Kate shuts her eyes tight and doesn't peek. John takes a jellybean out of the bag. Kate can't see it. John says to Kate, "What colour is it?" Kate says, "It's...er...a yellow one." Now listen carefully, I told you Kate couldn't see the jelly bean. Does Kate really *know* it's a yellow one or is she just *guessing*?

The texts accompanying all eight questions for the pre-test version of this task can be seen in Appendix B. In the post-test version, the pictures and characters were all changed, but other than minor, non-substantive differences, the text and the questions remained the same.

Metacognitive verb production. An open-ended story telling task was used to measure children's spontaneous metacognitive verb production. Children were given three props (for instance, a boy character, picket fence and a wolf) and they were asked to tell a story about a mean, sneaky wolf. The stories were transcribed and the metacognitive verbs counted.

Scoring

Language. The raw scores on the two TELD-3 subtests, Receptive and Expressive language, were added together to comprise a total general language score.

False-belief prediction. There were four false-belief prediction questions altogether; that is, one experimental question from each of the two location change tasks and two experimental questions (self and other) from the unexpected content task. Children were given a score of 1 for pass and 0 for fail for each of these making a total possible score of 4. With regard to performance on the control questions, the initial exclusion of 6 children based on this measure has been described above. No child included in the intervention failed a control question but passed the corresponding test questions, so no further adjustments were made.

False-belief explanation. There were four false-belief explanations required; one for each of the four stories. For each story, children's explanations were scored as 1, 0.5, or 0 making a possible total score of 4. A score of 1 was awarded for a spontaneous, appropriate explanation using a metacognitive term (e.g., *know*, *think*, *wonder*) or a term implying a mental state (e.g., *see*, *tell*, *check*). If a prompt was required for an appropriate explanation, a score of 0.5 was awarded. Any other response, or no response, elicited a 0. This included a few inappropriate explanations that happened to use a metacognitive term.

Metacognitive verb comprehension. Participants were given 1 point for each of the eight questions correctly answered. However, as each question was a forced choice, with a one-in-two chance of a correct answer, a point was deducted for each incorrect answer. Scores were then summed to give a total possible score of 8. Negative totals counted as 0.

Metacognitive verb production. The metacognitive terms used in the children's stories were *know*, *think*, *figure out*, *pretend*, *wonder*, and *realize*. The transcribed stories were examined for total number of metacognitive term types and tokens.

Results

As discussed above, the majority of children did not speak English as a first language at home and so care was taken to exclude children who did not have sufficient English language competence to participate comfortably in the testing. Scores on the Test of Early Language Development (TELD-3), which is a test of general language ability in English, show that this aim was achieved: There was no significant difference in performance between English-first-language and English-second-language children on the pretest TELD-3 (Form A) or post-test TELD-3 (Form B) ($t(46) = 1.28$ and 0.79 , ns, respectively).

Table 1 shows the mean and standard deviation of all variables for the experimental and control groups. There was no significant difference between the experimental and control groups in age or on any of the pretest measures, $t(46) = -1.10 - 1.58$, ns, except that the experimental group produced fewer numbers of metacognitive terms in the pre-test story telling task, types: $t(27.5) = 2.41$, $p < .05$; tokens: $t(25) = 2.25$, $p < .05$. There was also no significant difference between the number of times the books were read to the children either at home or at school ($t(46) = .21$, ns and $t(40.9) = .24$, ns, respectively).

-----Insert Table 1 about here-----

In order to examine the effects of the intervention, we conducted analysis of variance (ANOVA) for each measure. The dependent variable is the within-subject measure at two time points (pretest and post-test); that is, Time is within subjects (collapsed across conditions) and Group (experimental and control) is between subjects.

(1) For the General Language measure (TELD-3) there was no significant effect of Time ($F(1,46) = .01$, ns) and no significant Time X Group interaction ($F(1,46) = .13$, ns).

(2) For the False belief Prediction battery there was a significant effect of Time ($F(1,46) = 23.85$, $p < .001$) but no significant Time X Group interaction ($F(1,46) = .12$, ns). That is, both groups showed a significant improvement on the False belief Prediction task, and neither group

improved more than the other (difference between pretest and post-test mean scores for experimental group = 0.96 and for control group = 0.83). Follow-up T tests were conducted to evaluate pairwise differences among means. Each group separately showed a significant improvement over time, experimental, $T(23) = -3.81$, $p < .001$; control, $T(23) = -3.12$, $p < .01$.

(3) For the False-belief Explanation battery there was a significant effect of Time ($F(1,46) = 40.36$, $p < .001$) and also a significant Time X Group interaction ($F(1,46) = 9.94$, $p < .01$). That is, both groups showed a significant improvement on False-belief Explanation task, but the control group improved more than the experimental group (difference between pretest and post-test mean scores for experimental group = 0.35, and for control group = 1.03). Follow-up T- tests were conducted to evaluate pairwise differences among means. Each group separately showed a significant improvement over time, experimental, $T(23) = -2.59$, $p < .05$; control, $T(23) = -6.05$, $p < .001$.

(4) On the Metacognitive Verb Comprehension test there was no significant effect of Time ($F(1,46) = 1.06$, ns) and no significant Time X Group interaction ($F(1,46) = .68$, ns). That is, neither group showed a significant improvement on the metacognitive verb comprehension task. Although the difference between pre-test and post-test mean scores was greater for the experimental group (0.75) than for the control group (0.08), there was not a significant difference between the two groups.

(5) On the Storytelling Metacognitive Verb Production task, for number of Metacognitive Verb Types, there was no significant effect of Time, but there was a significant Time by Group interaction, Time, ($F(1,46) = 1.28$), ns, Time X Group ($F(1,46) = 4.13$, $p < .05$). Results were similar for Proportional score Types (that is, controlling for story length), Time, $F(1,46) = .70$, ns, Time X Group ($F(1,46) = 3.98$, $p = .05$). For Metacognitive Verb Tokens there were no significant differences, Time, ($F(1,46) = 1.01$), ns, Time X Group ($F(1,46) = 3.49$, ns).

Follow-up tests were conducted to evaluate pairwise differences among means: The control group showed no change from pre- to post-test, Types, $T(23) = .569$, ns; Tokens, $T(23) = .549$, ns, but the experimental group used more Metacognitive Types, more Proportional score Types, and more Metacognitive Tokens in the post-test, Types, $T(23) = -2.59$, $p < .05$; Tokens, $T(23) = -2.318$, $p < .05$, Proportional score Types, $T(23) = -2.61$, $p < .05$.

In terms of total words used in the Storytelling Task, even though both groups appeared to produce fewer words in the post-test stories, there was no significant effect of Time, and no Time X Group interaction, Time, ($F(1,46) = 2.70$, ns), Time X Group ($F(1,46) = .136$, ns).

Discussion

Metacognitive terms, by their very nature, refer to unobservable, abstract entities, and their acquisition is both intriguing and puzzling. Metacognitive terms are clearly related to a conceptual understanding of beliefs but can these terms, themselves, facilitate the development of this understanding?

The most interesting result of the present study was that inserting numerous metacognitive terms into children's narratives does not result in any greater conceptual understanding of mental states than just reading stories to children where the representational concepts are more implicit. While both groups improved significantly in developing a representational understanding of beliefs, on the false-belief prediction battery the children in the control implicit condition did as well as the experimental group, and on the false-belief explanation battery the control group did significantly better. With regard to the children's comprehension and production of metacognitive terms, the children who had intense exposure to

metacognitive language subsequently used more of this language in their post-test storytelling as compared to the children who had not had such exposure. However, there was no improvement in metacognitive term comprehension for either of the groups.

Before discussing in detail the children's performance on tasks assessing a representational understanding of beliefs, it must be noted that there was not a second control group of children who had no stories read to them. However, the markedly improved performance by both groups on the false-belief tasks appears after just a few weeks, making it likely that the children's performance improved more than might be expected over such a short time-period without any intervention (Hughes et al., 2000; Mayes, Klin, Tercyak, Cicchetti & Cohen, 1996). Furthermore, the improvement of the control-implicit group on the false-belief explanation task was most impressive, in that it significantly outperformed the experimental group which, itself, had improved significantly from pre- to post-test. To sum up this point, without a second control group the significant difference between Times in our analysis may be open to question; however, the Time by Group interaction on the false-belief explanation task is unambiguous. This will be discussed further below.

One of the aims of this study was to examine whether exposure to vastly increased numbers of metacognitive verbs in story reading would provide a semantic and/or syntactic form of scaffolding in children's acquisition of a representational understanding of mind. The semantic aspect was in the form of linguistic determinism whereby children's concepts are determined by lexical categories; the syntactic aspect in the form of object complements whereby embedded propositions such as "Toby is under the table" might be false without disturbing the overall truth value of "Mother thinks that Toby is under the table" (de Villiers, in press; de Villiers & de Villiers, 2000; Tager-Flusberg & Joseph, in press). However, the results demonstrated that providing metacognitive terms was actually less effective than story reading with none of these terms. While this result was unexpected, in the introduction to this paper we described a study by Naigles (2000) which found that children exposed to more metacognitive terms of certainty (*think*, *know* and *guess*) in a television show later displayed a poorer understanding of certainty distinctions than those exposed to episodes containing fewer of these terms. In addition, two very recent unpublished studies, which compared children whose teachers used more metacognitive vocabulary to those whose teachers used less, found superior performance on theory-of-mind tasks for children whose teachers used *fewer* metacognitive terms (D. Kamawar, personal communication, 2003; Richner & Nicolopoulou, 2003).

With regard to the impressive performance of the control group in the present study, an important point is that implicit mentalistic concepts occur with great frequency in young children's picture books (Cassidy et al., 1998; Dyer, Shatz & Wellman, 2000). In the books that we chose, vivid pictures depict, for example in "Whistle for Willie," the sausage dog walking obliviously past his owner who is hidden in an empty carton; or in "Would they love a lion?" the surprised or scared faces of Anna's family when Anna dresses up as various animals. It seems, then, that the children in the control group in this study, while not exposed to explicit metacognitive language, were certainly exposed to numerous pictures illustrating the knowledge states of the characters. Furthermore, these pictures were accompanied by text that drew attention to the differing perspectives as in the following wording in "Toby, where are you?" next to a picture of Toby hiding under the potplant as his mother looks for him in the wastebasket:

Is he in the wastebasket?
N.O. spells no!

Can you see where Toby is?
 Will Toby's mother find him?
 Toby's mother doesn't see him hiding in the potplant.

As is clear in the example, the texts of the control group stories, albeit stripped of actual metacognitive terms, provided an opportunity for the children to think about the beliefs of the story characters and formulate an understanding of how these can be false. The unanticipated success of this group suggests that they did, indeed, benefit from such discourse. This supports the viewpoint of Harris (in press) who suggests that the semantic and syntactic features of metacognitive terms are less important than the conversational discourse that draws attention to alternative possible perspectives and beliefs about a situation.

This performance of the control group can be explained in terms of Vygotsky's (1978) socio-cultural theory, and the importance of constructivism within this theory. To begin with Vygotsky's socio-cultural theory per se, the social interlocutor is the mediator between the enquiring child and the cultural tools and sign systems developed as part of our social history. In the present study the illustrations in children's narratives seem to fit well with Vygotsky's notion of symbol systems and cultural tools. Hence, the pictures and accompanying text might be seen as the cultural means by which the adults in our study seem to have guided the thinking of the children in the control group.

Based on Vygotsky's theory, a mediated learning experience (Feuerstein, 1980), involves someone helping a child without directly teaching a lesson. Teachers can create a mediated learning experience by structuring the situation so that they allow children to actively make connections, thereby having insights by themselves. In the control group in the present study, the adult readers jointly attended to the pictures with the child, albeit without explicit metacognitive language, and the results show that this allowed the children to make the inferences needed to interpret the pictures in terms of a representational understanding of mind.

But why did the control group significantly outperform the experimental group in the false-belief explanation battery? Embedded within Vygotsky's socio-cultural theory is constructivism, a psychological theory of knowing, in which the learner is conceived of as an active sense maker (Mayer, 2001) creating knowledge by integrating new situations with past experiences. Vygotsky, as well as Dewey (1912, 1916) and Piaget (1969, 1972), emphasize the child's cognitive activity, as distinct from passivity, as the major impetus for learning. As Wittrock (1981) states, the teaching of information does not automatically lead to learning. In the present study, the experimental group heard numerous instances of metacognitive terms in the form of statements such as Toby's "mother thinks he is in the bed. She doesn't know that he's under the bed," but learning is a constructive, effortful process where the learner actively reorganizes perceptions and makes inferences. It may be that the children in the experimental group were not sufficiently required to be active sense-makers. The texts provided all the information. Meaning was imposed from without.

In the control group, on the other hand, children had to construct their own understanding and explanation for the odd fact that Toby's mother is searching for Toby *in* the bed when the child can clearly see that Toby is hiding *under* the bed. The implicit mentalistic concepts in the text and illustrations may have provided an optimal level of scaffolding to challenge the listeners to make inferences such as not seeing Toby in the physical world and, therefore, not knowing in the mental world. These inferences lead to an understanding that may be all the deeper because the children had to strive to infer meaning. Ironically, the more direct, explicit condition may have produced less conceptual development precisely because it was explicit.

Finally, with regard to constructivism, this result is supported by recent research in early childhood education which shows that school achievement and interpersonal understanding are significantly higher among pre-schoolers from constructivist classrooms than those in more didactic Kindergarten settings (DeVries, Reese-Learned, Morgan, 1991; Golbeck, 2001).

To now focus on the second question of the study, whether it is possible to help children understand and acquire a lexicon of metacognitive terms: The experimental group children, who heard dramatically increased numbers of metacognitive terms in stories, produced more of such metacognitive language in their post-test storytelling, both in terms of types and tokens. The control group did not improve over time. However, while the experimental group increased the number of metacognitive terms used, Nelson (1996) has written about "use before meaning," that is, the need for the child to "re-parse" the world conceptually in response to learning words (Nelson & Kessler Shaw, 2002). The children in the present study may have been using these abstract terms without a complete understanding of them because scores on the metacognitive term comprehension test did not improve. According to Nelson and Kessler Shaw's (2002) three levels of conceptual understanding, the highest level is what they refer to as "sense," that is an ability to differentiate related terms within a domain, such as "I don't *know*. I *think* maybe it was my favorite color" (p. 50). Below this understanding is that of *denotation*, such as "I *thought* it was a real ghost, but it wasn't" (p. 49). At this level there is the implication of conceptual knowledge but without connection to related conceptual terms. While it could be argued that the metacognitive term comprehension test used in this study was at the highest level of differentiation and was, therefore, a particularly stringent measure of vocabulary comprehension, in examining the experimental group's vocabulary production in their story telling, none of the terms were at even the denotation level. While it is difficult to judge appropriate use in young children's open-ended, and therefore, imaginative stories, some of the terms did not even seem to be used appropriately, as in "One day a little boy see a wolf. He *think* he see him and he look at him. He said, 'Hello, what's your name? My name is little boy.' The little boy sat on the wolf and ride on him..."

In Scarborough and Dobrich's (1994) review of more than three decades of empirical research on parental reading to preschoolers, they discovered "that the notion that reading to preschoolers makes an important contribution to literacy development has usually been accepted uncritically.. (but) the evidence in support of this assumption was not as strong or consistent as we expected it to be" (p. 247). Indeed, the present study was similar to many of the (usually longer) interventions reviewed by Scarborough and Dobrich in that there was no improvement in general language scores for either group. However, there was a very significant improvement for both groups in their conceptual understanding that people may have different representations or perspectives in the face of a conflicting experience, both in their predictions and their explanations of scenarios involving a character with a false belief. It seems that intense reading to children from low SES areas, while not helping their general language ability, may have helped them build a representational understanding of the characters' knowledge states, an important conceptual development not usually assessed in literacy studies.

Dramatic tension in stories is created when the various characters have disparate knowledge with regard to the action. This may be through error: The reader knows that Romeo does not know that Juliet lies drugged, not dead. Or it may be through deception: Pretending his assigned chore is an adventure, Tom Sawyer tricks his friends into whitewashing the fence. To perceive this tension, one must appreciate the story on what Bruner (1986, 1990) calls the plane of consciousness as well as the plane of action. The one landscape is the action; the other is the

character's perception or misperception of the action. Reading intensely to these children may have helped many of them begin to synchronize these two landscapes. Indeed, an explanation for why reading intervention studies appear not to have had the expected effect on literacy development, may lie in the instruments that have previously been used to assess story understanding. The false-belief explanation battery developed for the present study, in which children had to show an understanding that Michael is looking under the sofa for his kitten because he does not know that it ran into the kitchen, or that Jenny is happy because she doesn't know that her brother has eaten all her chocolates, may be a more valid measure of the developing understanding of this important narrative function (Propp, 1968).

As discussed previously, the focus of this study was on the performance of those who received explicit metacognitive language as compared to those who did not, and while it would have been useful to have had a second control group, this was superseded by the need to have strict restraints on participation. When the first control group made such unexpectedly huge gains in predicting and, particularly, explaining false beliefs, attributing the success to intensive reading of picture books, without a second control group, has to be somewhat tentative. This is part of the price of attempting fairly naturalistic intervention research in the classroom. As Berliner (2002) recently noted, only partly tongue-in-cheek, in research the important distinction is not between the hard and soft sciences, but between the hard and the easy sciences, that is, the hard-to-do versus easy-to-do sciences. And he describes classroom interventions, with all its hard-to-control human variables, as the hardest-to-do science of them all. However, if theory-of-mind research is to be relevant in the real world, we need to begin to move from the laboratory to the classrooms, with all the risks it entails. This study was designed so that it could have implications in the real world. Reading picture books to 4-year-olds is a common activity in Kindergarten and often at home. Future research is required to confirm that intensive reading of picture books to low SES children increases their conceptual understanding of beliefs more than for a group who experience, for instance, child-adult interactions using number games.

In conclusion, the study has shown that enriching picture books with explicit metacognitive verbs does not result in a greater conceptual understanding of the mediating role of beliefs in behaviour. The results do not justify assigning a privileged position to explicit metacognitive vocabulary (Olson, 1994). Indeed, in light of the finding that the control group's performance on the false-belief explanation task exceeded that of the experimental group, it may be that they acquired a deeper understanding because they had to actively construct their own mentalistic interpretation of the stories. It seems that children are not passive recipients of mentalistic concepts, but rather actively involved in their construction. Finally, children who heard large numbers of metacognitive terms use more of these abstract terms when telling a story, but increased understanding of this vocabulary did not accompany increased production.

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Appendix A

First four pages of text from Control and Experimental group versions of "Toby, where are you?" (metacognitive terms italicized for present purposes only).

Page	Control group - implicit	Experimental group – explicit
1	Toby is hiding from his mother and father. He has taken his puppet hen with him under the bed.	Toby <i>decides</i> to hide from his mother and father. He <i>thinks</i> , "If I'm very quiet they won't <i>know</i> where I am."
2	Toby's father looks for Toby in the toy box. He does not find Toby there.	His father <i>remembers</i> , last time Toby hid in the toy box. Perhaps he's hiding there again.
3	Toby's mother looks for Toby under the sheets. She does not find Toby there either.	His mother <i>thinks</i> he is in the bed. She doesn't <i>know</i> that he's under the bed.
4	Toby's mother and father call out Toby's name. Where could he possibly be? They'll just have to keep looking.	"Is he in the living room?" <i>wonders</i> Toby's mother. "Or maybe he's in the kitchen." Toby's father says, "I can <i>figure out</i> where he is..."

Appendix B

Metacognitive Comprehension Test

1. Now John takes a bag of jelly beans out of the cupboard. In the bag there are red ones, green ones and yellow ones. John says to Kate, "Shut your eyes and I'll give you one. Don't peek." Kate shuts her eyes tight and doesn't peek. John takes a jelly bean out of the bag. Kate can't see it. John says to Kate, "What colour is it?" Kate says, "It's...er...a yellow one." Now listen carefully, I told you Kate couldn't see the jellybean. Does Kate really *know* it's a yellow one or is she just *guessing*?
2. The next day it's raining and Kate puts on her rain hat to go to her friend's house. When she gets to her friend's house she puts her wet hat on the heater to dry. Later, Kate goes home. It's now sunny outside and Kate leaves her hat behind at her friend's house. Kate's mom asks her, "Where is your hat?" Kate says, "Uh oh! It's on the heater at my friend's house." Does Kate *remember* that her hat is at her friend's house or does she *wonder* if her hat is at her friend's house?
3. The next day John's in the kitchen with his bag of jelly beans. Kate says to John, "Shut your eyes and I'll hide a jelly bean for you." John shuts his eyes. He doesn't peek. Kate hides the jelly bean in the fruit bowl. Kate says to John, "Open your eyes. The jelly bean is in the cookie tin or in the fruit bowl." John looks in the cookie tin. It's all empty. There's nothing in it. John says, "The jelly bean must be in the fruit bowl." Does John *figure out* that the jelly bean is in the fruit bowl, or does he *guess* that the jelly bean is in the fruit bowl?
4. Then it's time for Kate and John to go to school. The teacher begins the lesson. She says, "First, you need to trace the circle and then you need to cut it out." The kids listen to the teacher. Then the kids trace their circles and cut them out. Do the kids *forget* how to do it or do the kids *understand* how to do it?
5. Now all the kids go outside to play. Kate and John play hide and go seek. Kate closes her eyes and starts to count "1, 2, 3..." She doesn't peek. John hides behind the tree. Kate doesn't see where he hides. When she's finished counting she says, "Here I come, ready or not." Kate goes and looks for John behind the shed. Does Kate *think* John is behind the shed or does Kate *remember* John is behind the shed?
6. There's a new kid on the playground. John says, "Hi, what's your name?" The new kid says his name is Daniel. When John gets home he says to his dad, "There was a new kid at school today." Dad asks, "What's his name?" John says, "Er...er..." John couldn't tell Dad the new kid's name. Does John *figure out* the new kid's name or does he *forget* the new kid's name?
7. Now it's bedtime and tomorrow it will be John's birthday. John looks in the closet and sees a birthday present all wrapped up with his name on it. John says, "Maybe this present is a new baseball glove, or maybe it's a football, or maybe it's a new toy truck." Does John *understand* what the present is or does he *wonder* what the present is?
8. Then Dad comes into the room and says, "OK. It's time for bed. If it's sunny tomorrow, we'll go to the park." In the morning John gets out of bed and looks out the window. He sees the rain pouring down. "Oh no," says John, "Look at that! We won't be going to the park today." Does John *know* it's raining or does he *think* it's raining?

Table 1
Means and Standard Deviation for All Variables by Group

	Experimental (n=24)		Control (n=24)	
	Mean	SD	Mean	SD
Age in months at pretest	53.38	3.39	54.87	3.15
Number of times books read at home	28.75	20.29	30.00	21.70
Number of times books read at school	44.25	3.60	42.71	5.22
General language/ pretest	50.79	5.65	51.25	5.80
General language/ post-test	51.04	4.28	50.87	5.85
False-belief prediction/ pretest	.83	.87	.71	.75
False-belief prediction/ post-test	1.79	1.35	1.54	1.14
False-belief explanation/ pretest	.81	1.80	.91	1.11
False-belief explanation/ post-test	1.16	2.06	1.94	1.51
Metacog comprehension pretest	2.58	1.72	2.58	2.08
Metacog comprehension post-test	3.33	2.62	2.67	2.48
Storytelling Metacog types pre-test	.04	.20	.37	.65
Storytelling Metacog types post-test	.33	.56	.29	.62
Storytelling Metacog tokens pre-test	.04	.20	.50	.98
Storytelling Metacog tokens post-test	.46	.88	.38	.82
Storytelling total words pre-test	104.67	104.89	77.58	60.92
Storytelling total words post-test	80.71	68.97	62.42	53.54