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# Narrative Understanding and Theory of Mind in Preschoolers

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Running Head: Narrative Understanding and Theory of Mind in Preschoolers

Narrative Understanding and Theory of Mind in Preschoolers

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## Abstract

Social cognitive development is a phenomenon psychologists have studied for many years. Recent studies have focused on children's understanding of a theory of mind, that is, understanding what it means to say that someone thinks, believes, or knows something. In other words, a theory of mind represents an understanding of epistemic mental states that humans use to describe, predict, and explain behavior (Baron-Cohen, 1996).

The present study examined the relation between a developing theory of mind and language ability, by specifically examining changes in children's understanding of the feelings, thoughts, and actions of storybook characters. Children (n=21; aged 34 to 60 months) were given pre-tests and a post-test involving false belief tasks, deception tasks, and language comprehension, in order to detect differences in individual scores before and after children were read 14 different stories rich in mental state situations. These readings occurred over a 4-5 week period at the child's day care center or nursery school. The storybook sessions were taped in order to examine trends and patterns in the children's developing theory of mind. These data were collected as part of a larger study examining the impact of cumulative experiences with mental-state rich narratives on false belief understanding where preliminary analyses indicated that overall, scores improved from pre-test to post-test (n=38). In the present study, "correct" responses to questions elicited from the children during the storybook readings were assessed for three types of questions: The definitions and description of mental state phenomena, reality understanding, and explanations of mental-state related behaviors. Numbers of correct

responses to these three question types were examined with respect to children's performance on the language and theory of mind measures.

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## Narrative Understanding and Theory of Mind in Preschoolers

Acquisition of folk psychological or “common-sense” principles of the mind requires a theory that human action is a consequence of mental states such as thoughts, beliefs, desires, and intentions (Frye & Moore, 1991; Knoll & Charman, 2000). A theory of mind is a system for inferring the full range of mental states in self and others from behavior (Baron-Cohen, 1996; Whiten, 1994). A theory of mind is vital to acquire because if one can accurately assess another individual’s thoughts and feelings, one is better able to understand, interpret, and predict that person’s actions and behaviors (Ritblatt, 2000; Watson, Wilson, Nixon, & Capage, 1999).

While all normal human adults have this theory, individuals are not born with it. Investigations of the development of a theory of mind began because of a controversial study in which chimpanzee understanding of mental states was being compared to that of children (Premack & Woodruff, 1978). While the chimps did not show the ability to infer mental states from behavior, children were found to incorporate mental state understanding into knowledge about behavior at approximately age four (Astington & Gopnik, 1991; Knoll & Charman 2000; Bower, 1993). Although most research supports this development trajectory, there are still many questions about how a theory of mind is acquired. The purpose of the present study was to examine three- and four-year old children’s increasing understanding of theory of mind concepts. Children’s behavior during storybook reading sessions with an adult, who provided a great deal of information about the mental state-behavior relations present in the story (in the form of elaborations and questions), was assessed.

## Background

Since Premack and Woodruff's groundbreaking study with primates, the main test of a theory of mind in children assesses an understanding of false belief. Understanding false beliefs implies that an individual has the ability to distinguish unambiguously between their own current (true) belief and a different (false) belief they themselves held earlier, or a different (false) belief that another individual holds (Dennett, 1978). In order to test this understanding, multiple simple tasks have been developed. For example, in the "unexpected contents" task, a child is shown a tube of Smarties (a type of candy) and asked to state the contents of the tube. After the child answers, the true and surprising contents (a pencil) are revealed. The lid is then replaced and the child is asked what they thought was inside when they first saw the tube (a question about a false belief the self had) and what a classmate would say was in the tube were it to be shown to them (a question about a false belief another person has). In this task, the critical test questions determine whether the child can recall their prior (and now overtaken) belief about the tube's contents, and whether they can override their own current knowledge state to predict what someone else would believe about the tube's contents. Three-year-olds have difficulties reasoning about false beliefs, but four-year-olds perform well on these tasks (Perner, Leekam, & Wimmer, 1987).

Other types of appearance-reality distinctions have also been utilized in arrangements of false beliefs. For example, Harris and Gross (1988) demonstrated that young children are unable to acknowledge that a sponge can look like a rock and that someone who is smiling could actually feel unhappy. That is, the younger children can

not acknowledge the distinction between real and apparent substances and real and apparent emotion. They seemed to be unable to appreciate that an object can look like one thing, but really be something else, or that the way in which emotion is experienced can be different than how it is expressed (Mitchell, 1997). Older children can easily make these discriminations.

Advances in language development must certainly be critical to these age differences, even if only because false belief tasks involve complex language. Language ability is, in fact, associated with development in this domain. In a longitudinal study, language ability at 24 months accurately predicted false belief understanding at 48 months (Watson, Painter, & Bornstein, 2001). At 24 months, children were given a structured language assessment, the Reynell Developmental Language Scales-Revised (Reynell & Huntley, 1985). Then, measures of verbal intelligence and false belief were taken within a month of each child's fourth birthday. Results indicated that both the early language factor score and the 48-month verbal IQ were positively correlated with 48-month false belief understanding. However, above and beyond language skill, environmental factors that create situations in which concepts relating to a theory of mind might be learned are also important to consider in attempting to understand the developmental transition in theory of mind that takes place during preschool years.

Family variables, for example, number of siblings, are associated with a child's theory of mind (Astington, 2001; Jenkins & Astington, 1996; Perner, Ruffman, & Leekam, 1994). This finding suggests that children from larger families have more opportunity to engage in the types of social interactions that contain information about

mental concepts. Contrasting perspectives, such as responsibility for wrongful actions and cooperative play, occur more frequently in larger families. In addition, the child's social behavior, or talk about feeling states and the amount of cooperation he/she has with siblings, assessed in the second year, accurately predicts performance on false belief task in the third year (Watson et al., 1999). Similarly, social interactions with peers in the school setting are also associated with false-belief understanding. Specifically, behaviors observed during a pretend play session with peers such as joint proposals for false pretense (e.g., "Let's make cookies") and the explicit assignment of roles (e.g., "You be the mommy") were positively correlated with theory of mind understanding (Astington & Jenkins, 1995).

Children's experiences with narrative in the form of storybook reading may be another place where theory of mind concepts are learned (Charman & Schmueli-Goetz, 1998; Lewis, Freeman, Hagestadt, & Douglas, 1994). All narrative involves a great deal of discussion about why people are doing the things they are doing based on their mental states. For example, it is uninteresting to know that Papa is going up to the attic to make a costume out of an old sheet. This behavior, however, comes alive when the reader realizes that Papa Bear is doing this act with the intention to scare the cub scouts on their camping trip. The world of stories, like the world of family, might be a means through which children develop, practice, and redescribe theory of mind concepts to more complex levels (Ferryhough, 1998; Karmiloff-Smith, 1995). Improvement in false belief understanding through enhanced exposure to theory of mind concepts in the naturalistic setting of storybook reading has been demonstrated. Guajardo and Watson (2002) found

that with a sufficient sample size, individual training and adequate inclusion criterion, training in multiple scripted discussions about false beliefs, deception, and appearance-reality during storybook reading sessions led to improvements in performance on measures of false belief and deception. Furthermore, while scores on the theory of mind tasks of both training and a no training groups improved across time, the training group improved significantly more than the no training condition.

The purpose of this study was to broaden our understanding of the development of theory of mind by gaining a better understanding of what happens during storybook reading sessions like those used in Guajardo and Watson (2002). This study examined the verbal behavior of children during multiple storybook reading sessions. Children's responses to questions about concepts related to a theory of mind, such as appearance-reality and deception, were examined (e.g., "Did Mrs. Moore *really* see a suit?" and "*Why* is the boy wearing a disguise?"). The changes in the ability to correctly answer these questions were examined in relation to pre- and post-test scores on several theory of mind measures, as well as each child's level of language ability. Based on previous research, we expected language ability to strongly predict theory of mind ability. We hypothesized that improvement in children's ability to correctly answer questions about concepts related to theory of mind will predict improvement from pre-test to post-test.

## Method

### *Participants*

Twenty-one 3- to 4-year-old participants were drawn from a larger data set ( $N = 38$ ) for the purpose of this study. The children were predominantly white, and from middle class families in three pre-schools in a medium-size, midwestern city. Thirteen girls (mean age of 47.31 months) and eight boys (mean age of 48.25 months) participated. Specifics have been omitted for purposes of confidentiality.

### *Design*

The current study included a pre-test, a post-test, and a training session in between. The mean amount of time for each child between the pre-test and post-test was 46.29 days (24-96,  $SD = 26.6$ ). Several trained, college-age students conducted the pre-test, post-test, and training for each child to guarantee that any changes in the children's performance on the measures from pre-test to post-test were not related to familiarity between the examiner and the participant. Training sessions were all audio-taped and then transcribed in order to ensure accuracy and reliability. The examiner recorded children's responses on the pre- and post-tests at the time of assessment.

### *Pretest*

Prior to conducting the training sessions, the children were pre-tested on three measures of false belief, two deception tasks, and a language assessment. A description of each measure follows. Children were tested individually on two separate occasions in a quiet part of their school. During one 10-20 minute session, the children received the

language measure, and during a second 10-15 minute session, they received the theory of mind measures.

*False Belief Assessment.* Children's theory of mind was assessed during the pre- and post-tests using the following tasks. The first false belief task is the "change in location" task, in which the children were told a story about Maxi and her mother (for girls; for boys, it was Max and his mother). The story was acted out for each child with small dolls and replica objects. In the story, Maxi and her mother return from the grocery store and put the chocolate they bought in the cupboard. Then, while Maxi is out of the room, her Mother moves the chocolate from the cupboard to the green cupboard. Before asking the children the test questions, the experimenter asked them three unscored comprehension questions to ensure that they understood the story: (a) "Where did the chocolate used to be?" (b) "Where is the chocolate now?" and (c) "Did Maxi see the chocolate being moved?" If the children answered any of these questions incorrectly, they were corrected. Next, the children were asked to answer two test questions: (a) "Where will Maxi think the chocolate is when she comes back?" and (b) "Where will Maxi first look for the chocolate when she comes back?" The correct response to the question was "The blue cupboard." After the children had been told the story of Maxi and asked the previous test questions, the experimenter asked them to consider another possibility. In this "deception task" scenario, Maxi is trying to deceive her sister, who wants the chocolate. For the test question, the children were asked, "Where will Maxi tell her sister the chocolate is?" Children received a score of 1 for a correct response of "the green cupboard" and a score of 0 for the incorrect response, "the blue cupboard."

Next, the experimenter gave the second false belief task, the “unexpected contents-representational change” task, which asked the children questions concerning their understanding of their own representational change, using an unexpected contents task (Lewis & Osborne, 1990). Children were shown a Band-Aid box and asked, “What do you think is inside the box?” Then, they were shown the contents of the box, a toy car. Next, the box was closed, and the experimenter asked the children the first test question: “What do you think *was* in the box?” If the children responded that they thought Band-Aids were in the box, they received a score of 2. If the children did not answer the first question correctly, the experimenter provided a prompt: “What did you think was in the box *before* I took the top off?” If the children answered the prompt question correctly (e.g. they thought the Band-Aids were in the box), they received a score of 1. If the children answered both questions incorrectly, they received a score of 0. Following the test questions, the experimenter asked the children a memory question—“Can you remember what is inside the box?”—in order to affirm that they remembered the inside of the box.

The second part of the unexpected contents task included the third false belief task, the “unexpected contents-explanation” task, in which the children were shown the same Band-Aid box and a similar unmarked box containing Band-Aids. Following the procedure of Bartsch and Wellman (1989), the experimenter showed the children a doll named Maxi (or Max) and told them that she has a cut, and wants a Band-Aid. The doll then approached the actual Band-Aid box, and the children were asked the critical test question: “Why do you think she is looking in there?” Children who gave the correct

response (Maxi looked in the Band-Aid box because she *thought* it contained Band-Aids) received a score of 2. If the children either did not respond or did not mention beliefs, the experimenter provided a response. Children who answered both questions incorrectly received a score of 0. Finally, the experimenter asked the children an unscored reality question: “Are the Band-Aids there really?” to ensure that they recalled the true contents of the box.

In the second deception task, the “change in location and deception,” the children were led through a task that involved actively deceiving a character (Lalonde & Chandler, 1995). They were again introduced to a doll named Maxi (or Max) and then were told that John knows there was candy in the green drawer but that he has to leave the room for a while. While John was “gone” the experimenter told the children, “Let’s play a trick on John. Let’s move the candy to the blue drawer.” After the children moved the candy to the blue drawer, they were asked two test questions: (a) “Where will John think the candy is?” and (b) “When John comes back into the room, where will he first look for the candy?” Children received a score of 1 for each correct response of “the green drawer” and a score of 0 for each incorrect response, “the blue drawer” (Guajardo & Watson, 2002) (See Appendix A for Sample Pre-test).

*Language.* Previous research indicates that language comprehension is correlated with theory of mind performance and therefore needs to be controlled for in assessing relations between pre-tests, post-tests, and data collected during training (e.g., Astington & Jenkins, 1995). The Test for the Auditory Comprehension of Language-Revised consists of three sub-scales assessing various aspects of verbal ability (word

comprehension, morphology, and sentence comprehension) (TACL-R; Carrow-Woolfolk, 1985). All three sub-scales were administered to each child. For each item, the experimenter read a word, a group of words, or a sentence to the child and instructed the child to point to one of three pictures that best corresponded to the experimenter's utterance. Standard scoring procedures were used.

### *Storybook Reading*

Upon completion of the pre-test, children participated in 14 audiotaped bookreading sessions across five weeks. Each session involved the reading of a storybook to the child by the experimenter. Two storybook orders were used—one for the first data collection period and one for the second data collection period, in order to assure that change in scores was not related to the storybook order. During the session, the experimenter asked questions pertaining to the character's thoughts and actions using a story script for each story. The children's books and accompanying scripts contained multiple references to theory of mind concepts—similar to those tested for in the pre- and post-test (Cassidy et al., 1998). Trained research assistants administered these sessions.

Before the start of each session, the child was asked if he or she wanted to participate in the story-telling session and told that they had the option of stopping at any time. Children were also told that they would be asked some questions regarding the stories throughout the session.

Each story was specifically chosen to reflect some aspect of theory of mind. For example, *The Berenstain Bears in the Dark* book centers around a series of appearance-reality situations, which require theory of mind reasoning. This story is about cubs that

are afraid of the dark because they imagine things that are not true. Throughout the story, theory of mind concepts is highlighted through a prepared script. Some comments include, “In the attic, Sister thought things looked like scary shapes, but then she knew it was just some old tools” and “So we make believe that things in the dark are scary things, but they aren’t really. We make up things in our mind that aren’t real.” Other stories asked about false belief or deception. Children’s responses to these comments and questions in the scripts are coded as definition, reality understanding, and mental state understanding, as used in Guajardo and Watson (in press). A full list of stories and a sample script is included in Appendix B.

### *Post-Test*

Children were tested on the same false belief, appearance-reality, and deception tasks that were used for the pre-test. However, all tasks were modified to include use of different specific items to each scenario. For example, in the unexpected contents/representational change task, a toy boat rather than a toy car was used.

### *Transcription*

Once all the data tapes were collected, the researcher and assistants listened to all the storybook training session tapes and transcribed them onto a Microsoft Word template. Initially, each file was separated by participant. Later, the data was organized by each of the fourteen stories. Once this was complete, every individual question from the storybook script was coded into one of three question types: definition questions (e.g.

“Do you remember what a trick is?” & “What is an imagination?”), reality understanding questions (e.g. “Did Ms. Moore really see a suit?” & “Who is wearing the disguise now?”) and mental state understanding questions (e.g. “Why did the little boy wear the disguise?” & “Why did he say the suit was super?”) (A sample of coding is found in Appendix B). There were a total of 131 questions within the fourteen storybook scripts, broken down into thirteen definition questions, fifty-six reality understanding questions, and sixty-two mental state understanding questions.

In order to check the reliability of the coding manual, all of the questions were given to a research assistant to code. The inter-rater reliability for the coding manual was 93.08%. In order to figure this percent accuracy, a research assistant was given all of the scripts for the stories and asked to designate each question as a definition, reality understanding, or mental state understanding question. Then, the coding manual was compared to the answers the research assistant deemed as correct.

## Results

Table 1 shows the mean performance by gender on the major variables. The only variable that was significantly different by gender was the TACL-R score, which was expected because girls, in this age range, usually show advanced language ability compared to boys (Bornstein & Haynes, 1998). Therefore, all further analyses were collapsed across gender.

Test scores significantly improved from the pre-test ( $M = 2.33$ ,  $SD = 1.49$ , range = 0 to 6) to the post-test ( $M = 3.95$ ,  $SD = 1.83$ , range = 1 to 7),  $F(1,20) = 18.68$ ,  $p < .001$ ,

$\eta^2 = .48$ , replicating Guajardo and Watson's (2001) findings, which showed that the storybook training session improves children's theory of mind skills compared to changes in pre- and post-test scores for children who have not had training.

Percent correct responding to the training questions embedded in the stories was analyzed by type: definition, reality understanding, and mental state understanding. There was an effect of question type in correct responding ( $F(1,20) = 66.12, p < .01$ ). Post hoc tests revealed that definition questions were harder to answer correctly (13% correct) than reality understanding (44.7%) or mental state understanding (36.6%) questions ( $p < .001$ ) and mental state understanding questions were harder to answer correctly than reality understanding questions ( $p < .01$ ).

In order to assess differences from the beginning to the end of training in percent correct responding to the embedded questions, a 3 x 2 repeated measures ANOVA was conducted involving the three types of questions and correct responding to the first four and last four stories (See Table 2). There was a main effect of question type utilizing the data from the first and last four story questions, replicating the previous analyses with answers to all questions used,  $F(2,19) = 22.83, p < .001$ . However, there was also an interaction effect (question type x first four/last four percent correct),  $F(2,19) = 20.83, p < .001$ , and post hoc tests revealed that there was only a significant change from the first four questions to the last four questions for definition questions ( $t(20) = -2.36, p < .05$ , for the percent correct definition;  $t(20) = -.039, n.s.$  for the percent correct reality understanding;  $t(20) = -.71, n.s.$  for the percent correct mental state understanding).

Table 3 shows the correlation matrix for TACL-R, pre-test, and post-test. All variables are correlated with one another, which indicates that the pre- and post-test are good measures for measuring the change in theory of mind. In addition, the TACL-R score is correlated to the post-test, but not the pre-test, which is fairly consistent with previous research.

Table 4 shows the correlations of the three main assessments in the pre- and post-testing with the total correct answers per question type in the storybook reading sessions. The correlations between the theory of mind pre- and post-test scores and the three question types are all significant, which illustrates that correct responding to the story questions and the tests were related ( $p < .05$ ). The language assessment, TACL-R, was only significantly correlated to correct responding to the definition questions. Based upon previous research, it was hypothesized that the language scores would be related to all of the question types because all question types reflect specific theory of mind concepts.

We wanted to investigate if the change from the beginning of the training to the end of training was associated with the ToM change (change in score from pre- to post-test). Therefore, a computation of the change in percent correct responding between the first four and last four stories was done. Table 5 shows the correlations between change in percent correct responding to each question type with age, language ability, and pre- to post-test theory of mind task change. Both age and TACL-R scores were significantly associated with change for the reality understanding questions, and marginally significant

with the definition questions, and none of the other correlations were significant. Change in the theory of mind scores were not significant to any question type.

### Discussion

Guajardo and Watson (2002) found that children do improve on theory of mind tasks from pre- to post-test in the training session compared to a non-training control group. The results of the present study also found that mean scores from pre-test to post-test changed significantly and additionally, the mean percent correct responses increased from the first four stories to the last four stories for one of the question types (definition). In other words, the results of the present study indicate that participation in discussions of mental-state behavior relations within the context of narrative was linked to improvements in both the ability to answer some questions during the reading sessions and in performance on theory of mind tests. However, change scores from theory of mind pre- to post-test were not significantly correlated with change scores in total percent correct responding to questions (collapsed across question type) from the first stories to the last four stories. Clearly, the storybook training session was effective, as evidenced by the significant change in pre- to post-test scores. Unfortunately, we were unsuccessful in tracking learning within the training session. Our hypothesis, that pre-test to post-test scores would be reflected in our measure of child behavior during the training sessions, namely, the percent correct scores on the three question types, was not strongly supported.

We did see a significant change over reading sessions in the definition questions. Therefore, the definition may have been a better assessment of theory of mind understanding than the reality understanding and mental state understanding questions. This idea is supported by the fact that only the definition questions were linked to language. This is a surprising finding because it is contrary to previous findings, which have shown the link between language and theory of mind ability (Watson et al., 1999; Watson, Bornstein, & Painter, 2001; Astington et al., 2001). The difference in correct responding to definition questions versus reality understanding and mental state understanding may mean that the definition questions may be a more sensitive measure. Reality understanding questions and mental state understanding questions may not have been a good measure of theory of mind because children may have been able to simply repeat what was just heard in the story or use the picture to answer the question. This is vital to examine further because if this was, in fact, taking place, then the latter two question types were ineffective in testing theory of mind. On the other hand, definition questions required the children to engage in critical thinking and produce an original answer. In fact, previous research has specifically linked the correct use of mental state terms in naturalistic language samples with performance on the theory of mind false belief tasks (Moore & Furrow). Perhaps the inclusion of additional definition questions would have been beneficial since it seemed to be a more sensitive measure. Therefore, further investigation into what types of question probes might reflect learning should be conducted.

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For future research, some changes in the method could help to determine how the theory of mind changes are associated to the pre- to post-test change. First, the storybook reading sessions were only audiotaped because it was the most efficient way for researchers to go from school to school on a fairly regular basis. If the storybook sessions were videotaped, researchers would be able to investigate nonverbal cues of cognitive learning that the researcher may have otherwise not noticed. Specifically, a video tape could be examined for evidence of the child showing joint attention, looking at the reader, and pointing to specific parts of pictures in the storybook. Looking at these levels of engagement may help to determine measures that would more accurately coincide with individual differences in pre- to post-test changes. Perhaps the children who showed the most change in their pre- to post-test scores were the children who were paying close attention to both the story and the researcher for the majority of the time. The videotape would help to determine if the child was in fact, paying attention, and therefore benefiting from the storybook training, or if he/she was simply hearing the story and not necessarily listening actively.

In conclusion, the present study supported, but did not extend previous research on understanding mental state concepts in theory of mind development. Additional research including more examination of type of knowledge probe question and evaluation of attention behaviors during the training sessions is suggested.

Table 1

*Means (ranges and standard deviations in parentheses) and T-tests of Variables by Gender (N=21)*

<u>Variable</u>	<u>Girls</u>	<u>Boys</u>	<u>t-tests</u>
Age	47.31 (34-60, 7.72)	48.25 (39-57, 5.99)	$t(19) = -.29$
TACL-R	53.00 (33-87, 14.96)	36.00 (9-66, 18.02)	$t(19) = 2.34 *$
ToM Pre-test	2.38 (1-6, 1.66)	2.25 (0-4, 1.28)	$t(19) = .20$
ToM Post-test	4.23 (1-7, 1.83)	3.50 (1-7, 1.85)	$t(19) = .88$
Definition (% Correct)	14.79 (0-46, 13.12)	10.58 (0-23, 8.16)	$t(19) = .81$
Reality (% Correct)	46.70 (14-70, 17.90)	40.85 (20-71, 16.85)	$t(19) = .74$
Mental State (% Correct)	38.09 (11-68, 17.71)	33.27 (24-61, 12.07)	$t(19) = .68$

Table 2

*Mean percent correct responses by question type for two methods of comparison*

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	<u>First Four Stories</u>	<u>Last Four Stories</u>
Definition	9.52	18.1
Reality Understanding	51.50	51.76
Mental State Understanding	34.9	38.6

Table 3

*Correlation Matrix of the Three Main Assessments (N = 21)*

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	<u>TACL-R</u>	<u>Pre-test</u>	<u>Post-test</u>
TACL-R	-	.34	.59**
Pre-test	.34	-	.48*
Post-test	.59**	.48	-

\* Significant at the 0.05 level (1-tailed)

\*\* Significant at the 0.01 level (1-tailed)

Table 4

*Correlation of Question Types to Assessments*


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	<u>Total Definition</u>	<u>Total Reality</u>	<u>Total Mental State</u>
TACL-R	.553*	.144	.354
Pre-test	.405*	.402*	.504**
Post-Test	.509*	.467*	.429*

\* Significant (one-tailed) at  $p < .05$

\*\*Significant (one-tailed) at  $p < .005$

Table 5

*Correlation of Percent Correct Responding Change (by Question Type) to Other Variables*

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	<u>Age</u>	<u>TACL-R Score</u>	<u>ToM Change</u>
Definition	.25	.31	-.07
Reality	.55*	.55**	.18
Mental State	.03	-.09	-.17

\*Significant (two-tailed) at  $p < .05$

\*\*Significant (two-tailed) at  $p < .01$

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## Appendix A: Theory of Mind Pre-Test for Girls

## UNEXPECTED CHANGE IN LOCATION TASK (Girl)

Subject # \_\_\_\_\_

Date \_\_\_\_\_

Experimenter \_\_\_\_\_

score \_\_\_\_\_

[girl doll present representing Maxi waiting for her mother; kitchen cabinet on table]

Maxi's mom comes back from the grocery store. She bought a chocolate cake. Maxi helps her put away the things and she asks her mom where she should put the cake. "In the blue cabinet," her mom says.

Maxi puts the chocolate cake into the blue cabinet.

[Place miniature chocolate cake in the blue cabinet.]

Maxi decides to go to the playground. But she remembers exactly where she put the chocolate cake so she can come back and get some later. She loves chocolate cake. Then she leaves for the playground.

[The doll is removed.]

Maxi's mom also likes chocolate cake. She takes the cake out of the blue cabinet and gets a little bit of frosting on her finger for a taste. And then she does *not* put it back into the blue cabinet but into the red cabinet.

[Transfer chocolate cake to red from the blue cabinet to the red cabinet.]

Now Maxi's mom realizes that she forgot to buy eggs. So she goes to her neighbor for some eggs. Maxi back from the playground, hungry, and she wants to get some chocolate cake.

[Doll reappears.]

She still remembers where she put the chocolate cake.

## Control Questions:

- |   |      |     |
|---|------|-----|
| 1. Where did the chocolate cake used to be? | Blue | Red |
| 2. Where is it right now?                   | Blue | Red |
| 3. Did Maxi see it being moved?             | No   | Yes |

## Test Questions:

1. Where will Maxi first look for the chocolate cake when she comes back into the room?

Blue                      Red

DECEPTION TASK (Girl)

Subject # \_\_\_\_\_

Date \_\_\_\_\_

Experimenter \_\_\_\_\_

score \_\_\_\_\_

[Place a crayon box, a cereal box, and the appropriate doll on the table.]

Now let's do another story about Maxi. She took the cereal out of this cereal box and put it in this crayon box so that her brother Bruce would not find it.

[Show the child the cereal in the crayon box and the empty cereal box.]

Maxi does not want her brother to eat the cereal. When Bruce comes into the room he asks Maxi where the cereal is. Maxi decides to tell her brother something *completely wrong* so that her brother will *not* find the cereal.

Test Question:

1. Where will Maxi *say* the cereal is?

Cereal

Crayon

PROMPT (if answers cereal): Where is the cereal really?

Cereal

Crayon

UNEXPECTED CONTENTS-REPRESENTATIONAL CHANGE TASK (Girl)

Subject # \_\_\_\_\_

Date \_\_\_\_\_

Experimenter \_\_\_\_\_

score \_\_\_\_\_

[A Band-Aid box is placed on the table in front of the child.]

Look at this box. **What do you think is inside the box?**

Band-Aids      Other \_\_\_\_\_

Let's look inside. Look, there is a toy car in here. Imagine that, a Band-Aid box with a toy car inside!

[Close box.]

Test Questions:

1. **What did you think was in the box?**      Band-Aids      Other \_\_\_\_\_

If child answers incorrectly, prompt with: **What did you think was in the box *before* I opened it?**

Band-Aids      Other \_\_\_\_\_

If child answers correctly, ask **What's really inside the box?**

Band-Aids      Other \_\_\_\_\_

UNEXPECTED CONTENTS-EXPLANATION TASK (Girl)

Subject # \_\_\_\_\_

Date \_\_\_\_\_

Experimenter \_\_\_\_\_

score \_\_\_\_\_

[The Band-Aid box and a similar, solid colored box containing Band-Aids is placed on the table in front of the child.]

"Let's see what is inside of here. Look, there are Band-Aids in this box! There are Band-Aids in this box and a toy car in the Band-Aid box."

[Close both boxes. Place the boy doll on the table.]

"Look, here is Maxi again. Maxi has a cut. And she wants a Band-Aid."

[The doll then approaches the Band-Aid box and starts to open it, without revealing its contents.]

Test Question:

1. **Why is she looking in there?**

If child makes no reference to thoughts/beliefs, provide prompt: **What does Maxi think?**

Prompt if child answers correctly: **Are the Band-Aids there really?**

No      Yes

ACTIVE DECEPTION TASK (Girl)

Subject # \_\_\_\_\_  
Experimenter \_\_\_\_\_

Date \_\_\_\_\_

score \_\_\_\_\_

[The cupboard is set on the table along with boy doll. A bunch of grapes is contained in the green cabinet.]

Ok, now we're going to tell another story with Maxi. Maxi knows that there are grapes in the green cabinet.

[Show the child the grapes in the green cabinet.]

Maxi has to leave the room for a minute.

[Remove the doll.]

Let's play a trick on Maxi. Let's move the grapes to the *orange cabinet*.

[Have the child place the grapes in the orange cabinet.]

Control Questions:

- |                                     |        |       |
|-------------------------------------|--------|-------|
| 1. Where did the grapes used to be? | Orange | Green |
| 2. Where is it now?                 | Orange | Green |
| 3. Did Maxi see them being moved?   | Yes    | No    |

Test Questions:

1. **Where will Maxi first look for the grapes when she comes back into the room?**

Orange                      Green

2. If child answers correctly, ask: **Will she find the grapes there?**

Yes                              No

Appendix B: Theory of Mind Script

**Story:** Calmenson, S. (1989). The Principal's New Clothes. New York, NY: Scholastic, Inc.

**Topic:** Trickery

**Starting Question:** Do you remember what a trick is? (DEFINITION ?) Was there ever a time someone tricked you? What happened? Sometimes people trick us just to be funny, but sometimes they do it to be mean. Now we are going to hear a story about how some thieves tricked the principal of the school.

Pg. 4 - Do you know what a trickster is?(Someone who tricks people.) They are making Mr. Bundy think something that is not true. (DEFINITION ?)

Pg. 9 - Ivy and Moe are going to trick Principal Bundy. What are they going to do? (MENTAL STATE UNDERSTANDING ?)

Pg. 14 - Did Mrs. Moore really see a suit? (No) Why did she say the suit was beautiful? (So people would not think she is silly.) (REALITY UNDERSTANDING ?; MENTAL STATE UNDERSTANDING ?)

Pg. 21 - Did Roger really see a suit? (No) Why did he say the suit was super? (REALITY UNDERSTANDING?)

Pg. 23 - Did Principal Bundy really see the suit? (No) Why did he say the suit was fantastic? (REALITY UNDERSTANDING? ; MENTAL STATE UNDERSTANDING?)

Pg. 25 - See, Principal Bundy is having a dream about being in the cold. You can see what he is thinking in the bubble.

Pg. 32 - So the little girl knew that Principal Bundy didn't really have a suit on.

**Conclusions:** So Ivy and Moe tricked the principal. Did they really make him a suit? (No). Sometime people trick other people. They try to make them think something that is not true. Ivy and Moe tried to make Principal Bundy think they really make him a suit, but he just couldn't see it. (REALITY UNDERSTANDING ?)

Full List of Stories Used

Why a Disguise?

Principal's New Clothes

Moongame

Miss Nelson is Missing

Hog-Eye

I Thought I Heard

The Berenstain Bears in the Dark

Miss Nelson is Back

Berenstain Bears and Trick or Treat

Seven Blind Mice

Berenstain Bears and the Ghost of the Forest

Borguita and the Coyote

How Spider Tricked Snake

Timothy and the Night Noises