Creativity Research Journal
1999, Vol. 12, No. 2, 115-128

Children's Divergent Thinking Improves When They Understand False Beliefs

Thomas Suddendorf and Claire M. Fletcher-Flinn
University of Auckland, New Zealand

ABSTRACT. This research utilized longitudinal and cross-sectional methods to investigate the relation between the development of a representational theory of mind and children's growing ability to search their own minds for appropriate problem solutions. In the first experiment, 59 preschool children were given 3 false-belief tasks and a divergent-thinking task. Those children who passed false-belief tasks produced significantly more items, as well as more original items, in response to divergent-thinking questions than those children who failed. This significant association persisted even when chronological age and verbal and nonverbal general ability were partialed out. In a second study, 20 children who failed the false-belief tasks in the first experiment were retested 3 months later. Again, those who now passed the false-belief tasks were significantly better at the divergent-thinking task than those who continued to fail. The associations between measures of divergent thinking and understanding false beliefs remained significant when controlling for the covariates. Earlier divergent-thinking scores did not predict false-belief understanding three months later. Instead, children who passed false-belief tasks on the second measure improved significantly in relation to their own earlier performance and improved significantly more than children who continued to fail. False-belief task performance was significantly correlated to the amount of intraindividual improvement in divergent thinking even when age and verbal and nonverbal skills were partialed out. These findings suggest that developments in common underlying skills are responsible for the improvement in understanding other minds and searching one's own. Changes in representational and executive skills are discussed as potential causes of the improvement.

Much research has recently been devoted to the study of the development of a representational theory of mind. By about age 4 most children understand that people, including they themselves, may misrepresent the world (e.g., Flavell, Flavell, & Green, 1983; Gopnik & Astington, 1988; Moore, Pure, & Furrow, 1990; Perrier, Leekam, & Wimmer, 1987; Wimmer & Perrier, 1983). This understanding of false belief is evidence for a representational theory of mind, because it implies an understanding that mental states are attitudes to representations of the world, rather than attitudes to direct copies of reality (Dennett, 1978; Wimmer & Perrier, 1983). Although some research suggests that even 3-year-old children may be able to pass simpler versions of classic theory-of-mind tasks (Chandler & Hala, 1994; Saltmarsh, Mitchell, & Robinson, 1995; Sullivan & Winner, 1993) and may have an implicit understanding of belief (Clements & Perrier, 1994, 1997), many researchers maintain the traditional view that fundamental cognitive changes are responsible for 4-year-olds' understanding of false beliefs (e.g., Flavell, 1993; Olson, 1993; Perner, 1995).

This research was supported by a Telecom New Zealand research grant to Claire M. Fletcher-Flinn.

We thank the children, parents, and teachers of the participating kindergartens. We are grateful to Linda Harris for her assistance in testing the children. We appreciate the thoughtful comments by Michael Corballis and Thomas Keenan on an earlier version of this manuscript.

The participating children were a subset of a larger study on the effects of computers on young children. The false-belief data is expected to be published also in the context of this computer project.

Manuscript received January 4, 1998; accepted May 23, 1998. Correspondence and requests for reprints should be sent to Thomas Suddendorf, Department of Psychology, University of Auckland, Private Bag 92019, Auckland, New Zealand. E-mail: t.suddendorf@auckland.ac.nz

Two areas of potential improvement have been proposed to underlie 4-year-olds' ability to pass standard theory-of-mind tasks: representational and executive skills. Measures of a representational theory of mind (such as false-belief tasks) typically require children to simultaneously entertain various conflicting representations (e.g., what it looks like and what it really is; your belief and my belief) of the same object or event (e.g., Flavell, 1993). Some researchers have suggested that through metarepresentation, or the ability to represent representational relations, children become able to tag different representations (as "false" or "true"; your belief and my belief) and thus avoid paradoxical conflict between the representations (Olson, 1993; Perrier, 1991; Suddendorf, 1999). There is some evidence suggesting that this new representational capacity also helps children in rule use (e.g., Frye, Zelazo, and Palfai, 1995). The tasks may, however, also be interpreted as testing executive functions. They require the child to engage and disengage various rules or representations. Failure to disengage from one's own present representation (e.g., belief, appearance, rule) to assume another might explain the typical perseveration of younger children (e.g., Russel, Jarrold, & Potel, 1994). Representational and executive accounts may not be in conflict, however. Indeed, Suddendorf (1999) proposed that the development of representational and executive factors converge at around age 4, enabling the child to improve on a host of skills the author subsumes under the heading metamind. If it is correct that skills such as metarepresentation and executive control underlie children's ability to pass standard theory-of- mind tasks, then one would expect that other capacities are also affected by the development of these skills and that the other capacities improve in tandem with false-belief understanding.

One of the other skills that might benefit from these representational and executive gains is divergent thinking. *Divergent thinking,* or the generation of many ideas or potential problem solutions, is a fundamental human cognitive skill (cf. Runco, 1992). From an early age children are confronted with problems that require novel solutions. Adults actively encourage children to make connections between previously independent aspects of knowledge, pointing out relation between different aspects of reality. Shared features of objects or events are emphasized in educational toys and teacher-child conversations. This helps children to structure their semantic networks flexibly, providing the basis for the generation of novel problem solutions. Children's ability to search their own minds for appropriate ideas might benefit from the emergence of skills that enable them to assume the different mental states others might hold (i.e., false-belief understanding). In divergent thinking, the same object or event might be represented in various different ways (e.g., Function A, B, and C), and potential problem solutions might be tagged as "right" and "wrong." The generation of creative problem solutions might further benefit from the ability to disengage from immediate perception and close associations in order to assume more novel ideas. In sum, the generation of many creative ideas and assessment of whether they fit the problem criteria might be facilitated by the ability to disengage from current mental content and by metarepresentational reflection.

Suddendorf and Fletcher-Flinn (1997) recently found some preliminary support for this hypothesis. They gave children false-belief (Prior, Dahlstrom, & Squires, 1990) and divergent-thinking tasks (Ward, 1968). In contrast to the convergent thinking questions of conventional intelligence tests, tests of divergent thinking (e.g., Guilford, 1968; Torrance, 1974; Wallach & Kogan, 1965; see Runco, 1992, for a review) involve open-ended questions such as "Tell me all the things you can think of that are round," or "Tell me all the ways in which you can use a newspaper." This results in scores for *fluency,* or the number of appropriate ideas, and for *uniqueness,* or the number of novel ideas. Analysis of children's performance revealed a significant correlation between false-belief task performance and both fluency (r = .62) and uniqueness (r = .48) of responses in the divergent-thinking task. Those children who passed false-belief tasks produced significantly more items, as well as more original items, than children who failed. Thus, Suddendorf and Fletcher-Flinn (1997) took the results as support for their hypothesis that common cognitive processes are involved in the acquisition of a representational theory of mind and divergent thinking. In particular, it was suggested that the abilities to disengage and metarepresent might allow children to entertain false beliefs as well as actively search their own minds by scanning and assessing their knowledge base for appropriate problem solutions.

Although the findings are consistent with such an interpretation, there are various problems with correlational results. Earlier false-belief understanding has recently been found to be significantly correlated with various factors, including number of siblings (Jenkins & Astington, 1996; Perner, Ruffinan, & Leekam, 1994), language ability (Jenkins & Astington, 1996; Suddendorf & Fletcher-Flinn, 1997), metalinguistic skills (Fletcher-Flinn & Snelson, 1997), computer use (Fletcher-Flinn & Suddendorf, 1996, 1997), attachment security (Fonagy, Redfern, & Charman, 1997), imaginary object pantomime (Suddendorf & Fletcher-Flinn, 1996; Suddendorf, Fletcher-Flinn, & Johnston, 1999; M. Taylor & Carlson, 1997), working memory (Davis & Pratt, 1995; Keenan, Olson, & Marini, in press), and social competence (Lalonde & Chandler, 1995). Although it might be a sign of progress that, after more than a decade of extensive research into the typical development of theory of mind in children, investigators are beginning to explore individual differences (Bartsch & Estes, 1996), it is not entirely clear what to make of cross-sectional correlations.

First of all, correlational findings might merely be artifacts. It is to be expected that some variables will be found to be significantly associated merely by chance, especially in studies with large numbers of variables. It is also problematic that some studies, including Suddendorf and Fletcher-Finn's (1997), use a single type of false-belief task. Given the low to moderate test-retest reliability of such tests (Mayes, Klin, Tercyak, Cicchetti, & Cohn, 1996), caution seems warranted. It is therefore necessary to replicate the findings and employ a variety of different measures of false-belief understanding.

Secondly, even when cross-sectional correlations are replicated, it is not clear whether there is a causal connection between the variables or whether unspecified maturational variables might mediate the association. To combat this problem, most research controls for the contribution of general factors such as chronological and mental age. Suddendorf and Fletcher-Flinn (1997) found that the correlation between divergent thinking and false-belief task performance survived partialling out of chronological age and verbal mental age measured using the British Picture Vocabulary Scale (BPVS; L. M. Dunn, Dunn, Whetton, & Pintilie, 1982). However, there might always be some other, theoretically not specified, factor mediating the observed correlation. In this case nonverbal intelligence would be a prime candidate.

Finally, even when an association turns out to be reliable and robust, it does not inform us about the direction of the relation. There are theoretical grounds for assuming that some correlates contribute to earlier understanding of false beliefs and others are consequences of the developed false-belief understanding or depend on the same underlying capacities as a representational theory of mind. Clearly, passing false belief tasks cannot be responsible for the number of siblings or the use of a computer. If there is a causal relation, the direction must be that exposure to siblings or computers contributes to earlier false-belief understanding. In the case of divergent thinking, however, this is not so clear. Although Suddendorf and Fletcher-Flinn (1997) claim that representational and executive skills are responsible for passing false-belief tasks and also promote divergent-thinking skills, this need not be the case. Perhaps children with greater skills at divergent thinking pass false-belief tasks earlier. Some support for this alternative interpretation can be found in the literature.

Divergent thinking might be regarded as an aspect of imagination and fantasy skill (cf., Dansky, 1980; Johnson, 1976), and several researchers have made a case for growing imaginative powers leading up to false-belief understanding (e.g., Harris, 1991; M. Taylor & Carlson, 1997). Children with greater imagination may pass false-belief tasks earlier. This appears to be true, for example, in children with imaginary friends (Lalonde & Chandler, 1995). Pretend play is an aspect of children's imagination that has received a lot of attention in theory-of-mind research (e.g., Leslie, 1987; Lillard, 1993), and it has been argued that pretend play might promote earlier false-belief understanding (e.g., Perrier et al., 1994). Indeed, Dockett (1994, as cited in M. Taylor & Carison, 1997) found that children who were trained in pretend play scored better on theory-of-mind tasks than a control group. Thus, it might be that divergent thinking, like pretend play and fantasy, reflects the development of imaginational power that fosters earlier theory-of-mind development. The *imaginational power hypothesis* might suggest that higher divergent-thinking scores predict an earlier acquisition of a representational theory of mind, rather than being the result of the facilitating effect of the skills that may underlie theory of mind.

To assess this possibility, longitudinal investigations might be more telling than cross-sectional approaches. J. Dunn, Brown, Slomkowski, Tesla, and Youngblade (1991), for example; reported that social interaction and discourse predicted false-belief understanding 7 months later. Analysis of intraindividual changes over time might be the best way to assess whether divergent thinking is a predictor of false-belief understanding or whether divergent thinking improves with the development of false-belief understanding. The research described herein utilized this approach. We attempted to gain further insight into the relation between false-belief task performance and divergent thinking, keeping in mind the problems just identified.

Study 1

In Study 1 we attempted to replicate Suddendorf and Fletcher-Flinn's (1997) finding with a larger sample. To reduce the chance of some general mediating factor being responsible for any observed association, a nonverbal test of general ability (the Geometric Design of the Wechsler Preschool and Primary Scale of Intelligence Revised [WPPSI-R]; Wechsler, 1989) was included, in addition to the BPVS. Controlling for chronological age and verbal and nonverbal intelligence covers the most likely mediating variables. The study also employed three quite different false-belief tasks to improve the reliability and generality of the measure.

Method

Participants

Fifty-nine children (28 girls and 31 boys) with a mean age of 4 years-1 month (4-1; range = 32 to 60 months) participated. The sample was part of a broader study on computers and preschoolers. The children were recruited from three play centers on Waiheke Island, New Zealand, and the majority were of middle socioeconomic status. Consent of parents, staff, and the children themselves was obtained prior to testing.

Apparatus

Two 28 cm soft dolls (one with blond and one with black hair), a 10 x 6 x 3 cm tin with lid, a 10 x 5 X 3 cm doll backpack, and a marble were used for the first false-belief task. A 20 x 10 x 10 cm toy police car carton containing a blue balloon was used for the second false-belief test. The third task was based on a watercolor painting. The BPVS (L. M. Dunn et al., 1982) and the WPPSI-R (Wechsler, 1989) testing material was administered according to the manual.

Procedure

Testing took place in a quiet room in the participating play centers. The experimenter had been trained to conduct the testing but was deliberately kept blind as to the hypotheses that were being investigated. Children were tested individually, and the order of the tests was randomized.

False-belief tasks. The first false-belief task was administered following Prior et al.'s 1990 version of Baron-Cohen, Leslie, and Frith's (1985) "Sally-Anne" task. Two dolls, Sally and Anne, were introduced to the children and, when their names were learned, the following story was told:

> Sally has a marble and she puts it into her basket and closes the lid. She says good-bye and goes out to play. Now `naughty Anne' takes the marble out of the basket and places it into the box and closes both lids.

The child is then asked a memory question and a reality question: "Where did Sally put the marble, and where is the marble now?" (In the exceptional case of a child failing on the memory or reality question, the child was reminded of the true situation and the procedure was repeated.) The false-belief question followed: "When Sally comes back where will she look first for her marble?" The use of the word first has been suggested by Siegal and Beattie (1991) to make the task easier to comprehend.

The other two false-belief tasks were based on belief predictions (Hogrefe, Wimmer, & Perner, 1986; Perner et al., 1987). In the first test the child was presented with a box with pictures of a police car on it. When asked what might be in the box, children reliably replied "car" or pointed to the car picture. Then the box was opened and the true content revealed: a balloon. The balloon was put back into the box and the closed box was taken out of the child's reach. The false-belief question was asked next: "X (name of a same-sex playmate) hasn't seen inside this box. What will he (she) think is inside it before he (she) opens it?"

Finally, in the second belief-prediction task, the child was shown a colorful painting of an underwater scene. In the center of the picture was a big patch of sea grass that concealed the front half of a mermaid so that only the fin remained visible. Asked what they thought might be behind the sea grass, most children asserted a big fish or a shark. The sea grass part of the painting could be lifted up so that the mermaid was revealed. Again, most children spontaneously labelled the creature a mermaid or a fish lady. Then the mermaid was concealed again and the false-belief question was asked: "X hasn't turned the page. What will she (he) think is behind the seaweed before she (he) turns the page?"

Divergent-thinking test. Following Wallach and Kogan (1965) and Ward (1968), children were asked two types of questions. First they were asked to declare all the ways in which they may use or play with a newspaper, then with a cup, and finally with a towel. This final item of the Uses subtask was introduced as a substitute for a coat hanger because of a low response rate in an earlier study (Suddendorf & Fletcher-Flinn, 1997). The item "table knife" was eliminated because being taught not to play with knives might inhibit children's responses. In the Instances subtask, the children were asked to declare all the things that they could think of that were round, that have wheels, and finally, that are red. The tests, as with the earlier ones, were introduced as games, and in a permissive atmosphere the children received moderate praise for performance. There was no time limit imposed on the children. Instead, the experimenter moved onto the next item when a child ran out of ideas and the experimenter had offered encouragement three times.

Ability tests. The BPVS (Dunn et al., 1982) is a measure of verbal intelligence based on vocabulary assessment. The test was introduced to the children as a picture-book game, and the normal procedures were followed. The Geometric Design subtest of the WPPSI-R (Wechsler, 1989) was chosen as a nonverbal measure of general ability. This test correlates r = .74 with IQ scores of the full test and thus gives a good estimate of general ability. The test was administered according to the manual.

Scoring

The false-belief tasks were scored individually as either 1 *(passed)* or 0 *(failed).* These scores were then used to create a composite measure of false-belief understanding. Passing a minimum of two out of the three tasks was the criterion for categorization as understanding false beliefs.

The divergent-thinking performance was first assessed by two independent raters who judged whether unique responses (i.e., responses given by only one child) were appropriate answers (e.g., "square" is an inappropriate answer to the question regarding things that are round). The remaining unique answers were then accumulated to form the uniqueness scores, and the total number of appropriate responses formed the overall fluency score. Brief preliminary analyses confirmed that there was no significant difference between Uses and Instances subtasks (cf. Suddendorf & Fletcher-Flinn, 1997). Thus, the data were collapsed across the items of the Uses and Instances subtasks to form a total fluency score and a total uniqueness score.

BPVS and Geometric Design raw scores were converted into verbal and nonverbal IQs to assess the children's general ability. For the correlational analysis, however, the test raw scores are relevant, because IQs confound the test performance with chronological age (which is considered separately). For reasons beyond the researchers' control, some participants were tested on the Geometric Design (21) and the BPVS (26) almost 3 months after all the other testing had taken place. Their raw scores were therefore expected to be enhanced. To reach a good estimate of these children's probable performance 3 months earlier, the scores needed to be adjusted. To maintain an IQ of 100, a child has to improve by a raw score of 3 points from age 4-0 to 4-3 on the BPV S. The raw scores of children tested with the 3-month delay were therefore adjusted by subtracting 3 points. Similarly, maintaining average intelligence in the Geometric Design with a 3 months' delay (between the ages of 3-6 to 4-6) requires an improvement of between 3 and 5 points. The raw scores were thus adjusted for the time delay by subtracting 4 points. However, we also analyzed the data using the unadjusted raw scores and the (age scaled) IQs. No significant changes to the overall findings were observed. To avoid redundancies, only the analysis with the adjusted scores is reported here.

Results

General

No significant sex differences were observed for any of the measures, so the results were collapsed across gender. Parametric statistics are reported throughout, although there was some question as to whether the distribution of the divergent-thinking scores might be too skewed for this. Thus, analysis was also conducted with nonparametric statistics using rank scales, u tests, and Kendall's tau-b and partial tau. The same associations were significant as those yielded from parametric analysis. Again, to avoid redundancies, it was thus decided to only report the parametric results.

False-belief tasks. Thirty children (50.8%) failed and 29 children (49.2%) passed the Sally-Anne task. The mermaid task was failed by 32 participants (54.2%), whereas 19 children (32.2%) passed. Eight children (13.6%) did not give an answer to the question. The car-box task was the most difficult, with only 15 children (25.4%) answering the false-belief question correctly. Forty-three children (72.9%) failed, and 1 (1.7%) did not reply. Together the three tasks resulted in a composite measure (the criterion was passing at least two tasks) with about one third (20) classified as having and about two thirds (39) as not having false-belief understanding. The three tasks were significantly ($p < ,005$) intercorrelated with values of $r = .37$ (SA-Mermaid), $r = .38$ (SA-Car), and $r = .42$ (Mermaid-Car).

Divergent thinking. The mean fluency score was 16.44 *(SD* =10.41) items over the six questions. In the Uses subtask and in the Instances subtask 6.95 and 9.49 items were produced on average, respectively. The uniqueness scores for Uses (1.92, *SD* = 2.21) and Instances (2.20, SD= 2.84) were quite similar and accumulated in the overall average uniqueness score of 4.12 (SD = 4.14).

BPVS and WPPSI-R BPVS scores were only available for 50 of the 59 participating children. The average raw score was 33.3 (SD = 10.51). This converted into a verbal IQ average of 96.22 (*SD*= 11.40). A very similar level of general ability resulted from the Geometric Design subtest of the WPPSI-R. The average nonverbal IQ was 9.76 (with 10 = IQ of 100; *SD* = 2.47). Overall, the sample seemed to be of average intelligence. The lower outliers were kept in the sample because (a) they did not perform badly on the other tests and (b) standardization of the norms for a New Zealand sample were not available.

Associations between the Measures

Pearson correlation coefficients were calculated to assess the associations between the variables (see Table 1).

False-belief understanding and divergent thinking. Correlations between the two divergent-thinking measures and the false-belief tasks were strong and significant (see Table 1). The Sally-Anne task (fluency: r =.57, p <.001; uniqueness: r =.57, p <.001) and car-box task (fluency: r = .39, p<.005; uniqueness: r=.40, p<.005) were significantly associated with divergent thinking, whereas the mermaid task was not (fluency: r =.14, p =.16; uniqueness: r =.22, p =.06). T tests confirmed that those children classified as having acquired false-belief understanding produced significantly more appropriate items (M= 23.15 vs. 13.00; t(57) = 3.97, p <.001) and more unique items (M= 6.9 vs. 2.63; t(57) = 4.18, p <.001) than those children who failed to show evidence of understanding false beliefs.

One reason for the observed association could be the effect of mediating variables. Age and verbal and nonverbal intelligence were found to be correlated with both divergent-thinking and false-belief understanding (see Table 1). These variables might therefore be responsible for the observed association. In order to control for the effect of these variables, partial correlation coefficients were calculated. Table 2 shows that the association between false-belief understanding and both divergent-thinking scores survived partialling out BPVS scores, Geometric Design scores, and any combination of these covariates. In spite of the strong intercorrelations, the associations between false-belief understanding and divergent thinking were not caused by mediating effects of age or verbal or nonverbal general ability.

Table 1. *Pearson Correlation Coefficients for the Variables*

Variable	Fluency	Uniqueness	Age	BPVS	WPPSI-R
False Belief	.47***	.49***	.46***	.44**	.25*
Fluency		.89***	.40**	.29*	.51***
Uniqueness			.34**	.29*	.38**
Age				.54***	.52***
BPVS					.44**

Note: BPVS = British Picture Vocabulary Scale (L. M. Dunn, Dunn, Whetton, & Pintilie, 1982); WPPSI-R = Wechsler Preschool and Primary Scale of Intelligence-Revised (Wechsler, 1989). N= 50 for correlations with BPVS and WPPSI-R; otherwise, N= 59.
*p <.05. **p <.005. ***p <.001.

Table 2. *Association Between False-Belief Understanding and Both Divergent Thinking Measures (Fluency and Uniqueness) After Partialling out Age, BP VS, and Geometric Design*

Controlled Variables	df	Fluency	Uniqueness
-		.47**	.49**
Age	56	.35*	.39*
BPVS	47	.43*	.41*
Geometric Design	47	.44*	.43*
Age and BPVS	46	.38*	.40*
Age and Geometric Design	46	.43 *	.44*
BPVS and Geometric Design	46	.44*	.41*
Age, BPVS, and Geometric Design	45	.43*	.42*

Note: BPVS = British Picture Vocabulary Scale (L. M. Dunn, Dunn, Whetton, & Pintilie, 1982); Geometric Design = Geometric Design subtask of the Wechsler Preschool and Primary Scale of Intelligence-Revised (Wechsler, 1989). The partials involving ability scores were based on n = 50. *p < .005. **p < .001.

The associations might nonetheless merely be artifacts reflecting a lack of task understanding in some children. Thus a reanalysis of the data included only participants whose task comprehension was evident through production of at least one appropriate item to every divergent-thinking question. This criterion reduced the number of cases to 44. Yet the false-belief measure continued to be significantly associated with both fluency ($r = .36$, $p < .01$) and uniqueness ($r = .36$, $p < .0l$) scores. T tests confirmed the significant difference between the groups: fluency, $t(42) = 2.48$, $p < .0l$; uniqueness , $t(42) = 2.49$, $p < .01$. Even when age, BPVS, and Geometric Design were partialled out of the correlation from this reduced sample, the associations remained significant. False-belief understanding continued to be correlated with fluency ($r = .41$, $df=32$, $p < .01$) and uniqueness ($r = .35$, $df = 32$, $p < .05$).

Discussion

These results replicated with a bigger sample the earlier finding by Suddendorf and Fletcher-Flinn (1997). We found a significant association between theory of mind as measured by false-belief task performance and divergent thinking, both in quantity (fluency) and originality (uniqueness). The correlation was of similar strength (around $r = .5$) and also survived partialling out age and verbal intelligence as measured with the BPVS. Further, a nonverbal measure of intelligence, the Geometric Design subtest of the WPPSI-R (Wechsler, 1989), was added to our study. Neither controlling for nonverbal intelligence nor for any combination of covariates reduced the association between false-belief understanding and divergent thinking below significance.

This suggests that these variables are linked in other ways. However, simple correlational analysis cannot inform us of the nature of the association. Greater divergent-thinking skills might contribute to earlier development of a representational theory of mind, but it might also be that divergent thinking improves when false-belief tasks are passed.

Study 2

To investigate the nature of the relation between false-belief understanding and divergent thinking further, children who failed all false-belief tasks were retested 3 months later. Longitudinal, rather than cross-sectional designs should be used to address questions of directionality, but retesting confronts the researcher with a choice between problems associated with employing the same tasks (learning effects) and problems associated with employing different tasks that are assumed to measure the same skill as the first (task-specific effects). We chose the former because learning opportunity would be the same for all participants, whereas new tasks might have differential effects on the children's performance.

Our first prediction was that children who passed the false-belief tasks at the second testing would do better on the divergent-thinking tasks than those who continued to fail. If this hypothesis were supported, this would essentially be a replication of the cross-sectional correlations reported in the first study. However, the retesting was done primarily to assess the direction of the associations. If divergent thinking reflects imaginative power and greater imaginative power facilitates the acquisition of a representational theory of mind (imaginative power hypothesis), then one would expect that higher divergent-thinking scores at the first testing are associated with better false-belief task performance at the second testing. However, if the associations are due to the emergence of underlying skills aiding both false-belief understanding and divergent thinking, then one would expect that those children who pass the false-belief tasks at the second testing should not have had significantly higher divergent-thinking scores at the first testing, but should significantly increase in their divergent-thinking scores at the second testing. Indeed, we expected that intraindividual improvement in divergent thinking would be significantly greater in the children who pass false-belief tasks than in children who do not.

Method

Participants

Twenty children from the previous study were asked to participate in this study. The criterion for selection was that the child did not pass any of the false-belief tasks in the original study. Seven girls and 13 boys participated. The average age was 3-11 (*SD* = 5.82) at the time of the first measurement. Both verbal and nonverbal general ability for this group was about normal (BPVS: 94, *SD* = 10.18; WPPSI-R: 10.05, SD = 2.39). Note that a1120 children had been tested on the BPVS and the Geometric Design tests at the first testing, so no raw score adjustments were necessary.

Procedure

The children were retested with the same tasks 3 months after the first testing. A different experimenter did the testing. Although the experimenter was asked to adhere to the same procedure, differences-especially in regard to the probing and permissiveness in the divergent-thinking task and in general rapport with each child were to be expected. However, these effects seemed preferable to the problems that would be created by using the same experimenter. "Blindness" toward the earlier performances of the children was regarded as of paramount importance for the validity of the results regarding the main predictions. To prevent any experimenter bias, the divergent-thinking task was administered prior to the false-belief tasks.

Results and Discussion

Second Testing

False-belief tasks. Three months after the initial testing, 40% (8 out of 20) of the children who initially failed all false-belief tasks in Study 1 were categorized as having acquired an understanding of false beliefs (having passed a minimum of two tasks). The Sally-Anne task was passed by 11 children, and the car-box and the mermaid tasks were passed by 8 children each. The composite measure of false-belief understanding was associated with age. That is, those children who passed the tasks were significantly older (49.5 vs. 45.1 months) than those who continued to fail them, t(18) = 1.75, p <.05.

Divergent thinking. The children produced an average of 15.25 (SD = 8.11) appropriate items and an average of 6.2 (SD=4.74) unique items. Those children who had acquired false-belief understanding produced on average 21.13 items, whereas the other children only achieved 11.33 items. A Levene's test (Levene, 1960) showed that the variance in the performance of the two groups on these tasks was unequal (F= 6.26, p < .05). The t test assuming unequal variances confirmed that the difference between the groups was significant, t(9.05) = 2.82, p <.05. Children with false-belief understanding also produced significantly more unique items (9.75 vs. 3.83) than those without, t(18) = 3.42, p <.005. This is also reflected in the significant correlations reported in Table 3. The first prediction was therefore confirmed for both divergent-thinking measures.

Partial correlations. In order to control for the effect of age and general ability, partial correlation coefficients were calculated. False-belief understanding and fluency scores continued to be significantly related, even when age (r =.54, *df* = 17,p <.01), BPVS scores (r =.52, *df* = 17, p <.05), or Geometric Design scores (r = .62, *df* = 17, p < .005) were partialled out. The association with the uniqueness scores proved equally robust. The partial correlations were *r* =.55 *(df* = 17,p <.01) when controlling for age, r=.55 *(df*= 17, p<.01) when controlling for BPVS, and r = .64 *(df* = 17, p <.005) when controlling for Geometric Design. Even when controlling for all three covariates, higher fluency *(r* =.46, *df*= 15, p<.05) and uniqueness scores (r= .48, *df*= 15, p <.05) remained significantly associated with understanding false beliefs.

Comparing First and Second Testing

To examine the direction of the relation between divergent-thinking scores and false-belief understanding, performance on both testings was compared.

Divergent thinking. Three months later fluency scores increased from an average of 10.35 to 15.25. Intraindividual analyses of children's patterns of response over time showed that 14 children improved their performance, 1 remained constant, and 5 produced fewer items. Wilcoxon Matched-Pairs Signed Ranks test (Wilcoxon, 1949) confirmed the improvement (z = 2.6, p < .005). Uniqueness scores rose from 3.65 to 6.2. Twelve children improved, 5 worsened, and 3 tied. Again, Wilcoxon Matched-Pairs Signed Ranks test confirmed the improvement (z = 2.14, p < .05).

The higher divergent-thinking scores of the children classified as understanding false beliefs might be due to them having higher divergent-thinking scores at the first measure. In fact, these children had a higher original average of 11.87 (fluency) and 4.37 (uniqueness) than the children who continued to fail false-belief tasks on the second testing (9.33 and 3.16, respectively), but these differences were not significant. In contrast to the prediction from the imaginative power hypothesis, diver gent-thinking scores at the first testing were not significantly correlated with false-belief task performance 3 months later, but given the small sample size, one needs to be cautious in interpreting these negative findings. We decided to further investigate whether divergent-thinking skill at the first testing predicts false-belief understanding at the second testing by creating two same-sized groups based on the original divergent-thinking scores (fluency < 11 vs. fluency > 10). There was no difference between the group of children with more than 10 items and those children having produced 10 items or less on understanding false beliefs 3 months later (40% of each group was classified as having false-belief understanding).

This suggests that the significant association between false-belief understanding and divergent thinking at the second testing might instead be due to differential improvement in divergent thinking. Differential improvement over the 3 months can be tested by calculating separate t tests for matched samples of the groups. The improvement in children who continued to fail false-belief tasks was not significant. Fluency scores rose from 9.3 to

Table 3. *Pearson Correlation Coefficient for the Variables*

Variable	Fluency	Uniqueness	Age	BPVS	Geometric Design
False Belief	.61**	.63**	.38*	.39*	.16
Fluency		.94***	.40*	.45*	-.01
Uniqueness			.45*	.46*	.00
Age				.25	.43*
BPVS					.43*

Note: N= 20. BPVS =British Picture Vocabulary Scale (L. M. Dunn, Dunn, Whetton, & Pintilie,1982); Geometric Design = Geometric Design subtask of the Wechsler Preschool and Primary Scale of Intelligence-Revised (Wechsler, 1989).
*p <.05. **p <.005. ***p <.001.

11.3 and uniqueness scores from 3.2 to 3.8. In contrast, the children who now passed false-belief tasks improved significantly on the fluency, from 11.87 to 21.13; t(7) = 3.86,p <.005; and uniqueness scores, from 4.38 to 9.75; t(7) = 3.16,p <.01.

To compare whether the improvements of the children who displayed false-belief understanding differs significantly from the improvements of the other children, new variables were created by subtracting the scores of the first from those of the second round of testing. The difference in fluency scores was significantly higher (i.e., greater improvement) for those who passed false-belief tasks than for those who failed, t(18) = 2.45, p <.05, with the former increasing the score by an average of 9.25 items and the latter by an average of only 2. Similarly, the individual improvement of uniqueness scores was significantly greater, t(18) = 2.43,p <.05, for the children who displayed false-belief understanding (improving by 5.38) than for those who did not (improving by 0.67). The improvement in fluency and uniqueness scores were significantly correlated with understanding false beliefs (r = .50; p < .05).

Age, BPVS, and Geometric Design scores were not significantly related to the improvement variables. To exclude the possibility that these factors might nonetheless mediate the observed relation between false-belief understanding and divergent-thinking improvement, partial correlations were calculated. As can be seen from Table 4, the correlations remained significant, even when these possible mediating factors were controlled for. When controlling for the effect of Geometric Design scores, the correlation coefficient even increased. Altogether, then, the data supports the hypothesis that divergent-thinking skill increases when children become able to understand false beliefs.

General Discussion

The first aim of this project was to try to replicate the earlier finding by Suddendorf and Fletcher-Flinn (1997) that performance on false-belief tasks and divergent-thinking measures are positively correlated. Both the first and second studies found a significant association between false-belief tasks and both fluency and uniqueness scores. The strength of the correlation was similar to the earlier finding ranging from .47 to .63. Controlling for chronological age and BPVS scores, as in the earlier study, did not reduce the association below statistical significance.

A second aim of the study was to improve on the measures previously employed by Suddendorf and Fletcher-Flinn (1997). We included two

Table 4. *Correlations and Partial Correlations Between False-Belief Understanding and Intra-Individual Improvement in Fluency (Dif-Fluency: Study 2 Fluency Scores Minus Study 1 Scores) and Uniqueness (Dif-Uniqueness: Study 2 Uniqueness Scores Minus Study 1 Uniqueness Scores) of the Divergent-Thinking Task*

Controlled Variable	df	Dif-Fluency	Dif-Uniqueness
		.50*	.50*
Age	17	.46*	.43*
BPVS	17	.44*	.45*
Geometric Design	17	.59***	.58**
Age and BPVS	16	.42*	.40*
Age and Geometric Design	16	.53*	.50*
BPVS and Geometric Design	16	.51*	.50*
Age, BPVS, Geometric Design	15	.43*	.41*

Note: BPVS = British Picture Vocabulary Scale (L. M. Dunn, Dunn, Whetton, & Pintilie, 1982); Geometric Design = Geometric Design subtask of the Wechsler Preschool and Primary Scale of Intelligence-Revised (Wechsler, 1989).
*p < .05. **p <.01. ***$_p$ < .005.

surprise tasks in addition to the Sally-Anne task to increase the generality of the false-belief measure. A problem with the divergent-thinking task could have been that younger children failed to comprehend what was required of them. We reexamined the data, including only children who showed adequate comprehension through appropriate answers to every item. The same associations were found to be significant. Finally, nonverbal intelligence was considered a plausible explanatory factor not controlled for in the previous study. A measure of nonverbal intelligence was therefore included, and neither controlling for this alone nor in combination with verbal intelligence and chronological age reduced the associations below significance. With chronological age and verbal and nonverbal mental age, a broad spectrum of general maturational or developmental improvements was covered. In the light of these precautions the associations appear to be robust.

The third issue driving this study was whether a repeated measure 3 months later would illuminate questions regarding the direction of the relation under investigation. Earlier divergent-thinking scores did not predict children's performance on the false-belief tasks 3 months later. Although the results do not exclude the possibility that greater powers of imagination promote earlier acquisition of a representational theory of mind, they fail to support the possibility that this imaginative power hypothesis can explain the robust correlation between false-belief understanding and divergent thinking. Instead, passing the false-belief tasks 3 months after originally failing them was associated with a significant intraindividual improvement in divergent thinking. The children who passed false-belief tasks improved significantly more than those children who continued to fail. This differential improvement suggests that the two skills develop in tandem (although future studies might want to look at even shorter periods than 3 months to see whether one skill improves prior to the other). The correlations between false-belief understanding and intraindividual improvement scores on the divergent-thinking task were robust, surviving partialling out chronological age and measures of verbal and nonverbal ability. Taken together, the results support the claim that with passing false-belief tasks, divergent-thinking skill increases.

Interestingly, autistic children, who often fail theory-of-mind measures such as false-belief tasks (e.g., Baron-Cohen, 1989; Baron-Cohen et al., 1985), have recently been reported to produce significantly fewer items than normal controls on a single task similar to the Uses test employed here (Scott & Baron-Cohen, 1996). However, Scott and Baron-Cohen (1996) did not find a significant difference between autistic children and a matched group of children with mental handicap (who generally pass false-belief tasks). This might be due to important differences in our tasks. Scott and Baron-Cohen's task presented the children with an actual brick when asking them "what can you do with a brick," and they set a time limit of only 2 min for the answers. Individual differences, especially in regard to more novel ideas, show mainly in the later stages of the answer time, when the more straightforward answers have been exhausted (cf. Runco, 1992). Without the open-ended nature of the divergent-thinking task, group differences might have been underestimated. The present results suggest that children without a representational theory of mind should do worse than controls on open-ended divergent-thinking tasks.

Scott and Baron-Cohen (1996) claimed that in spite of the quantitative similarity between the mental handicap group and the autism group, there were qualitative differences in the answers. The autistic responses were more "direct" associations (e.g., build a house), whereas the clinical control group produced more "pretend" or "abstract" ideas. Indeed, none of the autistic responses was classified as pretend/abstract. Scott and Baron-Cohen (1996) used this to support their claim that autistic children have problems imagining unreal things. However, an example of the purportedly pretend/abstract answers of the children with mental handicap was "use it to stand tapes on a tape stand." We fail to see the abstract or pretend nature of this response. Instead, we suggest that such a response is perhaps a more creative answer than "building a house" and is probably the result of a more divergent mental search beyond areas of directly activated mental content. In the light of the present results, this suggests that autistic children are impaired in generating divergent answers because they lack the facilitating effect of the skills that underlie a representational theory of mind.

Because false-belief understanding is not obviously involved in the divergent-thinking task, and because the present results do not support the idea that the observed associations between false-belief understanding and divergent thinking are solely due to increased imaginative powers promoting earlier development of a representational theory of mind, it is reasonable to assume that some common underlying skill enhances performance on both tasks. Executive functioning and representational improvements have been proposed to underlie 4-year-olds' capacity to pass standard theory-of-mind tasks. Although the present data cannot show what variable is responsible, it is important to consider how these purported improvements might affect divergent-thinking skill.

Several authors have claimed that metacognitive skills are important for the process of determining whether potential solutions fulfill particular problem criteria (e.g., Ebert, 1994; Feldhusen, 1995; Suddendorf & Fletcher-Flinn, 1997). When children pass false-belief tasks they are said to be capable of metarepresentation, or representing representations as representations (e.g., Perrier, 1991, 1995; Pylyshyn, 1978). What is crucial here, according to Perner (1991, 1995), is that the child now understands the difference between what something represents and how it represents it as being. This may also be important for divergent thinking. When the child has to produce different uses for, say, a newspaper, it may represent a newspaper (there is no newspaper perceptible) and represent it as being (a) something to read, (b) packaging, and (c) material for making a hat. The same object is represented in different ways, and whether these representations meet the problem criteria is assessed.

With metarepresentation, the child is in a position to simultaneously entertain several conflicting representations of the same object or event (e.g., Flavell, 1993; Olson, 1993). But this ability is not necessarily required for children to produce appropriate answers to divergent-thinking questions. Answers might not be conflicting, and they might be entertained one after the other rather than concurrently. Indeed, children who fail false-belief tasks are clearly capable of divergent thinking. However, for these children a salient idea might stay in the focus of attention and thus prevent them from entertaining more novel alternative solutions that conflict with it. When the child can entertain conflicting representations concurrently (i.e., when they can pass false-belief tasks), this inhibitory process can be overcome and divergent thinking is facilitated. This might be why children produce many more potential solutions (fluency) and generate more ideas that are in contrast to conventional uses (uniqueness) when they understand false beliefs. They may be better at scanning their own knowledge beyond the areas of immediately activated mental content. This may also allow them to better reconstruct the past and preconstruct the future (Suddendorf & Corballis, 1997).

One might also interpret this as an increased ability to disengage from current mental content. Executive control or mental disengagement has been proposed to underlie the capacity to pass theory-of-mind tasks (e.g., Russei et al., 1994). One could, for example, argue that children need to disengage from their current model of reality in order to assume the false belief of another (e.g., regardless of where the object truly is, a person will search where she believes it is). Thus, the surge in divergent-thinking skill we observed in children who pass false-belief tasks might be caused by increased ease at disengaging from particular ways of looking at the object.

The argument for an involvement of executive functions might also be made on the basis of flexibility in employing mental search rules. Although children begin to form categories in their second year, they initially have problems flexibly applying different rules. Zelazo and colleagues (e.g., Frye et al., 1995; Zelazo, Frye, & Rapus, 1996) found that 3-year-olds but not 5-year-olds have problems changing the rules in card-sorting games. Children were asked to sort cards first according to, say, shape and subsequently according to color. The younger children had severe difficulty implementing a second rule and continued to sort the cards according to the first rule. What appears to be causing the problem is the necessity to engage and disengage the rules according to need. This capacity might also be important for divergent thinking. When we consider the cards as analogous to items represented in a semantic net, then flexible search of one's own mind according to different rules might demand similar disengagement capacities. In the divergent-thinking task, one may first scan one's knowledge for red items and then for round items. Flexibly applying different rules may pose a problem for younger children's mental search for appropriate problem solutions.

There are various ways in which improvements in both executive and representational skills might plausibly be linked to improvement in divergent thinking and theory of mind. These views might not be in conflict. Indeed, Suddendorf (1999) proposed that both skills might contribute unique variance to a host of new capacities maturing around age 4. The link between acquiring a representational theory of mind and divergent thinking might therefore be multileveled, involving the effects of metarepresentational thinking and increased executive control.

The current data cannot be used to assess this proposal. They do, however, strongly suggest that there is an underlying connection and that standard false-belief tasks are markers of more general cognitive advances. In this way, the data speak in favor of the traditional view of theory-of-mind development, which holds that passing standard theory-of-mind tasks reflects fundamental cognitive changes (e.g., Flavell, 1993; Olson, 1993; Perner, 1991). With development of a representational theory of mind, children not only gain in knowing about other minds but also in using their own minds.

References

Baron-Cohen, S. (1989). Are autistic children "behaviorists"? An examination of their mental-physical and appearance-reality distinctions. *Journal of Autism and Developmental Disorders,* 19,579-600.

Baron-Cohen, S., Leslie, A., & Frith, U. (1985). Does the autistic child have a "theory of mind"? *Cognition, 21,* 37-46. Bartsch, K., & Estes, D. (1996). Individual differences in children's developing theory of mind and implications for metacognition. *Learning and Individual Differences,* 8, 281-304.

Chandler, M., & Hala, S. (1994). The role of personal involvement in the assessment of early false belief skills. In C. Lewis and P. Mitchell (Eds.), *Children's early understanding of mind: Origins and development (pp.* 403-425). Hove, England: Lawrence Erlbaum Associates, Inc.

Clements, W. A., & Perner, J. (1994). Implicit understanding of belief. *Cognitive Development,* 9, 377-395.

Clements, W. A., & Perner, J. (1997). *When action really speaks louder than words but only implicitly: Young children's understanding of false belief in action.* Unpublished manuscript. Dansky, J. L. (1980). Make-believe: A mediator of the relationship between play and associative fluency. *Child Development*, *Sl*, 576-579.

Davis H. L., & Pratt, C. (1995). The development of children's theory of mind: The working memory explanation. *Australian Journal of Psychology, 47,* 25-31.

Dennett, D. C. (1978). Beliefs about beliefs. *Behavioral and Brain Sciences, 4,* 568-570.

Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. M. (1991). Young children's understanding of other people's feelings and beliefs: Individual differences and their antecedents. *Child Development, 62,* 1352-1366.

Dunn, L. M., Dunn, L., Whetton, C., & Pintilie, D. (1982). *British Picture Vocabulary Scale.* London: Nfer-Nelson.

Ebert, E. S. (1994). The cognitive spiral: Creative thinking and cognitive processing. *Journal of Creative Behavior,* 18, 275290.

Feldhusen, J. F. (1995). Creativity: A knowledge base, metacognitive skills, and personality factors. *Journal of Creative Behavior,* 29, 255-268.

Flavell, J. H. (1993). The development of children's understanding of false-belief and the appearance-reality distinction. *International Journal of Psychology,* 28, 595-604.

Flavell, J. H., Flavell, E. R., & Green, F. L. (1983). Development of the appearance-reality distinction. *Cognitive Psychology,* 15, 95-120.

Fletcher-Flinn, C. M., & Snelson, H. (1997). The relation between metalinguistic ability, social cognition and reading. *New Zealand Journal of Psychology, 26,* 20-28.

Fletcher-Flinn, C. M., & Suddendorf, T. (1996). Do computers affect `the mind'? *Journal of Educational Computing Research, /S,* 91-106.

Fletcher-Flinn, C. M., & Suddendorf, T. (1997). Computers and "the mind": An intervention study. *Journal of Educational Computing Research, 17,* 103-118.

Fonagy, P., Redfern, S., & Charman, T. (1997). The relationship between belief-desire reasoning and a projective measure of attachment security (SAT). *British Journal of Developmental Psychology, 15,* 51-61.

Frye, D., Zelazo, P. D., & Palfai, T. (1995). Theory of mind and rule-based reasoning. *Cognitive Development, 10,* 483-527. Gopnik, A., & Astington, J. W. (1988). Children's understanding of representational change and its relation to the understanding of false belief and the appearance-reality distinction. *Child Development,* 59, 26-37.

Guilford, J. P. (1968). *Intelligence, creativity, and their educational implications.* San Diego: Knapp.

Harris, P. L. (1991). The work of imagination. In A. Whiten (Ed.), Natural theories of mind: Evolution, development, and simulation of everyday mindreading, (pp. 283-304). London: Basil Blackwell.

Hogrefe, G. J., Wimmer, H., & Perner, J. (1986). Ignorance versus false belief: A developmental lag in attribution or epistemic states. *Child Development, 57,* 567-582.

Jenkins, J. M., & Astington, J. W. (1996). Cognitive factors and family structure associated with theory of mind development in young children. *Developmental Psychology,* 32, 70-78.

Johnson, J. E. (1976). Relations of divergent thinking and intelligence test scores with social and nonsocial make-believe play of preschool children. *Child Development, 47,* 12001203.

Lalonde, C. E., & Chandler, M. (1995). False belief understanding goes to school: On the social-emotional consequences of coming early or late to a first theory of mind. *Cognition and Emotion,* 9, 167-185.

Leslie, A. (1987). Pretence and representation in infancy: The origin of "theory of mind." *Psychological Review,* 94, 412-426.

Levene, H. (1960). Robust tests for equality of variances. In I. Olkin *(Ed.), Contributions to probability and statistics (pp.* 278-292). Palo Alto, CA: Stanford University Press.

Lillard, A. S. (1993). Pretend play skills and the child's theory of mind. *Child Development,* 64,348-371.

Mayes, L. C., Klin, A., Tercyak, K. P., Cicchetti, D. V., & Cohn, D. J. (1996). Test-retest reliability for false-belief tasks. *Journal of Child Psychology and Psychiatry,* 37, 313-319.

Moore, C., Pure, K., & Furrow, D. (1990). Children's understanding of the modal expression of speaker certainty and uncertainty and its relation to the development of a representational theory of mind. *Child Development, 61,* 722-730.

Olson, D. R. (1993). The development of representations: The origins of mental life. *Canadian Psychology,* 34, 1-14.

Perner, J. (1991). *Understanding the representational mind.* Cambridge, MA: MIT Press.

Perner, J. (1995). The many faces of belief: Reflections on Fodo's and the child's theory of mind. *Cognition,* 57, 241-269.

Perrner, J., Leekam, S. R., & Wimmer, H. (1987). Three-year-olds' difficulty with false-belief: The case for a conceptual deficit. *British Journal of Developmental Psychology,* 5, 125-137.

Perner, J., Ruffinan, T., & Leekam, S. R (1994). Theory of mind is contagious: You catch it from your sibs. *Child Development,* 65,1228-1238.

Prior, M., DahlsVOm, B., & Squires, T. L. (1990). Autistic children's knowledge of thinking and feeling states in other people. *Journal of Child Psychology and Psychiatry,* 51, 587-601.

Pylyshyn, Z. W. (1978). When is attribution of beliefs justified? *Behavioral and Brain Sciences, I,* 592-593.

Runco, M. A. (1492). Children's divergent thinking and creative ideation. *Developmental Review,* 12, 233-264.

Russel, J., Jarrold, C., & Potel, D. (1994). Executive factors in pre-schoolers' strategic deception. *British Journal* of *Developmental Psychology,* 12, 301-314.

Saltmarsh, R., Mitchell, P., & Robinson, E. (1995). Realism and children's early grasp of mental representation: Belief-based judgments in the state change task. *Cognition,* 57, 297-325.

Scott, F. J., & Baron-Cohen, S. (1996). Imagining real and unreal things: Evidence of a dissociation in autism. *Journal of Cognitive Neuroscience, 8,* 371-382.

Siegal, M., & Beattie, K. (1991). Where to look first for children's knowledge of false belief. *Cognition,* 38, 1-12.
Suddendorf, T. (1999). The rise of the metamind. In M. C. Corballis & S. Lea (Eds.), *The descent of mind psychological perspectives in hominid evolution (pp.* 218-260). New York: Oxford University Press.
Suddendorf, T., & Corballis, M. C. (1997). Mental time travel and the evolution of the human mind. *Genetic, Social and General Psychology Monographs,* 123, 133-167.
Suddendorf, T., & Fletcher-Flinn, C. (1996). Some correlates of the, emerging theory of mind. *Australian Journal of Psychology,* 48 (Suppl.), 26-27.
Suddendorf, T., & Fletcher-Flinn, C. M. (1997). Theory of mind and the origins of divergent thinking. *Journal of Creative Behaviour, 31,* 169-179.
Suddendorf, T., Fletcher-Flinn, C. M., & Johnston, L. (1999). Pantomime and theory of mind. *Journal* of *Genetic Psychology,* 160, 31-45.
Sullivan, K., & Winner, E. (1993). Three-year-olds' understanding of mental states: The influence of trickery. *Journal* of *Experimental Psychology,* 56, 135-148.
Taylor, M., & Carlson, S. M. (1997). The relation between individual differences in fantasy and theory of mind. *Child Development,* 3, 436-455.
Torrance, E. P. (1974). *Torrance Tests of Creative Thinking.* Lexington, MA: Personnel Press.
Wallach, M. A., & Kogan, N. (1965). Modes *of thinking in young children.* New York: Holt, Rinehard & Winston.
Ward, W. C. (1968). Creativity in young children. *Child Development,* 39, 737-754.
Wechsler, D.(1989). *Wechsler Preschool and Primary Scale of lntelligence-Revised.* San Antonio, TX: Psychological Corporation.
Wilcoxon, F. (1949). Some *rapid approximate statistical procedures.* Stanford, CA: American Cyanamid Co.
Wimmer, H., & Perrier, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition,* 13, 103-128.
Zelazo, P. D., Frye, D., & Rapus, T. (1996). An age-related dissociation between knowing rules and using them. *Cognitive Development, 11,* 37-63.