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Lying in the Elementary School Years:

Verbal Deception and Its Relation to Second-Order Belief Understanding

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Abstract

The development of lying to conceal one's own transgression was examined in school-age children. Children (N = 172) between 6 and 11 years of age were asked not to peek at the answer to a trivia question while left alone in a room. Half of the children could not resist temptation and peeked at the answer. When the experimenter asked them whether they had peeked, the majority of children lied. However, children's subsequent verbal statements, made in response to follow-up questioning, were not always consistent with their initial denial and, hence, leaked critical information to reveal their deceit. Children's ability to maintain consistency between their initial lie and subsequent verbal statements increased with age. This ability is also positively correlated with children's 2nd-order belief scores, suggesting that theory of mind understanding plays an important role in children's ability to lie consistently.

Keywords

lyingg; verbal deception; theory of mind; second-order belief; children

Lying, in essence, is theory of mind in action. Lying refers to the act by which one deliberately makes a false statement with intent to instill false beliefs into the mind of the statement's recipient (Lee, 2000). To lie successfully, lie-tellers must be able to have an appropriate assessment of their own and the recipients' mental states (e.g., whether recipients are ignorant about the true state of affairs that the lie-tellers themselves have full knowledge of). Lie-tellers must then construct and produce false statements that differ from their true beliefs about the state of affairs. Further, the false statements must be carefully constructed such that they will not arouse suspicion in the recipient. This often requires lie-tellers to produce verbal and nonverbal behaviors that are consistent with the false statement but inconsistent with their true beliefs and to conceal verbal and nonverbal behaviors that are consistent with their true beliefs but incongruent with the false statement. Thus, by examining lie-telling behaviors in children, we can gain important insight about how children learn to use their theory of mind in everyday life situations for adaptive (or maladaptive) purposes.

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A limited number of studies, most of which have involved young children, have investigated children's actual lie-telling behavior (e.g., Chandler, Fritz, & Hala, 1989; Lewis, Stanger, & Sullivan, 1989; Polak & Harris, 1999; Talwar & Lee, 2002a, 2002b; Talwar, Lee, Bala, & Lindsay, 2002, 2004). Many of these studies have used a modified temptation resistance paradigm in which children are given the opportunity to commit a transgression (i.e., peek at a forbidden object) and have an opportunity to spontaneously lie when they are asked if they peeked. Overall, these studies have found that children's lie-telling abilities emerge as early as 3 years of age and develop rapidly with age (Lewis et al., 1989; Polak & Harris, 1999; Talwar & Lee, 2002a).

Research findings on children's ability to control nonverbal expressive behavior while lying have been mixed. Although some have found that older school-age children can control their nonverbal expressive behavior by masking their deception with increased positive facial expressions better than younger children can (e.g., Feldman, Jenkins, & Popoola, 1979; Morency & Krauss, 1982), more recent findings suggest even preschool children may be able to conceal their lies regarding transgressions (e.g., Crossman & Lewis, 2006; Lewis et al., 1989; Talwar & Lee, 2002a).

However, research examining children's *verbal* behavior has found that young children are not skilled lie-tellers (Polak & Harris, 1999; Talwar & Lee, 2002a). To be successful in deceiving an intended dupe, a lie-teller must be able to not only produce a false statement but also to ensure consistency between his or her initial lie and subsequent statements. The ability to maintain consistency between statements during deception is referred to as *semantic leakage control* (Talwar & Lee, 2002a). Only two studies have addressed this issue. Both found children between 3 and 5 years of age to be incapable of semantic leakage control. When asked the identity of a toy, even though they said that they had not played with (Polak & Harris, 1999) or peeked at (Talwar & Lee, 2002a) it, children failed to feign ignorance and blurted out the identity of the toy. Talwar and Lee (2002a) found a developmental trend in children's semantic leakage control ability. Whereas the majority of the children between 3 and 5 years of age blurted out the name of the toy that they denied having peeked at, and thus implicated themselves as having transgressed, about half of 6- and 7-year-olds feigned ignorance of the toy's identity and successfully avoided detection of their lie by adult raters.

Both Polak and Harris (1999) and Talwar and Lee (2002a) argued that a sophisticated theory of mind understanding is needed to ensure semantic leakage control. Polak and Harris (1999) found that 3- and 5-year-olds' first-order false belief understanding was significantly correlated with their initial false denials of having played with a forbidden toy but was not significantly related to their ability to feign ignorance. These authors suggested that feigning ignorance to follow-up questions requires children to represent second-order mental states. For instance, in the temptation-resistance situation, children can take the experimenter's perspective and first assume that the experimenter thinks they have no knowledge of the answer because they have said that they have not peeked (a false belief). Given this false belief, children need to reason about what the experimenter expects them to know or not know (a second-order belief). Thus, after having lied about peeking at the forbidden toy, when asked the identity of the toy, children must represent that the "experimenter believes I do not know the identity of the forbidden object" in order to feign ignorance. Thus, the child must be able to represent a belief about another's belief to be able to maintain consistency between the initial lie and the subsequent statement.

Previous research has shown that second-order mental state understanding begins to emerge only around 6 years of age and undergoes steady development well into adolescence (Hogrefe, Wimmer, & Perner, 1986; Sullivan, Zaitchik, & Tager-Flusberg, 1994). Further, Banerjee and Yuill (1999) found that children who passed second-order belief tests were more likely to

suggest that story protagonists make false claims so as to present themselves in a positive light to others. On the basis of this evidence, Polak and Harris (1999) and Talwar and Lee (2002a) hypothesized that older children would be more likely to feign ignorance in follow-up questions and that their success would be linked to performance on second-order tasks (ToM_2 hypothesis). Because both Polak and Harris (1999) and Talwar and Lee (2002a) only studied children under 8 years of age and did not measure children's second-order belief understanding, the ToM_2 hypothesis had yet to be directly tested; doing so was the focus of the present study.

This study aimed to examine the development of children's semantic leakage control ability during the elementary school years and its relation to their second-order belief understanding. A modified temptation-resistance paradigm was used in which children played a trivia game. Children were told not to peek at a final trivia question when left alone. Later, they were asked about their behavior (e.g., whether they had peeked, the answer to the trivia question, and two additional "entrapment" questions about certain details on the back of the trivia card). On the basis of existing evidence, we expected that as age increased, children would be more likely to deny their transgression and to feign ignorance in answer to follow-up questions. In accordance with the ToM_2 hypothesis, it was expected that children's semantic leakage control ability would be significantly related to their performance on second-order belief tasks.

Method

Participants

One hundred and seventy-two children between 6 and 11 years of age participated (86 boys, 86 girls). In the experimental condition, there were 116 children: 36 first-graders (18 boys, 18 girls; mean age = 80 months, *SD* = 6.24), 38 third-graders (20 boys, 18 girls; mean age = 106 months, *SD* = 7.55), and 42 fifth-graders (21 boys, 21 girls; *M* = 122 months, *SD* = 6.84). There were 56 children in the control condition: 20 first graders (8 boys, 12 girls; mean age = 81 months, *SD* = 4.17), 18 third-graders (9 boys, 9 girls; mean age = 106 months, *SD* = 4.37), and 19 fifth graders (10 boys, 9 girls; mean age = 124 months, *SD* = 4.8). The children were predominately Caucasian and from middle-income families in a medium-sized North American city (population: 120,000).

Procedure and Materials

Experimental condition—Children were brought individually to the test room and told that they were going to play a trivia game. They had to answer multiple-choice questions (e.g., "Where does the President of the United States live?") written on cards. Children were read each question and the four possible answers written on the front side of the trivia card. After a child answered, the card was flipped over. The back side of each trivia card contained the answer to the question, written in a different color and accompanied by an unrelated picture. Children received one prize token for every correct answer, and after earning three prize tokens they could win a prize. After the child answered two questions correctly, the experimenter said that she had to leave the room for a minute. The experimenter read the final trivia question —"Which explorer discovered Tunisia?"—and four possible answers: Alexander the Great, Edward Bipley, Jacques Cartier, and Profidius Aikman. The "correct" answer, as indicated on the back of the trivia card, was Profidius Aikman (a fictitious name) and was written in red ink with a picture of a lion. The experimenter told the child not to peek at the answer while she was gone and left the child alone in the room with the trivia card containing the final question. Two hidden cameras providing a close-up of the child's face and a panoramic view of the room recorded the child's behavior.

After 60 s, the experimenter returned and asked, “When I was gone, did you peek at the answer?” (peeking question). Next, the child was asked the final trivia question, “Who do you think discovered Tunisia?” If the child answered this question correctly, the experimenter asked, “How did you know that?” Children’s answers were coded into three categories: “I don’t know” or no response, guessing, or plausible explanation (e.g., “I learnt it in school”). There was 94% intercoder agreement. All children were awarded the third prize token regardless of their answer, and all children received a prize. The rate at which children who did not peek (nonpeekers) should have answered the final trivia question correctly would have been 25% as a result of guessing.

Two follow-up entrapment questions about irrelevant details on the back of the final trivia question were asked. These questions were asked to examine whether children would feign ignorance about such details to avoid implicating themselves in their peeking. The experimenter told the child that they were finished playing the game, but before the child left, she had two more questions for him or her: “What color is the writing on the back of this card?” (color question) and “What animal is shown on the back of this card?” (animal question). Because there could be many different colors of ink used to write the answer and many different animal pictures, the correct guessing rate (nonpeekers’ responses) should be smaller than the correct guessing rate for the final trivia question. If the children who peeked at the answer and lied about their peeking were poor at semantic leakage control, they would be more likely to give correct answers to the color and animal questions. However, if the lie-tellers were skilled at semantic leakage control, their pattern of responses should have been similar to that of nonpeekers.

Control condition—To rule out the possibility that lie-tellers might not give correct answers to the entrapment questions because they forgot or did not notice the color of the writing or the animal picture on the back of the trivia card, we included a control condition. The procedure was the same as that in the experimental condition with one modification. The experimenter informed children that they were allowed to peek at the answer to the final trivia question while she was out of the room. All control children did look at the answer while alone for about 2–3 s (similar to the amount of time spent looking by the peekers). The experimenter never alerted the children that they would be probed about the color of the ink in which the answer was written or the picture of the animal. If the children were able to notice and remember the additional details on the trivia card, then they should have answered the color and animal questions correctly.

Nonverbal expressive behavior—To determine whether lie-tellers engaged in different nonverbal expressive behaviors than did nonliars, we coded all children’s nonverbal expressive behaviors. Facial expressions were coded according to the facial action coding system (FACS; Ekman & Friesen, 1975) by two independent coders. The use of the FACS provided a more systematic approach to coding and comparing the nonverbal leakage of lie-tellers and nonliars than that of Lewis et al. (1989) or Talwar and Lee (2002a), who used subjective coding techniques. In general, children did not display many expressive behaviors. Therefore, some of the more frequently occurring movements were collapsed into two categories: positive movements and negative movements. Positive movements included seven categories associated with vertical musculature movements that elongated the face in some way (e.g., lip-corner pulling, brow raises). Negative movements included nine categories associated with vertical movements that scrunched the face in some way (e.g., lip tightening, brow furrowing). Children received a positive and negative expressive display score for each segment of the interview. All five segments were coded: peeking segment (positive, $\kappa = .68$; negative, $\kappa = .73$), final trivia question segment (positive, $\kappa = .74$; negative, $\kappa = .78$), explanation segment (positive, $\kappa = .86$; negative, $\kappa = .92$), color question segment (positive, $\kappa = .88$; negative, $\kappa = .91$), and animal question segment (positive, $\kappa = .79$; negative, $\kappa = .76$).

Theory of mind tasks—Two second-order belief stories adapted from Hogrefe et al. (1986) and Sullivan et al. (1994) were acted out in puppet plays and shown to children on video. The order of the stories was counterbalanced. One story involved two children (John and Emma) who encounter an ice cream man at the park. Emma goes home to get money for an ice cream. While she is gone, the ice cream man tells John that he is going to the school to sell ice cream. On the way to the school, the ice cream man meets Emma and tells her he is going to the school. The children were asked the following target questions: "Does John know that Emma knows where the ice cream man is now?" and "Where does John think Emma will go to buy ice cream?" The second story involved two children, Mary and Simon, and their grandpa. In the story, Grandpa gives the children a piece of chocolate to share. Simon wants to keep the treat for himself, so he hides it while Mary plays outside. Unbeknownst to Simon, Mary is watching him through the window. Children were asked the following target questions: "Does Simon know that Mary knows where the chocolate is now?" and "Where does Simon think Mary will look for the chocolate?" For both stories, children were asked control questions to ensure they understood the story. All children answered the control questions correctly. The highest possible second-order belief score for the two stories was 4.

Results

Children's Peeking Behavior

All children in the control condition peeked at the back of the trivia card. In the experimental condition, 58 children peeked (50%) at the correct response when the experimenter left the room. We conducted logistic regression to assess the influence of the independent variables (age, sex, and second-order belief score) on children's peeking behavior. For this and subsequent analyses, the independent variables, because they were chosen for theoretical reasons (see Menard, 2002), were first entered as predictors. Additional predictors (i.e., interactions) were added individually to determine whether they would contribute significantly to the model.

For peeking behavior, the best fitting model included age and sex as predictors. The overall regression model was significant, $\chi^2(2, N = 116) = 9.38$, $p < .01$. Age reliably predicted children's peeking behavior ($B = -0.79$, Wald = 8.75, $p < .01$). Although 78% of first graders peeked, only 45% of third graders and 31% of fifth graders peeked. There was no significant effect of sex, with boys and girls both equally likely to peek. The mean latency to peek was 19 s ($SD = 19.9$). However, 54% children peeked within 10 s. A linear regression analysis was conducted with age, sex, and second-order belief scores entered as predictors. The model was not significant ($\Delta R^2 = .04$, *ns*).

Children's Lie-Telling Behavior

Children in the experimental condition were categorized as lie-tellers, confessors, or nonliars (children who did not peek). Of the 58 peekers, 54 denied looking at the correct response (93.1%). A logistic regression analysis was conducted on children's responses to the peeking question with age, sex, and second-order belief scores as predictors. The overall regression model was not significant, $\chi^2(3, N = 58) = 6.11$, *ns*. All of the nonliars stated that they did not peek. All children in the control condition admitted that they had peeked.

Children's Responses to the Final Trivia Question

A logistic regression analysis was conducted on children's responses to the final trivia question (correct vs. incorrect) with age, sex, type of child (lie-teller vs. nonliar), and second-order belief scores as predictors (confessors were excluded from the analysis). The overall regression model was significant, $\chi^2(4, N = 112) = 12.85$, $p < .01$. Lie-tellers' responses were significantly different from those of the nonliars ($B = 0.72$, Wald = 10.73, $p < .01$). Fifty percent of the lie-

tellers gave the correct answer, "Profidius Aikman," whereas only 28% of nonliars answered correctly, as would be expected by chance (25%). In the control condition, all children answered correctly because they all peeked and there was no motivation to conceal the correct answer.

Children's answers to "How did you know that?" when they gave the correct answer were analyzed. A linear regression conducted to assess the relation between the independent variables (age, sex, type of child, and second-order belief scores) and children's explanation answers was not significant ($\Delta R^2 = .08$, *ns*). The majority of lie-tellers (42%) and nonliars (67%) explained that they had guessed the correct answer, whereas some gave no justification (lie-tellers: 30%; nonliars: 27%). Approximately 27% of lie-tellers gave plausible answers (e.g., "I learnt it in school"), and only 1 nonliar gave such an answer.

Children's Responses to the Entrapment Questions

Although 53.1% of lie-tellers answered the color question correctly, only 19.1% of nonliars answered correctly. All but 1 child in the control condition gave a correct response. A logistic regression analysis was conducted on children's answers to the color question (correct vs. incorrect). The best fitting model included age, sex, type of child, second-order belief scores, and the Type of Child × Second-Order Belief Scores interaction as significant predictors of children's responses, $\chi^2(5, N = 112) = 21.94$, $p < .01$. There was a significant effect for type of child ($B = 2.911$, Wald = 8.81, $p < .01$) but also a significant Type of Child × Second-Order Belief Scores interaction ($B = -0.86$, Wald = 6.51, $p < .05$). To assess the nature of the interaction, we performed additional regression analyses, which revealed a significant second-order belief score effect for lie-tellers ($B = 1.26$, Wald = 7.06, $p < .01$) but not for the nonliars ($B = 0.79$, Wald = 1.82, *ns*). Lie-tellers whose answers were incorrect to the color question had higher second-order belief scores ($M = 3.15$, $SD = 0.80$) than did lie-tellers who gave correct answers ($M = 2.26$, $SD = 0.87$).

For the animal question, 56% of lie-tellers and 17.6% of nonliars answered correctly. All but 1 child in the control condition gave a correct response. We conducted a logistic regression to assess children's answers to the animal question. The best fitting model included age, sex, type of child, second-order belief score, and the Type of Child × Second-Order Belief Score interaction, $\chi^2(5, N = 112) = 34.02$, $p < .01$. Age predicted lie-tellers' incorrect responses ($B = -0.99$, Wald = 8.98 $p < .01$). Whereas 82% of first graders gave correct responses, 42% of third graders and 25% of fifth graders gave correct responses. There was also a significant effect of type of child ($B = 0.68$, Wald = 80.13, $p < .01$) and a significant Type of Child × Second-Order Belief Score interaction ($B = -0.76$, Wald = 5.71, $p < .05$). To assess the nature of the interaction, we performed additional regression analyses, which revealed a significant second-order belief score effect for lie-tellers ($B = -0.93$, Wald = 5.72, $p < .05$) but not for nonliars ($B = 0.15$, Wald = 0.15, *ns*). Lie-tellers who gave incorrect answers had higher second-order belief scores ($M = 3.13$, $SD = 0.90$) than did those who gave correct answers ($M = 2.43$, $SD = 0.84$).

To examine children's overall concealment, we conducted a linear regression to assess the relationship between the independent variables (age, sex, type of child, and second-order belief score) and the total number of correct answers to the three questions (final trivia, animal, and color questions). The overall regression model was significant, $F(4, 111) = 12.68$, $p < .001$, $\Delta R^2 = .30$, $p < .01$. There was a significant difference for type of child, $t(111) = 5.69$, $p < .001$. Lie-tellers gave more correct answers than nonliars (see Table 1). There was a significant age difference, $t(111) = -2.05$, $p < .05$, with younger children giving more correct answers than older children (see Table 1). Another linear regression analysis that was conducted to assess the relation between only the lie-tellers' responses to the three questions and the independent variables (age, sex, and second-order belief score) was significant, $F(3, 111) = 4.31$, $p < .01$, $\Delta R^2 = .24$, $p < .01$. The second-order belief score effect was significant, $t(46) = -2.87$, $p < .01$.

Lie-tellers who gave all incorrect answers had higher second-order belief scores (M = 3.2, SD = 0.84) than did those who gave three correct answers (M = 1.4, SD = 0.55; see Figure 1). No significant results were found for nonliars' correct responses (ΔR^2 = .06, *ns*).

Nonverbal Expressive Behavior

Of the 116 children in the experimental condition, 100 children had valid facial scores. For the remaining children, facial expression could not be coded due to various problems (e.g., face moved off camera, technical difficulties when recording). There were no significant differences found for lie-tellers' and nonliars' positive or negative expressive behavior for the peeking segment, final trivia question segment, or animal question segment. For the explanation segment, there was a significant difference between lie-tellers' and nonliars' positive facial expressions, $F(1, 50) = 6.12$, $p < .05$. Lie-tellers exhibited more positive facial expressions (M = 1.87, SD = 1.53) than did nonliars (M = 0.95, SD = 1.39). There was no significant difference in terms of age or sex. A main effect of type of child was also found for negative expressive behavior, $F(1, 50) = 6.73$, $p < .05$. Lie-tellers exhibited more negative facial expressions (M = 0.98, SD = 1.24) than did nonliars (M = 0.68, SD = 1.38). For the color question segment, there was a main effect of sex of child, $F(1, 100) = 7.62$, $p < .05$. Boys showed more positive expressive behavior (M = 1.167, SD = 1.44) than did girls (M = 0.58, SD = 0.78). There were no significant correlations found between children's nonverbal expressive behaviors and their second-order false belief scores.

Discussion

The current study investigated elementary school-age children's lie-telling behavior and their ability to successfully control semantic and nonverbal leakage in a temptation-resistance paradigm. Several major findings were obtained.

First, contrary to previous studies in which the majority of preschoolers peeked (Lewis et al., 1989; Talwar & Lee, 2002a), only half of the school-age children in the current study did so. Also, younger children were more likely to peek than were older children. These age-related peeking results are consistent with existing findings that children show normative developmental increases in their inhibitory control when facing a tempting situation (Carlson & Moses, 2001; H. N. Mischel & Mischel, 1983; W. Mischel, 1996; Rodriguez, Mischel, & Shoda, 1989).

Second, of those children who did peek at the answer, 93% denied their transgression. These findings are consistent with past research, which has found a strong tendency to lie in children under 7 years of age if they have transgressed (Polak & Harris, 1999; Talwar & Lee, 2002a). Thus, it appears that after 3 years of age, the tendency to lie about one's own transgression remains strong through preschool and elementary school years.

Consistent with recent findings, analysis of children's nonverbal expressive behavior when denying that they peeked showed that lie-tellers were virtually indistinguishable from nonliars (e.g., Lewis et al., 1989; Talwar & Lee, 2002a, 2002b). However, when the lie-tellers explained why they had chosen the correct answer, they were more likely to reveal their deception in their nonverbal behavior by showing both more negative and positive expressive behavior. This is partially consistent with the findings of Talwar and Lee (2002a), who demonstrated that lie-tellers under 8 years of age were more likely to show exaggerated positive expressions (big smiles) than nonliars were when denying peeking at a toy. It is possible that the lie-tellers in the present study, like those younger children in Talwar and Lee (2002a), were trying to conceal their lie by increasing their positive expressive behavior but overdid it. It should be noted, however, that the explanation segment was the only segment in which lie-tellers were significantly distinguishable from nonliars, and the distinction was made by trained coders

who were able to view the videos repeatedly. Thus, it is unlikely that those children's deception could have been easily detected by naive adults.

Third, it was hypothesized that older children would not only deny their transgression but also successfully control semantic leakage by feigning ignorance. The two entrapment questions were designed to assess to what extent children would make verbal statements congruent with their initial lie. On the whole, lie-tellers answered the entrapment questions correctly more often than nonliars. However, incorrect answers increased with age. Younger lie-tellers were more likely to answer the entrapment questions correctly than were third and fifth grade lie-tellers. Given the fact that all of the control children remembered and answered the follow-up questions correctly, and children's memory increases with age (Bjorklund & Muir, 1988; Schneider & Bjorklund, 1998), it is unlikely that the present developmental pattern of results can be attributed to memory failure. Rather, it is highly likely that many of these lie-tellers intentionally answered at least one entrapment question incorrectly to conceal their transgression.

The fourth major finding of the present study was that children's tendency to feign ignorance was significantly related to their second-order belief understanding, as predicted by the ToM_2 hypothesis. Children who had lower second-order belief scores were less likely to feign ignorance when answering the entrapment questions. These findings support the suggestion about the relationship between semantic leakage control and children's second-order theory of mind understanding (Polak & Harris, 1999; Talwar & Lee 2002a). However, children's second-order belief understanding was unrelated to their nonverbal expressive behaviors. It is possible that school-age children were already highly proficient in their ability to control their nonverbal behaviors, as suggested by the lack of significant differences found between lie-tellers and nonliars. It may be that the ability to regulate nonverbal expressive behavior during lying is an earlier developmental milestone, which may be influenced by children's first-order belief understanding, a hypothesis that requires testing in the future.

Interestingly, children's answers to the final trivia question were not related to their second-order belief scores. This may have been the case because many of the children had realized that they could give the correct answer with a plausible explanation ("I learnt it in school" or "I guessed") without their transgression being detected. Also, the incentive of winning the game may have overcome children's motivation to feign ignorance. However, the current study found a similar rate of feigning ignorance on the final trivia question as Talwar and Lee (2002a) found for oldest children in their sample (6–7 years of age). This similarity in results suggests that the motive to appear well-informed and give the correct answer may have overridden some children's desire to conceal information they had acquired illicitly. However, when children's answers to all three questions (final trivia question and entrapment questions) are scrutinized, it appears that children who adopted a strategy of partially feigning (e.g., giving one correct answer) had higher second-order false belief scores and may have tried to give the appearance of answering correctly "by chance," similar to the nonliars. Children might have been motivated to appear both well-informed and to have not transgressed. They might have believed that it was sufficient to conceal their transgression by answering only one or two questions incorrectly. This possibility needs future confirmation with specifically designed studies in which there is no benefit to appearing well-informed. Nevertheless, the present results suggest that as children become older, they are increasingly able to maintain semantic leakage control, and this ability is related to their second-order belief understanding.

The relationships between other cognitive abilities and the development of children's lie-telling abilities require future empirical research. One issue to be explored is the relation between children's semantic leakage control and comprehension monitoring. Research shows that younger children have difficulty detecting inconsistencies between verbal statements produced

by others (Ackerman, 1993; Beal & Flavell, 1984: Robinson, Goelman, & Olson, 1983). It is possible that children's ability to maintain their lies may be influenced by their increased ability to monitor statement discrepancies as they become older. It has also been suggested that executive functioning may be directly related to children's deception (Carlson & Moses, 2001; Carlson, Moses, & Hix, 1998). Carlson et al. (1998) found that preschool children who experienced difficulty with executive functioning tasks, especially those that require a high level of inhibitory control, demonstrated difficulties with first-order deception tasks. Hence, children may have difficulties with lying if they lack advanced executive functioning skills. However, such a relation might be mediated by theory of mind development (Carlson, Moses, & Breton, 2002; Perner, Lang, & Kloo, 2002; Sabbagh, Xu, Carlson, Moses, & Lee, 2006). Future research should explore the relation between children's lie-telling abilities and their executive functioning skills as well as those abilities' relation to theory of mind abilities.

In summary, the current study showed that the majority of children between 6 and 11 years of age who transgress will lie to conceal their transgressions, and their ability to maintain their lies increases with age. However, children's semantic leakage control ability increased not only with age but also with increased cognitive sophistication. Children who had acquired an understanding of second-order beliefs were more likely to sustain their deception in subsequent follow-up statements. Although children's deception is often considered to be problematic, the current study's results suggest that lying is associated positively with children's cognitive development in terms of their understanding of others' minds.

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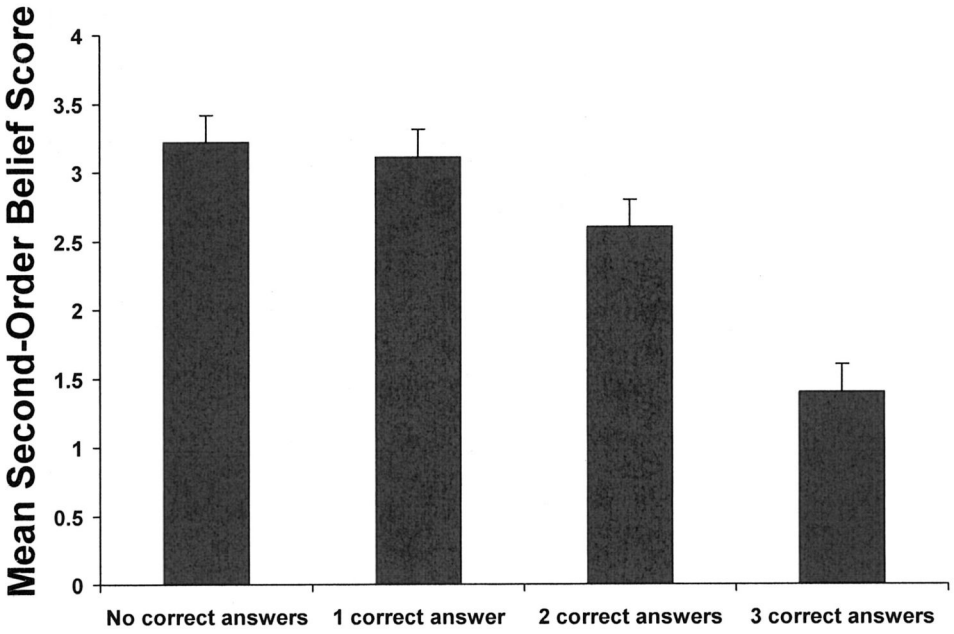

Figure 1.
Mean second-order belief scores as a function of correct or incorrect answers to the final trivia question and the two entrapment questions. Error bars represent standard errors.

Table 1

Percentages of Correct Answers to Follow-Up Questions

Type of child and number of correct answers	Age group			
	First graders	Third graders	Fifth graders	Total
Experimental				
Lie-teller				
None	7.1	5.8	23.1	11.1
One	17.9	47.1	53.8	31.5
Two	57.1	47.1	15.4	44.4
Three	17.9	0	7.7	12.9
Nonliar				
None	66.6	61.9	65.5	65.5
One	33.3	38.1	34.5	34.4
Two	0	0	0	0
Three	0	0	0	0
Permission control				
None	0	0	0	0
One	0	0	0	0
Two	10.5	0	0	3.6
Three	89.5	100	100	96.4