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Theory-of-Mind Training Causes Honest Young Children to Lie

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Abstract

Theory of mind (ToM) has long been recognized to play a major role in children's social functioning. However, no direct evidence confirms the causal linkage between the two. In the current study, we addressed this significant gap by examining whether ToM causes the emergence of lying, an important social skill. We showed that after participating in ToM training to learn about mental-state concepts, 3-year-olds who originally had been unable to lie began to deceive consistently. This training effect lasted for more than a month. In contrast, 3-year-olds who participated in control training to learn about physical concepts were significantly less inclined to lie than the ToM-trained children. These findings provide the first experimental evidence supporting the causal role of ToM in the development of social competence in early childhood.

Keywords

theory of mind, lying, deception, training, social behavior

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The ability to reason about mental states and act in accordance with such reasoning is commonly known as *theory of mind* (ToM; Wellman, 2014). It is widely accepted that this sociocognitive ability plays a major role in children's everyday social interactions with other people. Indeed, extensive research shows that ToM predicts children's social competence in such domains as prosocial behavior, interpersonal interaction, and popularity with peers (Astington & Jenkins, 1995; Davis-Unger & Carlson, 2008; Mizokawa & Koyasu, 2015; Slaughter, Imuta, Peterson, & Henry, 2015; Watson, Nixon, Wilson, & Capage, 1999). Impairments in ToM have also been associated with debilitating sociocognitive deficits such as autism, severe conduct problems, and psychopathy (Baron-Cohen, Tager-Flusberg, & Cohen, 1994; Blair et al., 1996; Frith & Happé, 1994; Sharp, 2008). However, because these findings are correlational, they fall short of fully establishing a causal link between ToM and social competencies.

Training studies could establish such a link. Indeed, developmental psychologists have recently used training methods to improve children's ToM (e.g., Melot & Angeard, 2003; Mori & Cigala, 2015; Rhodes & Wellman, 2013). ToM training has led to significant enhancement not only in ToM itself but also in several collateral abilities, including executive functioning (Fisher & Happé, 2005), metamemory (Lecce, Bianco, Demicheli, & Cavallini, 2014), and language (Hale & Tager-Flusberg, 2003). To date, however, researchers have reported the collateral effects of ToM training only in the cognitive domain. Despite the long-standing acceptance of the idea that ToM plays a major role in the development of social competences, no causal evidence exists (Wellman, 2014).

In the current study, we aimed to address this significant gap in the literature by focusing on children's verbal

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deception, an important social behavior that is sometimes adaptive and other times maladaptive (Bok, 1989; Lee, 2013). The development of verbal deception or lying has been the subject of extensive research for over a century (Darwin, 1877; Hartshorne & May, 1928; Piaget, 1932). Recent research has shown that lying emerges normatively at 2 or 3 years of age and develops rapidly with increased age, in particular between the ages of 3 and 7 years (Lee, 2013).

Traditionally, research has focused on the role of moral, social, and situational factors in the development of verbal deception. But in the past decade, researchers have shown that children's ToM understanding significantly correlates with their verbal deception in the preschool years for Western (Evans & Lee, 2013; Talwar & Lee, 2008) and Chinese children (Evans, Xu, & Lee, 2011). Because ToM is typically thought of as contributing to prosocial development, one might surmise that improving ToM ability should potentially reduce children's tendency to lie. However, the recent correlational studies on the issue suggest that the opposite may be true: the greater the ToM ability, the earlier and better children lie (Chandler, Fritz, & Hala, 1989; Polak & Harris, 1999; Talwar & Lee, 2008). These findings, taken together, lead to the hypothesis that ToM may play an important role in engendering verbal deception in children (Lee, 2013). In particular, ToM may enable children to understand the similarities and differences between their own mental states and those of other people; in turn, this allows children to make appropriate decisions about whether to lie and what to lie about (Lee, 2013). More specifically, telling a lie successfully requires deliberately creating a false belief in the mind of the lie recipient, and ToM could provide an important cognitive tool to enable children to do so (Talwar & Lee, 2008). Thus, ToM training has the potential to cause children who do not know how to lie to begin to tell lies. Such a finding would provide intriguing data, not only about the underlying mechanisms of the emergence of lying, but also about the overarching hypothesis that ToM causally influences children's social competence.

To address these possibilities, we recruited 3-year-olds who were initially unable to lie. Half of the children were assigned to a ToM training condition in which they learned to reason about various mental states in different situations, and the other half were assigned to a control training condition in which they learned to reason about properties of physical objects. We controlled for IQ and the executive-functioning ability of the two groups, because both factors have been shown to be related to the development of ToM (Carlson, Moses, & Breton, 2002; Hughes, 1998) and deception (Ding et al., 2014; Evans et al., 2011). Our primary hypothesis was that ToM training would increase not only children's ToM understanding but also their tendency to lie. Furthermore, we expected that the effects of ToM training on lying, if indeed they exist, would be apparent not only a few days after training but also weeks after training had stopped. This seemed reasonable, because two prior studies have found that ToM training effects can last for several weeks or more (Appleton & Reddy, 1996; Lecce et al., 2014).

Method

Overview of the study

Figure 1 provides an overview of the entire study. A pretest identified children who consistently failed to lie, as revealed on an existing hide-and-seek deception task (Yi et al., 2014). Children's IQ, ToM, and executive functioning were assessed on appropriate standard tasks used to assess these constructs. At this point, children who consistently failed to lie on the pretest were assigned to either an experimental training condition or a control training condition by yoke-matching them on IQ, executive functioning, and ToM scores.

Then, children in the experimental condition were trained on standard ToM tasks as well as stories rich in mental-state vocabulary, whereas control children were trained using Piagetian conservation tasks (Gelman, 1969) and stories without mental-state words. Posttests were conducted 3 days after training. At posttest, children in both the experimental and control conditions performed another ToM task as well as the same hide-and-seek deception task used in pretest. After the posttest, a short-term follow-up phase ensued. During this phase, all children received trials of the same hide-and-seek deception task every day for 6 consecutive days. We reasoned that the effects of ToM training would be best revealed over multiple days through engaging children in the actual deployment of deception on a regular basis. Finally, after the short-term follow-up phase, we waited for about 1 month (26 days) and then retested children in both conditions with the same deception task to examine whether the training effect had lasted.

Participants

We planned to recruit 60 children to participate in the study and successfully recruited 58. All were Han Chinese and native speakers of Mandarin; they came from two different kindergartens (which in China are attended by 3- to 6-year-olds) located in an eastern city of mainland China. The children were from families of various socioeconomic backgrounds. Informed consent was obtained from parents or legal guardians before the commencement of the study, and oral assent was obtained from all children. To ensure that the children possessed the

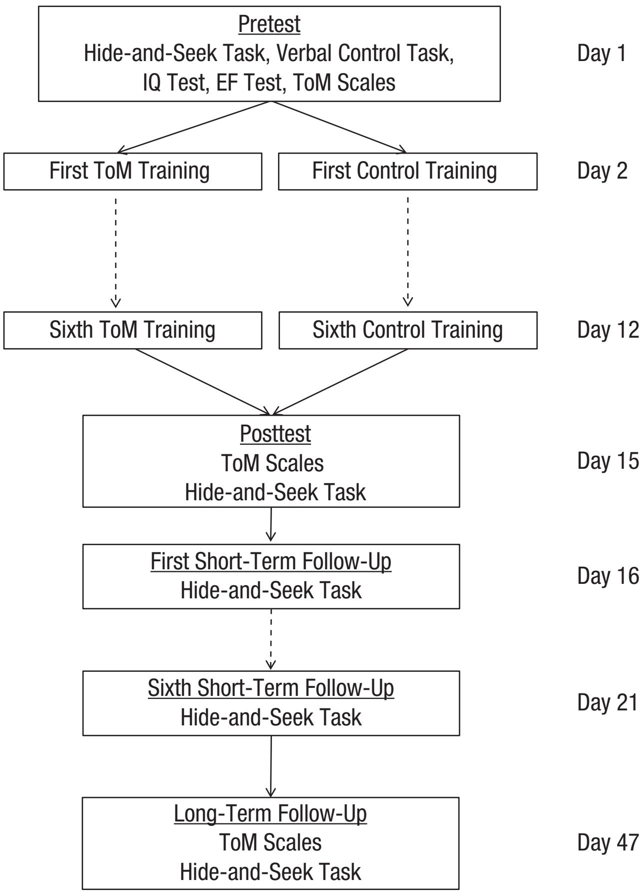

Fig. 1. Overview of the study procedure and tasks. Dotted arrows indicate the second through fifth repetitions of the training session; solid arrows indicate directly sequential tasks. ToM = theory of mind; EF = executive functioning.

minimum verbal abilities necessary for completing our pretests, we also used an existing verbal control task (Gopnik & Astington, 1988; Slaughter & Gopnik, 1996). No child failed the verbal control task.

Two children were excluded from the study because they passed one or more deception trials at pretest. An additional 14 children were excluded because they did not complete training as a result of sickness, traveling, or unwillingness to continue their participation. In the end, 42 children completed our procedures: 21 in the experimental condition (mean age = 3.08 years, *SD* = 0.14, age range = 2.83–3.33 years; 10 boys and 11 girls) and 21 in the control condition (mean age = 3.07 years, *SD* = 0.16, age range = 2.83–3.50 years; 6 boys and 15 girls).

Tasks and materials

Hide-and-seek deception task. The hide-and-seek deception task is a frequent measure of verbal deception in preschool children (Chandler et al., 1989; Sodian, Taylor, Harris, & Perner, 1991; Yi et al., 2014). During a warm-up, the children began with a simple hide-and-seek game with the experimenter that involved no deception. The experimenter hid a candy in one of two cups and then asked the children to guess where the candy was. If the children guessed correctly, they were declared a winner and received the candy. If they guessed incorrectly, they were declared a loser and the experimenter kept the candy. For each of these three warm-up trials, we explained the rules of the game to the children.

After this warm-up, for the hide-and-seek deception task itself, the experimenter showed the children 10 candies and 10 stickers and asked them to pick their favorite sticker. The experimenter told the children that they could keep this sticker only after they had won the 10 candies. Then, during each of the 10 trials, the experimenter closed her eyes. After the children announced that they had hidden the candy, the experimenter opened her eyes and asked, "Where did you hide the candy?" The experimenter always guessed the cup that the children indicated to have hidden the candy. If a child responded truthfully by indicating the cup where the candy was really hidden (counted as truth-telling), the experimenter took the candy from the cup, stating, "I won! It is my candy. Let's do it again." If a child responded untruthfully by indicating the empty cup (counted as lying), the experimenter displayed disappointment and stated, "I lost. It is your candy now. Let's do it again."

The lying score ranged from 0 to 10. To be conservative, we allowed only those children who received a zero lying score at pretest to go on to training. For some posttest and follow-up test analyses, and again to be conservative, we considered only those children who received 10 on their lying score to have passed the task. We never taught the children how to misdirect the experimenter to win the candy in the pretest, posttest, or follow-up tests with the hide-and-seek deception task.

Verbal control task. A verbal control task (see Gopnik & Astington, 1988; Slaughter & Gopnik, 1996) was used to ensure that the children could understand and answer questions about the current and past state of affairs of the sort that would be essential to successfully complete the ToM training tasks. In the task, the experimenter put a toy car inside a box, then showed the box to the children and asked them to open the box. After they did so, the experimenter asked, "What is in the box?" (correct answer: a car). Then, the experimenter took the car out of the box, covered the car with his or her hand, put a sticker inside the box, and asked, "What is in the box now?" (correct answer: a sticker). After the children answered this question, the experimenter asked, "When I first showed you this box, what was in the box?" (correct answer: a car). If the children failed to answer the first two questions correctly, the experimenter gave them feedback and asked the questions again. No child failed the verbal control task.

Executive-functioning task. Existing research has revealed that executive functioning is significantly correlated with ToM understanding (Carlson et al., 2002). Thus, to ascertain the specific role of ToM in engendering lying in children, we sought to ensure that the children in the experimental and the control conditions were the same before training. To assess (and control for) children's executive-functioning ability, we chose to use the flanker-fish task. This specific executive-functioning measure is one of the best standard measures for measuring executive-functioning in children, and it is known to be appropriate for 3-year-old children (Diamond, Barnett, Thomas, & Munro, 2007; Röthlisberger & Neuenschwander, 2011).

The measure has two initial tasks (the blue-fish and pink-fish tasks) that lead to the focal executive-functioning task, the mixed-fish task. We used the scores on the mixed-fish task to match the executive-functioning abilities of children in the experimental and control conditions. After a practice session with four trials, the children performed the blue-fish task first. They saw five fish of the same color (blue or pink) on a computer screen. The blue-fish task required the children to respond on the basis of the orientation of the central target, the blue fish, by pressing a key to indicate whether the fish was facing right or left. There were 17 trials in this task. Then, the pink-fish task ensued. It required responding on the basis of the orientation of the outside flanker fish. In the congruent condition of these tasks, the flanker fish and the central target fish faced in the same direction; in the incongruent condition, the flanker fish and the central target fish faced in opposite directions. The children completed 17 trials of the pink-fish task. Finally, the crucial mixed-fish task that involved both blue and pink target fish was administered, so the children were required to remember the different rules according to the different fish colors and press the appropriate keys. There were a total of 45 mixed fish trials. Each child's overall percentage accuracy in the shifting trials (i.e., pink-to-blue or blue-to-pink fish) of the mixed-fish task was recorded as the executive-functioning score (for these young children, reaction time was not recorded). There was no significant difference between the executive-functioning scores of children in the experimental condition (M = 62.00%, SD = 14.32) and the scores of children in the control condition (M = 60.63%, SD = 14.19), $t(39)$ = 0.04, p = .97; Cohen's d = 0.01.

Intelligence test. The children were administered the Chinese Stanford-Binet Intelligence Scale Revised (Wang, 1982). Raw scores were converted to an IQ score according to the age-specific norms provided by the manual, with a mean of 100 and a standard deviation of 15. There was no significant difference between the IQ scores of experimental group (M = 111.48, SD = 17.62) and those of the control group (M = 107.33, SD = 17.00), $t(40)$ = .78, p = .44; Cohen's d = 0.25.

ToM scale (pretest and posttest). We used a Chinese version of the ToM scale that included six subtasks (for details, see Wellman & Liu, 2004): diverse desires, diverse beliefs, knowledge access, false belief, belief-emotion, and hidden emotion. Each task included a warm-up or control question along with its target question, and if a child answered both questions correctly, he or she received 1 point. Thus, scores could range from 0 to 6. We used two equivalent versions of this scale (Sets I and II), counterbalanced between participants. Children who were tested on Set I in the pretest received Set II in the posttest, and vice versa.

ToM training (experimental condition). Children in the experimental condition received direct training with feedback on two false-belief tasks (false-content task and false-location task, Gopnik & Astington, 1988; Wimmer & Perner, 1983) and one appearance-reality task (Flavell, Flavell, & Green, 1983). We focused on these two types of tasks for ToM training because the false-belief task is widely accepted as the litmus test for a representational ToM (Wellman & Woolley, 1990), and children's performance in the false-belief task is strongly correlated with that in the appearance-reality task (Melot & Angeard, 2003; Slaughter & Gopnik, 1996), which also measures children's ToM (Flavell et al., 1983). In addition, to reinforce the ToM training effects induced by the training on the ToM tasks, we further trained the children via reading them stories rich in mental-state vocabulary and asking them questions about the content of the story (Guajardo & Watson, 2002; Ornaghi, Brockmeier, & Gavazzi, 2011).

We describe the false-content task in detail to illustrate the direct training of false-belief tasks. In one such false-content task, the children were shown a pencil box and asked what they thought was inside. They were then shown that the box contained something other than what the box suggested. The children were asked three target questions: (a) whether someone else who had not seen inside the box knew what was inside, (b) what they had originally thought was inside the box before opening it, and (c) what someone else who had not seen inside the box would think was inside. The children received 1 point for each correct response to a target question, so scores ranged from 0 to 3. In each false-belief task, there were three target questions, and in the appearance-reality task, there were two; in total, the children received scores ranging from 0 to 8 for each training session.

For all the target questions, correct answers received feedback as follows. For example, for the false-content task just illustrated, incorrect answers received feedback such as "No, you are incorrect. When he saw this box, before opening it, he thought there were pencils inside it," whereas for correct answers, the feedback was: "Yes that's right. When he saw this box, before opening it, he thought there were pencils inside it." In addition to the immediate feedback, at the end of the training session, children were told their total scores for that day.

To reinforce our ToM training, we provided the children with six additional stories that were rich with *mental-state vocabulary* (see Text S1 in the Supplemental Material available online). On each training day, children further heard and responded to a short story rich with mental-state vocabulary. These stories were modified from popular children's picture storybooks. There were three target mental-state words in each story. After hearing each story, the children were asked to construct as many sentences as possible using the target mental-state words. The experimenter gave them feedback about whether the sentence was correct or not. Feedback training for each word took about 3 to 5 min, and the total time in each session was about 10 to 15 min. Thus, for the six training sessions, there were six different stories in total, all with similar lengths.

Non-mental-state training (control condition). In the control condition, paralleling ToM training, children were trained on three Piagetian conservation tasks (Gelman, 1969)—number conservation, length conservation, and mass conservation—as well as stories without mental-state vocabulary.

We describe the number-conservation task in detail to illustrate the conservation training tasks. In this task, two sets of five Chinese checkers were used. At first, the two sets of checkers were presented in a one-to-one correspondence, so that they were perceptually and quantitatively equal. The children were asked whether the sets had the same number or different numbers of checkers. The experimenter then rearranged one row of checkers, spreading it out so that it looked longer, while the children watched. The children were asked whether the two sets had the same number of checkers. They received 1 point for a correct response.

As in the ToM training, the children were given immediate feedback about their performance on each task. At the end of the training session, they were also told their total scores for that day. For each training session, the total score for the conservation tasks ranged from 0 to 3.

To parallel the experimental condition, in each training session, we provided the children with a story that did not have mental-state vocabulary (see Text S2 in the Supplemental Material). After hearing the story, the children constructed sentences using target non-mental-state words. There were six stories, one for each training session. The length of the stories was very similar to the length of the mental-state stories.

Procedure

The children were seen individually in a quiet room in their kindergarten. As shown in Figure 1, during the pretest, they performed the hide-and-seek deception task, the IQ task, the executive-functioning task, and the ToM task. After the pretest, we kept in our sample only those children who were unable to lie in the hide-and-seek deception task. They were ordered sequentially according to their pretest scores for IQ, executive functioning, and ToM and grouped into pairs. One of each pair was randomly assigned to the experimental training condition and the other to the control training condition.

During the training phase (11 days), the children were trained every other day (i.e., six times). They received either ToM training (experimental condition) or non-mental-state training (control condition). Each training session took about 20 min per child.

During the posttest phase, which occurred 3 days after the last training session, all children took the ToM task (Set I or II) to ascertain whether their ToM scores had improved. In addition, to ascertain whether training led children to be more inclined to lie, the children performed the hide-and-seek deception task.

In the short-term follow-up phase, which began 1 day after the posttest, the children performed the hide-and-seek deception task on each of the subsequent 6 days. In the long-term follow-up phase (26 days after the short-term follow-up phase and 35 days after the last day of training), all children performed the hide-and-seek deception task.

Results

Preliminary analyses revealed no significant effect of gender, and thus data were collapsed across this factor in subsequent analyses.

To first determine whether ToM training improved children's ToM scores, we conducted a repeated measures 2 (testing phase: pretest vs. posttest) × 2 (condition: experimental condition vs. control condition) analysis of variance (ANOVA). Testing phase was the within-subjects variable, and ToM score was the dependent variable. As predicted, the main effect of condition was significant, $F(1, 40) = 101.32$, $p < .001$, $\eta_p^2 = .72$, and the interaction of testing phase and condition was significant, $F(1, 40) = 101.32$, $p < .001$, $\eta_p^2 = .72$. As shown in Figure 2, post hoc analyses (least significant difference) showed that ToM scores of children in the experimental condition improved significantly from pretest to posttest, $F(1, 20) = 162.00$, $p < .001$, $\eta_p^2 = .89$, but the scores of children in the control condition did not.

Was there a corresponding change in the children's lying? As shown in Figure 3, at posttest, children in the experimental condition became significantly more likely

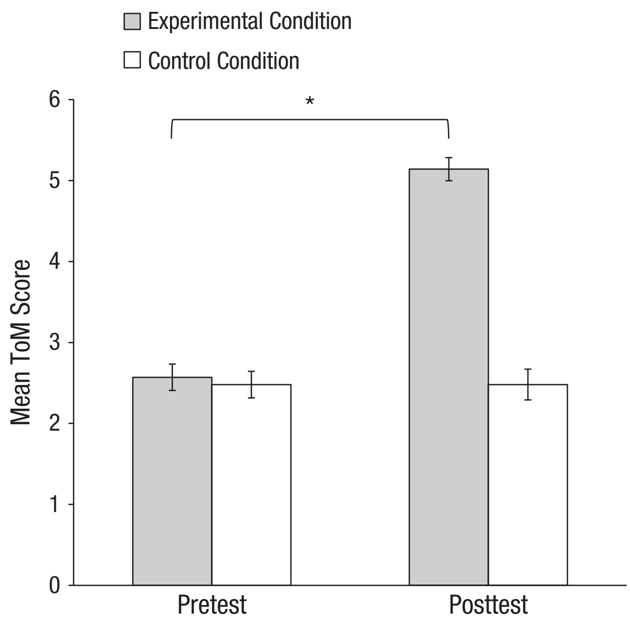

Fig. 2. Mean theory-of-mind (ToM) scores at pretest and posttest, separately for children in the experimental condition and the control condition. Error bars indicate ±1 *SE*. Asterisks indicate significant differences (*$p < .001$). Maximum possible score = 6.

to lie in the hide-and-seek deception task than those in the control condition, $t(40) = 4.42$, $p < .001$, Cohen's $d = 1.40$. This effect was apparent on the last of the six daily short-term follow-up tests as well, $t(40) = 3.49$, $p < .001$, Cohen's $d = 1.10$.

To further examine the relationship between ToM training and lying, for children in the experimental condition, we calculated a Pearson correlation between ToM score gains (the difference between the ToM pretest score and the ToM posttest score) and lying scores at posttest. The correlation was not significant, $r(21) = .064$, $p = .782$. To further examine whether the training effect depended on the initial level of ToM ability, we calculated a correlation for initial ToM scale scores at pretest and lying scores at posttest, again for children in the experimental condition. This correlation was also not significant, $r(21) = .114$, $p = .622$. Thus, the ToM training improved children's lying scores significantly, and this improvement depended neither on their initial ToM scores nor on the increase in the ToM scores after training. In other words, the ToM training worked for children generally, not just some of them who happened to have a higher initial ToM scores or who were more sensitive to the ToM training.

Because the children had one posttest and six daily short-term follow-up tests, we also conducted a survival analysis to assess how their lying improved over the posttest and the short-term follow-up tests. For this analysis, we categorized the children into either pass or fail groups according to their performance on the hide-and-seek deception task for each testing session. To be conservative, we decided that to pass, children had to score 10 of the 10 trials for a particular session.

The findings of Yi et al. (2014) led us to suspect that, given 7 consecutive days of exposure to the lying task,

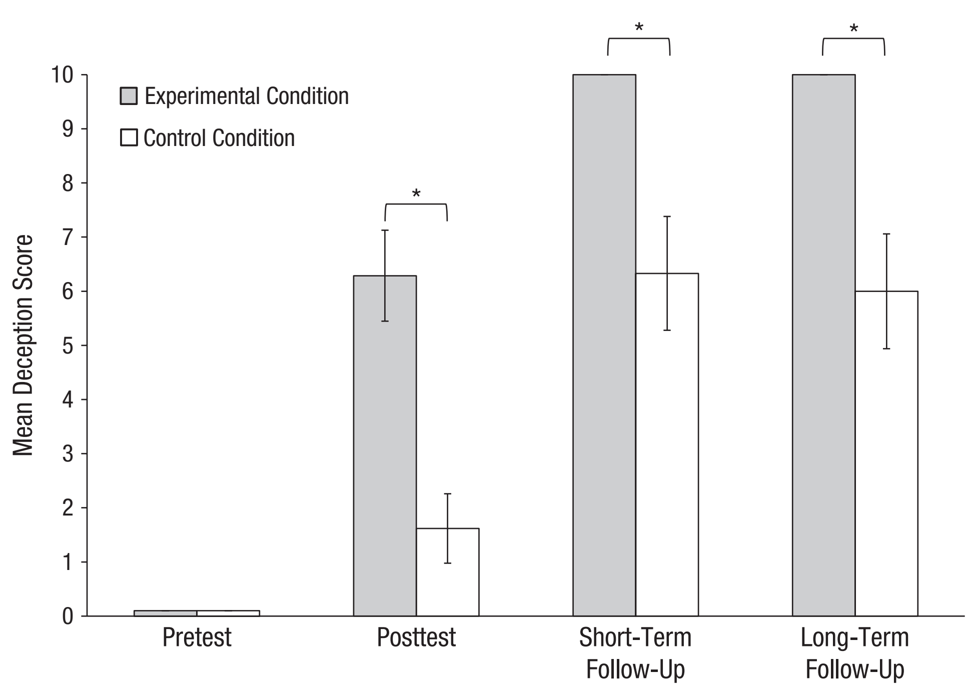

Fig. 3. Mean lying scores at pretest, posttest, short-term follow-up, and long-term follow-up. Scores are presented separately for children in the experimental condition and the control condition. Error bars indicate ±1 *SE*. Asterisks indicate significant differences (*$p < .001$). Maximum possible score=10.

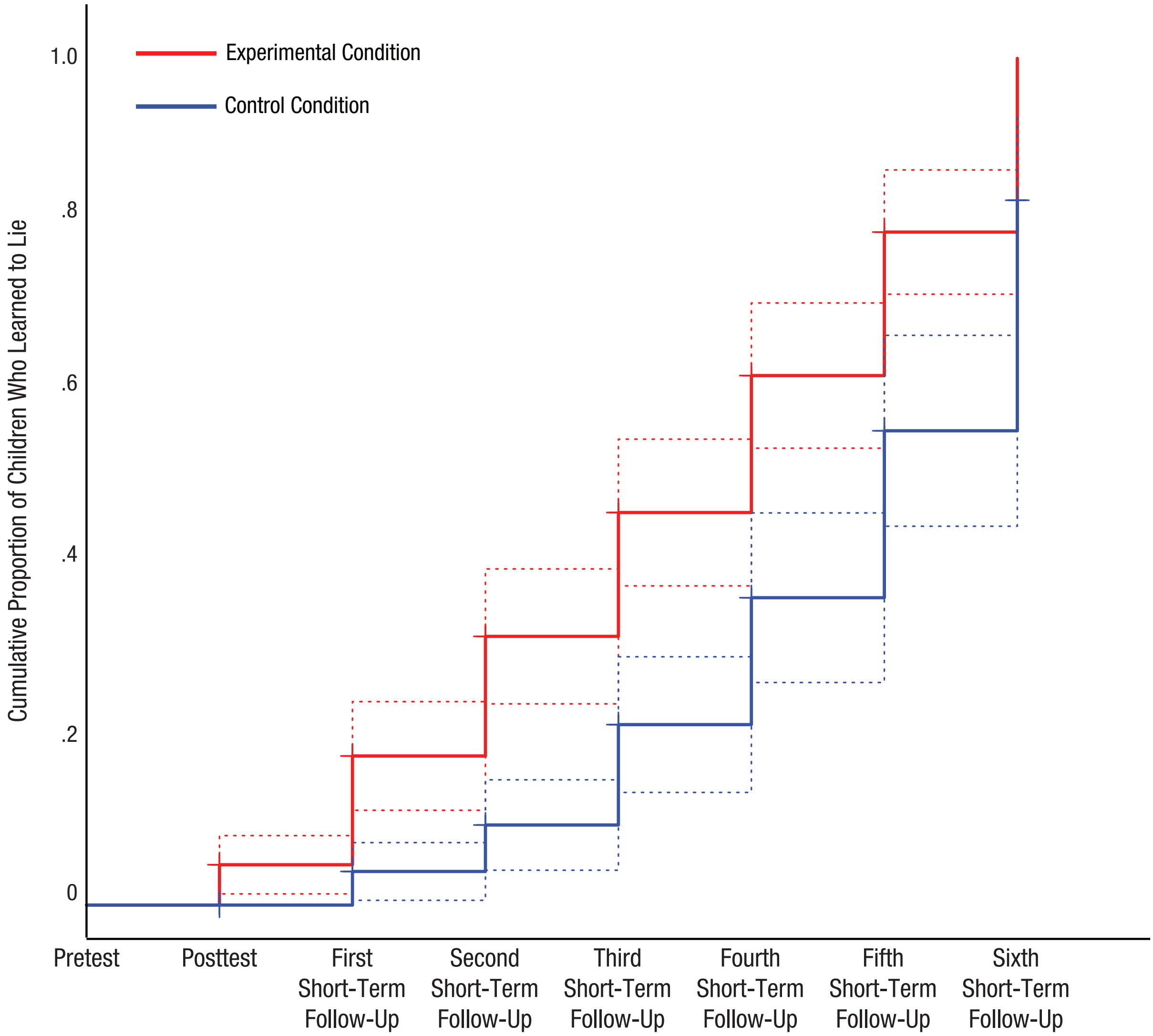

Fig. 4. Cumulative proportion of children who learned to consistently lie over time, separately for the experimental and control conditions. Dashed lines represent 95% confidence intervals.

even children in the control condition could improve. Indeed, as shown in Figure 4, during the short-term follow-up phase after training, the number of children who passed the deception task increased systematically in both conditions. However, the rate in terms of number of sessions required for children to consistently pass the task (10 lying responses to the 10 trials per session) was significantly greater in the experimental condition than in the control condition—log-rank test: $\chi^2(1, N = 42) = 28.36$, $p < .001$.

The changes and group differences we observed might be transitory and might diminish with yet further time and without further training. The long-term follow-up data, 35 days after the last day of training, address this possibility. As shown in Figure 3, although the children in the experimental condition received no further ToM training or exposure to the deception task after the short-term follow-up phase, they were still significantly more likely to lie than the children in the control condition at the long-term follow-up, $t(40) = 3.77$, $p < .001$, Cohen's $d = 1.19$.

Discussion

The present study examined the causal linkage between ToM understanding and the emergence of verbal deception in young children. As predicted, ToM understanding for children in the experimental condition but not for children in the control condition improved significantly after training. More importantly, children in the experimental condition became significantly more likely to lie in the hide-and-seek deception task compared with both their own pretests and the children in the control condition. Moreover, this training effect lasted for more than 1 month.

These findings support both the specific hypothesis that ToM plays a causal role in the emergence of young children's lying behavior and the general hypothesis that ToM causally affects children's social competence.

Lee (2013) proposed that lying can be seen as ToM in action. To lie, one must realize that (a) different people may have different beliefs about the true state of affairs, and (b) people can be misled to form false beliefs about the true state of affairs and to act in accordance with their false beliefs. In particular, in our hide-and-seek deception task, to successfully deceive (and thereby outcompete an adult in accumulating candies), children must know that false statements would mislead the adult to search for the candy in a wrong location. According to other ToM training research (e.g., Slaughter & Gopnik, 1996; Wellman & Peterson, 2013), false-belief training allows children to become sensitive to different mental states, to learn that people may have a false belief about reality that may differ from the children's own true belief. In addition, as suggested by Guajardo and Watson (2002), false-belief training coupled with mental-state training via story narratives rich in mental-state terms might be particularly effective in helping children reason about how people's false beliefs can mislead them to behave erroneously. In the current study, we showed that such training causes children to become more inclined to use lying in a hide-and-seek deception task and thereby to more often win the game.

We do not know which of the various parts of our ToM training are necessary or sufficient to produce these effects. However, not only was the impact of ToM training on verbal deception evident immediately after the training, but also it continued for at least 1 month afterward. Existing studies that have demonstrated the influence of ToM training have focused mostly on short-term effects. And to the extent that existing studies have examined the impact of ToM training on collateral competences, they have focused on cognitive abilities, such as executive functioning and language (Hale & Tager-Flusberg, 2003; Melot & Angeard, 2003; Slaughter & Gopnik, 1996). Only two of these existing studies have examined ToM training effects beyond 1 week. Appleton and Reddy (1996) found that the false-belief training affected children's ToM understanding on a closely related competence (i.e., understanding the distinction between appearance and reality) 2 to 3 weeks after training. Lecce et al. (2014) found that ToM training affects children's performance on meta-memory tasks 2 months after training.

To the best of our knowledge, the current study is the first to show that ToM training can have a lasting impact on children's social behavior. By increasing their sensitivity to mental states and engaging them in reasoning about false beliefs, we enabled young children not only to quickly apply their newly acquired knowledge to solve a problem in a social situation but also to continue to do so more than a month later. Taken together, these two findings also suggest that children were not just mechanically memorizing what they were taught in the ToM training sessions; rather, they were able to consolidate the knowledge and use it adaptively to solve a social problem they were facing.

It should be emphasized that our ToM training induced children to become more inclined to lie. This provocative outcome helps underwrite the power of our finding, because lying is typically discouraged. But this may also be a worrisome and unwanted outcome because in all cultures, lying is considered an immoral behavior that is met with disapproval by parents and teachers everywhere (Heyman, Luu, & Lee, 2009). It is possible that ToM training also has an unintended collateral effect of promoting dishonesty in children. We think this concern would be unwarranted and premature. Although research has shown consistently that children who eventually develop severe conduct problems and delinquency have a history of chronic lying (Loeber, Stouthamer-Loeber, & White, 1999; Pedersen, Vitaro, Barker, & Borge, 2007), research also demonstrates that lying is an age-related normative development in almost all children younger than 7 years old. Moreover, all cultures also value at least some forms of lies, such as white lies (see Talwar & Lee, 2002).

Furthermore, in our study, the significant effect of ToM training on children's lying was shown in a special competitive game situation. It is unlikely, although of course possible, that children would generalize their lying in this relatively innocuous game setting to more serious real-life situations such as lying about a transgression, stealing, or cheating. Additional studies specifically designed to examine this issue are needed, however, because ToM training has increasingly been used not only by researchers but also by clinicians and educators to promote children's social-cognitive competences. In this regard, one must still be mindful of the possibility of unwanted collateral consequences of such training. In addition, recent studies have shown that children with developmental disorders and delays may lie differently (e.g., Baron-Cohen et al., 1994; Blair et al., 1996; Frith & Happé, 1994; Sharp, 2008; Yi et al., 2014). Thus, whether ToM training will have a significant effect on such children's deceptive behavior awaits further research.

In summary, the present study demonstrated that ToM training could cause young children who normatively do not lie to begin to do so. Thus, we confirmed the hypothesis that ToM plays a causal role in the emergence of young children's lying behavior. Moreover, we thereby provide evidence for the larger hypothesis that increases in ToM understanding cause changes in children's social competences.

Author Contributions

K. Lee and G. Fu developed the study concept. K. Lee, H. M. Wellman, G. Fu, and X. P. Ding contributed to the study design. Data collection was performed by Y. Wang and G. Fu. X. P. Ding and Y. Wang performed the data analysis. X. P. Ding drafted the manuscript, and K. Lee, H. M. Wellman, and G. Fu provided critical revisions. All authors approved the final version of the manuscript for submission.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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Supplemental Material

Additional supporting information can be found at http://pss.sagepub.com/content/by/supplemental-data

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