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BRIEF REPORT

Emergence of Lying in Very Young Children

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Lying is a pervasive human behavior. Evidence to date suggests that from the age of 42 months onward, children become increasingly capable of telling lies in various social situations. However, there is limited experimental evidence regarding whether very young children will tell lies spontaneously. The present study investigated the emergence of lying in very young children. Sixty-five 2- to 3-year-olds were asked not to peek at a toy when the experimenter was not looking. The majority of children (80%) transgressed and peeked at the toy. When asked whether they had peeked at the toy, most 2-year-old peekers were honest and confessed to their peeking, but with increased age, more peekers denied peeking and thus lied. However, when asked follow-up questions that assessed their ability to maintain their initial lies, most children failed to conceal their lie by pretending to be ignorant of the toy's identity. Additionally, after controlling for age, children's executive functioning skills significantly predicted young children's tendency to lie. These findings suggest that children begin to tell lies at a very young age.

Keywords: deception, honesty, lie-telling, children, executive function

Lying is a pervasive behavior in the adult world (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996). Furthermore, children, as young as 42 months, have been found to lie in laboratory settings for a variety of reasons (Evans, Xu, & Lee, 2011; Polak & Harris, 1999; Popliger, Talwar, & Crossman, 2011; Talwar & Lee, 2002). There is strong evidence that the ability to lie is positively related to the development of cognitive skills such as theory of mind and executive functioning (Evans et al., 2011; Polak & Harris, 1999; Talwar, Gordon, & Lee, 2007; Talwar & Lee, 2008).

However, little is known regarding whether children younger than 42 months will lie. Young children may not lie in the same sense as adults or older children, which is deliberately stating a belief that one does not believe with an intent to instill a false belief in the listener (Chisholm & Feehan, 1977). Talwar and Lee (2008) proposed a developmental model of lying. The first level of *primary lies* emerges around 2–3 years of age when children begin to be able to deliberately make factually untrue statements. However, they do not necessarily take into consideration the mental states of the listener. *Secondary lies* emerge around the age of 4 years and require children to understand that the listener, unlike themselves, does not know the true state of affairs and thus is susceptible to false beliefs. Finally, around 7–8 years of age, children begin to reach *tertiary lies* where they are able to conceal their lies by maintaining consistency between their initial lie and follow-up statements. The present investigation focuses on the emergence of young children's primary lies.

Given that there is evidence that executive functions emerge in toddlerhood (Hughes & Ensor, 2005; Rennie, Bull, & Diamond, 2004), some of the cognitive ingredients necessary for lying are in place to support 2-year-olds' ability to lie. Parental reports suggest that children younger than 3 years will lie. The first report was made by Darwin (1877), who, after observing his son attempting to deceive him, concluded that even children as young as 30 months will attempt to lie. More recently, Newton, Reddy, and Bull (2000) examined the lie-telling behaviors of the second author's son, who was 30 months old. Using a natural observation method, these authors reported 37 incidents of deception. In addition to parental reports, Wilson, Smith, and Ross (2003) observed lie telling at home and found that 65% of 2-year-olds and 94% of 4-year-olds lied at least once.

Although naturalistic observation studies can reveal how children behave in a comfortable context, experimental studies are needed to control for alternative explanations. Whereas no laboratory study has examined 2-year-olds' lying, several studies have examined their nonverbal deception. Chandler, Fritz, and Hala (1989) as well as Sodian, Taylor, Harris, and Perner (1991) found that 2- and 3-year-olds produced deceptive ploys to conceal the location of a hidden toy with the support of an experimenter. However, it is unknown whether very young children can spontaneously tell lies in the laboratory.

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In addition to developmental age differences, cognitive skills such as executive functioning have been found to be related to deceptive abilities (Carlson, Moses, & Hix, 1998; Evans et al., 2011; Talwar & Lee, 2008). Inhibitory control, or an individual's ability to suppress a response while completing a separate goal, is believed to be required to tell a lie because that individual must inhibit the truth while reporting false information. Working memory, a system for temporarily holding and processing information (Baddeley, 1986), is also believed to be required to lie because one must keep in memory both the lie and the truth.

Carlson et al. (1998) found support for the relation between inhibitory control and deception by demonstrating that 3-year-olds who had difficulty with inhibitory control also had difficulty deceiving someone by pointing to the wrong location of a hidden object. Building on Carlson et al.'s findings, Talwar and Lee (2008) found that 3- to 8-year-olds' ability to deny their transgression was related to their inhibitory control skills. Additionally, Evans et al. (2011) found that 4-year-olds' inhibitory control skills were significantly related to their ability to maintain consistency between physical evidence of a transgression and their deceptive statements. These studies strongly support the relation between inhibitory control skills and lie-telling behaviors.

Support for a relation between working memory and lying has been more inconsistent. Talwar and Lee (2008) found no significant relation. However, both Talwar and Lee (2008) and Evans et al. (2011) found that the Stroop task, which has been suggested to involve both inhibitory control skills and working memory (Carlson & Moses, 2001), was significantly related to children's lie telling. These results suggest that children's performance on tasks that measure working memory in conjunction with inhibitory control (rather than inhibitory control or working memory alone) may be related to children's lie-telling behavior.

The present investigation was the first to directly examine the development of children's early spontaneous verbal deceptive behaviors between the ages of 2 and 3 years and the related cognitive skills. All children participated in a temptation-resistance paradigm where children were asked not to peek at a toy while the experimenter was absent. Upon returning, the experimenter asked children whether they had peeked (lie-telling measure). To assess whether children could conceal their lie during follow-up questioning (semantic leakage control; Talwar, Lee, Bala, & Lindsay, 2002), children were asked what the toy was. Children completed a series of executive functioning tasks and their parents completed a language measure.

While Carlson et al. (1998) found that 3-year-olds with poor inhibitory control scores had difficulty deceiving someone by pointing to an alternate location, in the present investigation we removed the component of providing a false statement and simply required children to make a denial of an action they had committed. This reduced cognitive requirement provided an opportunity to examine children's earliest lies. Based on existing studies (Newton et al., 2000; Wilson, Smith, & Ross, 2003), we hypothesized that 2-year-olds would lie to conceal their transgression. We also hypothesized that as age increased, children would be significantly more likely to lie (Wilson et al., 2003). Finally, we explored whether semantic leakage control would improve with age and executive functioning skills (Evans et al., 2011; Talwar & Lee, 2002, 2008).

Method

Participants

Forty-one 2-year-olds (M = 29.56 months, SD = 3.10; range: 25–35 months, 25 boys) and twenty-four 3-year-olds (M = 43.31 months, SD = 3.39; range: 37–47 months, 12 boys) participated in the study, resulting in a total sample of 65. Children were recruited from households of diverse socioeconomic status in a major Canadian city through a participant database. Informed consent was obtained from parents and verbal assent from children. The study was approved by the university research ethics board.

Procedure

Children were seen individually in a quiet room and completed a series of executive functioning tasks and a measure of verbal deception. The order of tasks was randomized between participants with the exception of the Gift Delay, which always was the last task. Parents completed a questionnaire of their child's verbal ability.

Verbal ability measure (MacArthur–Bates Short Form Vocabulary Checklist–Level II; Fenson et al., 2000). Parents were presented with a one-page list of words (e.g., *dog*, *bye*) and were asked to indicate the words they had heard their child say. Children received 1 point for each word. Total scores could range from 0 to 100.

Executive functioning measures. The executive functioning battery was based on Carlson's (2005) toddler tasks.

Reverse Categorization (Carlson, Mandell, & Williams, 2004). First, big blocks were sorted into a big bucket and little blocks into a little bucket. Next, 12 Reverse Categorization trials were completed. The experimenter asked children to sort the big blocks in the little bucket and the little blocks in the big bucket. One point was awarded for each Reverse Categorization trial the child performed correctly. Scores could range from 0 to 12.

Shape Stroop (Kochanska, Murray, & Harlan, 2000). Children were presented with three cards depicting a large and small image of a fruit. The experimenter labeled the size of each fruit and asked children to name the fruit. Then, children were given three trials in which the card depicted two large fruits with smaller fruits embedded in the center (e.g., a large banana with a small apple inside next to a large orange with a small banana inside). Children were asked to point to the small fruit (e.g., the little banana). One point was given for each correct trial. Scores could range from 0 to 3.

Gift Delay (Kochanska et al., 2000). The experimenter presented children with a gift bag and asked children not to peek at the gift while she went to get a bow. Hidden cameras captured children's behavior in the experimenter's absence. The experimenter returned to the room after 3 min (or once the child peeked). Children were given 1 point if they did not peek at the gift. Scores could range from 0 to 1.

Table 1 shows the means and standard deviations of the cognitive measures by age. A total executive functioning score was created. Because scoring standards for each executive functioning task were different, a z-score transformation was performed on each executive functioning measure. The total executive functioning score for each participant was the summed z scores of all executive functioning tasks (see Table 2 for intercorrelations be-

Table 1
Percentage of Children Who Peeked and Lied and the Means (Standard Deviations) for Verbal Ability and Executive Functioning Measures by Quartile Split on Age in Months

Measure	Age in months				Total
	25–28 (n = 19)	29–33 (n = 14)	34–42 (n = 16)	43–48 (n = 16)	
Peeked % (fraction)	94.7 (18/19)	85.7 (12/14)	75 (12/16)	62.5 (10/16)	80 (52/65)
Lied % (fraction)	33.3 (6/18)	25 (3/12)	25 (3/12)	90 (9/10)	40 (21/52)
MacArthur–Bates mean (*SD*)	60.28 (27.65)	57.46 (21.36)	89.88 (10.94)	94.31 (9.82)	75.49 (25.10)
Reverse Categorization mean (*SD*)	4.72 (4.53)	3.00 (4.64)	4.94 (4.06)	11.88 (0.50)	6.14 (5.05)
Shape Stroop mean (*SD*)	1.56 (0.92)	1.36 (1.21)	1.94 (1.24)	2.62 (0.89)	1.88 (1.15)
Gift Delay mean (*SD*)	0.53 (0.51)	0.43 (0.51)	0.13 (0.34)	0.19 (0.40)	0.32 (0.47)

Note. MacArthur–Bates = MacArthur–Bates Short Form Checklist–Level II.

tween executive functioning measures and age; the lack of correlations between Gift Delay and Stroop is consistent with findings of Evans et al., 2011).

Deception task (Talwar & Lee, 2002). Children were invited to play a guessing game. A toy was placed behind them (e.g., a duck), a noise associated with the toy was made (e.g., quacking), and the children were asked to guess the name of the toy. After the children successfully guessed the first two toys, the experimenter told children that she needed to get a storybook and that the next toy would be placed on the table with the noise playing but that they were not to turn around while the experimenter retrieved the storybook. The toy was placed on the table, and a musical card played music unrelated to the toy so that children could not accurately identify the toy. Due to the young age of the children, the experimenter did not leave the room but instead went to a corner (in front of the child) and rummaged through a bin with her back to the child. Hidden cameras captured whether children peeked. After 1 min, the experimenter closed the bin loudly and stood up to indicate that she was done and was about to turn around. The experimenter then turned around and immediately covered the toy with a cloth. Children were classified as either peekers (peeked at the toy) or nonpeekers (did not peek at the toy). As a measure of whether children understood that they were not supposed to peek, children's behavior at the moment that the experimenter stood up was coded. Of the children who peeked at the toy, 86.5% (N = 45) of children returned to their seated position with their back to the toy, indicating that they understood the rule and remained in this position while the experimenter covered the toy. No significant age (M = 33.77 months, SD = 7.11 and M = 31.32 months, SD = 7.78, for children who returned and did not return to their original seated position, respectively, p = .406) or cognitive differences (ps > .117) were found between those who returned to the seated position and those who did not.

To assess whether children would tell the truth or a lie about their peeking behavior, the experimenter asked, "While I was getting the book, did you turn around and peek at the toy?" If they peeked and admitted peeking, they were classified as a confessor. If they peeked but denied peeking, they were classified as a lie teller. Then, to examine whether children were able to maintain verbal consistency between their initial statement and subsequent statements (i.e., semantic leakage control) they were asked, "What do you think it is?" Children who blurted out the name of the toy were classified as revealers. Children who concealed their knowledge by either feigning ignorance (e.g., saying "I don't know") or guessed another toy were classified as concealers.

Results

Preliminary analyses with gender as a predictor variable on the first step of all described regressions revealed no significant effects of gender (ps > .20). Thus, all further analyses were conducted collapsing across gender.

Peeking Behavior

Overall, 80% (52 of 65) of children peeked at the toy. A logistic regression was performed with peeking behavior (0 = did not peek, 1 = peeked) as the predicted variable and age in months as the predictor. The model was significant, $\chi^2(1, 65) = 6.74$, Nagelkerke R^2 = .16, p = .009. As age increased, children were

Table 2
Correlations Among Children's Age (in Months), Language, Individual Executive Function Measures, and the Total Executive Function Composite Score

Measure	Age (months)	MacArthur–Bates	Reverse Categorization	Shape Stroop	Gift Delay
Age (months)					
MacArthur–Bates	.597**				
Reverse Categorization	.581**	.358**			
Shape Stroop	.403**	.378**	.396**		
Gift Delay	−.328**	−.251*	−.093	−.192	
Total executive function composite score	.375**	.303*	.728**	.674**	.392**

* Correlation is significant at the .05 level (2-tailed). ** Correlation is significant at the .01 level (2-tailed).

significantly less likely to peek at the toy ($B = 0.1–1.0$, Wald = 6.09, $p = .014$, odds ratio [OR] = 1.12). The odds ratio indicates that for each month increase in age, children were 1.12 times less likely to peek (Table 1).

Peeking latencies were calculated from the time that the experimenter placed the toy on the table until the child turned around ($M = 10.75$ s, $SD = 16.02$; range 0–59). A linear regression was performed with peeking latencies as the predicted variable and age in months as the predictor. As age increased, children took significantly longer to peek, $F(1, 51) = 5.21$, $R^2 = .10$, $\beta = .32$, $p = .027$.

Lie Telling

Of the 52 peekers, 40% (N = 21) lied about having peeked. A logistic regression was performed with lie-telling behavior (0 = confessor, 1 = lie-teller) as the predicted variable. Age in months was entered on the first step followed by verbal ability on the second step and total executive functioning score on the third step. The first model was significant, $\chi^2(1, 52) = 8.64$, Nagelkerke $R^2 = .29$, $p = .003$. As age increased, children were significantly more likely to lie ($B = 0.13$, Wald = 7.33, $p = .007$, OR = 1.14). The odds ratio indicates that for each month increase in age, children were 1.14 times more likely to lie (Table 1). The second block of the model including verbal ability was not significant, $\Delta\chi^2(1, 52) = 2.26$, Nagelkerke $R^2 = .28$, $p = .13$. However, the third block including the total executive functioning score was significant, $\Delta\chi^2(1, 52) = 6.91$, Nagelkerke $R^2 = .43$, $p = .009$. Further investigation of the individual variables in the model indicated that children with higher executive functioning skills were significantly more likely to lie ($B = 1.75$, Wald = 5.26, $p = .022$, OR = 5.77). The odds ratio indicates that for each point increase in children's total executive functioning score, they were more than 5 times more likely to lie.

A logistic regression was also performed with only those children who demonstrated their understanding of the rule by returning to their seated position ($N = 45$) following the same steps as the previous logistic regression. The first model was significant, $\chi^2(1, 45) = 12.28$, Nagelkerke $R^2 = .34$, $p < .001$. As age increased, children were significantly more likely to lie ($B = 0.18$, Wald = 9.02, $p = .003$ OR = 1.19). The second block of the model including verbal ability was not significant, $\Delta\chi^2(1, 45) = 0.84$, Nagelkerke $R^2 = .36$, $p = .36$. However, the third block including the total executive functioning score was significant, $\Delta\chi^2(1, 45) = 3.72$, Nagelkerke $R^2 = .44$, $p = .05$. Again, children with higher executive functioning skills were significantly more likely to lie ($B = 0.39$, Wald = 3.33, $p = .06$, OR = 1.47).

To assess which executive functioning measures were contributing uniquely to children's lie-telling, we performed a series of three follow-up logistic regression for each of the individual executive functioning measures on children's lie-telling behavior (0 = confessor, 1 = lie teller). Age was entered on the first step followed by either children's Reverse Categorization, Gift Delay, or Shape Stroop scores on the second step. Because children's verbal ability was not a significant predictor, it was excluded from the model. Furthermore, because findings were consistent across analyses that included and excluded children who did not remain in their original seat, all children were included in the follow-up logistic regression to ensure statistical power. For all logistic regressions, the first step with age was significant, $\chi^2(1, 52) = 8.64$, Nagelkerke $R^2 = .29$, $p = .003$, ($B = 0.13$, Wald = 7.33, $p = .006$, OR = 1.14). Next we examined the second block for all three logistic regressions. For the first logistic regression with children's Reverse Categorization scores entered on the second step, the second block with was not significant, $\chi^2(1, 52) = 2.72$, Nagelkerke $R^2 = .27$, $p = .10$. For the second logistic regression with children's Gift Delay scores entered on the second step, the second block was also not found to be significant, $\chi^2(1, 52) = 2.06$, Nagelkerke $R^2 = .26$, $p = .15$. Finally, for the third logistic regression with children's Shape Stroop scores entered on the second step, the second block was found to be significant, $\chi^2(1, 52) = 4.45$, Nagelkerke $R^2 = .34$, $p = .04$, indicating that for each point increase in children's Shape Stroop scores, they were 1.88 times more likely to tell a lie ($B = 0.63$, Wald = 4.02, $p = .04$, OR = 1.88).

Semantic Leakage Control

Of the 21 children who lied, 76% ($N = 16$; Mage = 39.46 months $SD = 8.62$; range = 25– 48 months) of children were revealers, 14% ($N = 3$; one child was 32 months and two children were 27 months) were concealers, and 10% ($N = 2$; both were 29 months) refused to answer the question about what the toy was. Thus, although most young children lied, their semantic leakage control was poor, and their responses to the follow-up question revealed that they peeked and lied. Due to the small number of concealers, we were unable to examine the linkage between semantic leakage control and the other measures.

Discussion

The present study investigated the emergence of lie-telling behaviors in children between 2 and 3 years old. We examined the development of the lie-telling behaviors, and the relation between lie-telling and children's executive functions.

With regards to children's lie-telling behavior, consistent with studies with older children (Polak & Harris, 1999; Talwar & Lee, 2002, 2008), the majority of 3-year-olds who peeked lied. In contrast, only a quarter of the 2-year-olds lied to conceal their transgression. Consistent with our hypothesis, we established experimentally that 2-year-olds will spontaneously tell lies. We also found that between 2 and 3 years of age, the tendency to lie dramatically increases, which mirrors the developmental trend of children between 3 and 12 years (Talwar et al., 2007; Talwar & Lee, 2002, 2008). However, it is possible that the present study underestimated 2-year-olds' lie-telling. Previous studies have found that 2-year-olds are likely to exhibit a yes bias (Fritzley & Lee, 2003). If children exhibited a yes bias in response to the question "Did you turn around and peek at the toy?" this would decrease the rate of lie-telling. Due to the low frequency of nonpeekers in the present study, we were unable to test the possibility of a yes bias. Future studies are needed in which both yes and no responses could lead to a lie to test this possibility. Also, it remains to be ascertained what type of lies are being told by young children. They could have told a primary lie, which is simply desire based (Ahern, Lyon, & Quas, 2011; Reddy, 2007), or a secondary lie, in which they take the listener's mental state into consideration. To ascertain what type of lie is being told, investigators in future studies need to examine whether young children's lie telling is related to their performance on desire-based or belief-based theory-of-mind tasks.

The present investigation also examined the relation between lie telling and executive functions. After controlling for age, we found that consistent with our predictions, children who performed better on executive functioning tasks were significantly more likely to lie. It has been suggested that the unique combination of inhibitory control skills and working memory required by the Stroop task make this an important skill for telling a lie (Evans et al., 2011; Talwar & Lee, 2008). Unlike delay inhibitory control tasks where children merely have to inhibit their response (e.g., Gift Delay), in conflict inhibitory control tasks (e.g., Stroop) children must inhibit an inappropriate response while producing a conflicting novel response (Carlson & Moses, 2001). This additional requirement of producing the alternative response increases the demands of working memory. These demands are similar to telling a lie as one must inhibit the truth while producing a conflicting alternative response. Thus, it may be this unique combination of inhibitory control and working memory that is important for lie telling. The present investigation suggests that rather than younger children being more morally inclined to tell the truth, they may simply be less able to tell lies due to their fragile executive functioning skills.

Future studies could use methods similar to those used by Polak and Harris (1999) and Lyon, Malloy, Quas, and Talwar (2008) with control conditions in which 2-year-olds are allowed to play with the toy in the experimenter's absence. Such a design would provide important insights into whether very young children are making factually untrue statements indiscriminately or flexibly according to the demands of the situation. Furthermore, increasing the salience of the transgression by asking children about an action (e.g., "Did you get out of your chair?"), as well as their perception, and highlighting the rules may assist in supporting children's memory of the transgression. Finally, including a posttest memory check question about the transgression would confirm that children did indeed remember peeking at the toy.

In summary, we demonstrated for the first time experimentally that children begin to tell lies as young as 2 years of age, but most 2-year-olds are still highly honest. Within a 1-year span, children become more inclined to lie about their transgression. In line with studies involving older children, we found that executive functioning skills played an important role in lie telling. Furthermore, the results of the present investigation suggests that rather than younger children simply being more morally inclined to tell the truth, they may simply be less able to tell lies due to their executive functioning skills. Thus, our findings taken together with the previous findings suggest that lying is an early developmental milestone, and its emergence and development reflect increased cognitive development.

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