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Development of lying to conceal a transgression: Children's control of expressive behaviour during verbal deception*

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The present study examined lying behaviour in children between 3 and 7 years of age with two experiments. A temptation resistance paradigm was used in which children were left alone in a room with a music-playing toy placed behind their back. The children were told not to peek at the toy. Most children could not resist the temptation and peeked at the toy. When the experimenter asked them whether they had peeked, about half of the 3-year-olds confessed to their transgression, whereas most older children lied. Naïve adult evaluators (undergraduate students and parents) who watched video clips of the children's responses could not discriminate lie-tellers from nonliars on the basis of their nonverbal expressive behaviours. However, the children were poor at semantic leakage control and adults could correctly identify most of the lie-tellers based on their verbal statements made in the same context as the lie. The combined results regarding children's verbal and nonverbal leakage control suggest that children under 8 years of age are not fully skilled lie-tellers.

Lying was an early topic of investigation in developmental psychology (Hartshorne & May, 1928; Piaget, 1932). Since the 1980s, the topic, after being neglected for nearly half a century, has received renewed attention from developmental psychologists with diverse theoretical orientations and research purposes. The reasons for the current interest in the development of lying are both theoretical and practical. Theoretically, research on the issue has implications for current debates about children's theory of mind (Chandler, Fritz, & Hala, 1989; Peskin, 1992; Polak & Harris, 1999) and the universality of moral development (Lee, 2000; Shweder, Mahapatra, & Miller, 1987). Research on the issue also has practical implications for developing moral education programmes in schools and for assessing children's testimony in legal settings (Burton & Strichartz, 1991; Goodman, 1984).

Most studies on the development of lying have focused on children's concept of lying and their moral evaluations of lie- and truth-telling (Bussey, 1992, 1999; Lee, Cameron, Xu, Fu, & Board, 1997; Peterson, Peterson, & Seeto, 1983; Siegal & Peterson, 1996, 1998; Strichartz & Burton, 1990; for a review, see Lee, 2000). A relatively smaller number of studies have examined children's production of lies (Chandler et al., 1989; Lewis, Stranger, & Sullivan, 1989; Peskin, 1992; Polak & Harris, 1999; Sodian, 1991). Among these studies, the majority have mainly focused on whether children would lie. They did not investigate how successful children's lies were in deceiving others, which is the focus of the present study.

To deceive another successfully, lie-tellers must regulate expressive behaviours to avoid inconsistencies between the behaviours and the lie. Expressive behaviours involve two major inter-related components, one verbal and the other nonverbal. ''Verbal expressive behaviour'' refers to the semantic content of the statements children make during deception, including both the lie and other statements made in the same context. ''Nonverbal expressive behaviour'' refers to the vocal prosody, facial expressions, and body language displayed in conjunction with the verbal expressive behaviour. To be successful a lie-teller must ensure that the content of verbal statements made in conjunction with a false statement does not contradict the lie, which we refer to as ''semantic leakage control''. Second, they must simulate nonverbal behaviours consistent with their untruthful statements and suppress spontaneous, incongruent nonverbal responses, which is referred to as nonverbal leakage control (Ekman & Friesen, 1969).

Several studies have found that young children were poor at ''feigning'' dislike or liking of different stimuli (e.g., the taste of a drink) (Feldman, Jenkins, & Popoola, 1979; Feldman & White, 1980; Morency & Krauss, 1982). However, in such situations children were instructed by experimenters to lie about something they seemed not to care about and therefore might not have been motivated to lie convincingly. Lewis et al. (1989) avoided this problem by using a temptation resistance paradigm in which they told 3-year-olds not to peek at a toy when the experimenter left the room. The majority of children peeked due to the highly tempting nature of the situation. As soon as children peeked at the toy, the experimenter returned to the room and asked the children if they had peeked. This set-up

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provides children an opportunity to lie in order to conceal their own transgressions for self-protection. Hence, they have a reason to lie convincingly. In fact, this situation is similar to the natural situations where children tend to lie (Newton, Reddy, & Bull, 2000; Smith, Wilson, Ross, & Ross, 1997).

Lewis et al. (1989) found that among the 3-year-olds who peeked, 38% lied by denying they had peeked, 38% confessed, and 24% gave no verbal response. Lewis (1993) reported a second study in which the majority of children older than 3 years also lied after peeking. A similar pattern of results was found by Polak and Harris (1999), who asked children not to touch an object or look at a hidden toy for up to 5 minutes. Furthermore, a recent study by Cleland and Lewis (2000) demonstrated that the peekers showed discomfort after peeking but before the experimenter returned, suggesting that they not only remembered their peeking behaviour but also understood that they had transgressed.

Lewis et al. (1989) also asked university students to view video clips of the 3-year-olds. They failed to distinguish between the lie- and truth-tellers based on the children's nonverbal behaviours. Analyses of the video clips by trained coders revealed a small difference in positive, but not negative, nonverbal behaviours between lie-tellers and nonliars. Lie-tellers displayed more positive behaviours than nonliars, suggesting an attempt to mask their emotional expressions. Thus, in a temptation resistance situation where children are motivated to cover up a transgression, it appears that even 3-year-olds are successful at nonverbal leakage control. No studies, however, have examined older children's ability at nonverbal leakage control.

There has also been no direct examination of children's ability to exercise semantic leakage control. In most of the paradigms used, children were only required to give simple responses such as ''yes'' and ''no'' (Lewis et al., 1989), or ''I like it'' and ''I don't like it'' (Feldman & White, 1980; Morency & Krauss, 1982). No follow-up probe questions were asked to assess whether children could elaborate on their lie beyond a simple response. A recent study by Polak and Harris (1999) indirectly examined preschoolers' ability at semantic leakage control. They asked 3- and 5-year-olds about the characteristics of a toy that they claimed not to have touched or seen. Most of the children failed to feign ignorance about it. However, as the focus of their study was not on whether children are successful at semantic leakage control, the researchers did not examine whether the children could successfully deceive others who are naïve to their transgression.

The present study specifically investigated young children's ability to use both verbal and nonverbal leakage control to deceive adults with the use of a modified temptation resistance procedure. Children aged 3 to 7 years played a guessing game in which they had to guess the names of hidden toys. For the last toy, children were told not to peek at a toy located behind them while the experimenter was out of the room. When the experimenter returned, the children were asked if they had peeked. Unlike Lewis et al. (1989) and Polak and Harris (1999), the experimenter in the present study was unaware of whether the child had peeked. In addition to comparing the behaviours of peekers and natural nonpeekers (children who chose not to peek in the experimental condition), a control condition was included in the present study. In this condition, the experimenter returned to the room before the child had had a chance to peek. The forced nonpeekers were asked the same questions as were the children in the experimental condition. This control group was included to allow for appropriate comparisons of the verbal and nonverbal behaviours of the lie-tellers and those of nonliars.

Both peekers' and nonpeekers' expressive behaviours were videotaped. The video clips were shown to university students and parents, who were asked to determine whether the children had lied to assess how successful children were at deceiving naïve adults with and without extensive experience with children. Children's nonverbal expressive behaviours were also analysed independently by two trained coders to identify whether specific nonverbal expressive behaviours, if any, may differentiate the lie-tellers and nonliars.

To examine semantic leakage control, like Polak and Harris (1999), the experimenter in the present study asked follow-up probe questions about what the children thought the toy was. As suggested by Polak and Harris, a skilled lie-teller would be expected not to report the true identity of the toy that they had seen because reporting of this information would reveal that they had peeked. However, in addition to replicating Polak and Harris's (1999) experiment, we also showed the transcripts of the peekers' and nonpeekers' answers to a group of naïve adults to examine whether the adults were able to discriminate between the lie-tellers and nonliars based on the semantic information alone.

Based on the findings of previous studies, we expected that children would lie in the temptation resistance situation, with the number of lie-tellers increasing with age. With regard to nonverbal leakage control, we hypothesised that the child lie-tellers' ability at masking their nonverbal expressive behaviours would increase with age, and naive adults would experience difficulty in distinguishing between the lie-tellers and nonliars as the children's age increased. With regard to semantic leakage control, we hypothesised that children's ability to conceal incriminating verbal information about their transgression would also increase with age, and naïve adults would find it increasingly difficult to discriminate between the lie-tellers and nonliars based on semantic content of children's responses to probe questions.

Experiment 1

Method

Participants. One hundred and one 3- to 7-year-olds from middle and upper-middle income families participated. There were 66 children in the experimental condition: 13 aged 3 years (5 boys), 10 aged 4 years (3 boys), 15 aged 5 years (5 boys), 16 aged 6 years (5 boys), and 12 aged 7 years (7 boys). Thirty-five children were in the control condition in which they had no opportunity to peek: 6 aged 3 years (2 boys), 5 aged 4 years (2 boys), 5 aged 5 years (3 boys), 5 aged 6 years (3 boys), and 14 aged 7 years (5 boys).

Ninety undergraduates participated as evaluators for course credit (67 women, 23 men). Sixty-six parents who had at least one child between the ages of 3 and 11 years of age also participated as evaluators (52 women, 14 men).

Materials. Several well-known commercial toys recognisable by all children from either movies or TV programmes, which had specific sounds associated with the characters (e.g., Buzz Light Year said ''To infinity and beyond''), were used as

practice toys. Two practice toys were randomly chosen to be presented to each child. For the third "target" toy, a Barney doll was used. The audio clue played was music from a greeting card and was not associated with the Barney character in any way. One video camera was mounted to the ceiling to record the child's responses. The camera was discreetly placed and not obvious to the child. It was remotely controlled by an assistant in an adjacent room to obtain a frontal view of the child's head and upper body.

Procedure. Children were seen individually. They were told that they were going to play a game with an experimenter in which they had to guess the names of different toys. They were instructed to sit on a chair with their back turned toward the experimenter. The experimenter then brought out a practice toy and played the audio clue associated with it. If the children could not guess after the first clue, they were given other verbal clues by the experimenter until they correctly identified the toy. This was done with two practice toys. Before the target toy (Barney) was brought out, an assistant interrupted the game to inform the experimenter that there was a phone call. The experimenter explained to the children that they would be left alone for a moment while she took the phone call. Children were told that the next toy would be placed on the table with the audio clue playing and when the experimenter returned they would be asked to guess what the toy was. They were told, "*Don't turn round to peek and look at the toy*" and that they would get a prize if they guessed the toy correctly. The experimenter then left the room and shut the door loudly behind her, saying "Remember, no peeking".

In the experimental condition, like Lewis et al. (1989) and Polak and Harris (1999), we used a variable time schedule in that different children were left alone for different amounts of time. Unlike previous procedures in which children were left alone for up to 5 minutes, we left the child alone for only 30–60 seconds. This modification was due to the fact that most children in our pilot testing appeared to peek within this time limit and some children appeared restless, uneasy, or even upset when they were left alone for too long. This procedural change allowed us to reduce potential participant attrition and to avoid upsetting some of the children. The length of time children were alone was assigned randomly by an assistant. The experimenter was neither informed of, nor could guess, who had peeked. This procedural modification controlled for a potential confound in the previous studies where the experimenter was always aware who had peeked before returning to the room. This knowledge might bias the experimenter's subsequent questioning.

Before opening the door to return to the room, the experimenter turned the doorknob several times to signal to the child that she was entering. While entering the room, she told the child not to turn around. All of the children remained with their backs turned as instructed. The experimenter covered up the toy with a cloth and then asked children to turn around to face her. The experimenter asked the following probe questions: "While I was gone did you turn your head to the side? Did you move around in your chair? Did you peek to see who it was?" To ensure that the children understood the questions, the experimenter modelled head turning, moving in the chair, and peeking at the toy as she asked the questions.

In the experimental condition, there were two groups of children, those who peeked within the assigned time period and those who did not (the natural nonpeekers). The children were coded as having peeked if they turned their head more than 90° with their eyes open and gazed directly at the toy. The peekers were categorised as having lied if they replied "no" to all three of the questions. If they peeked and responded "yes" at least to the third question, they were categorised as "confessors". This criterion for determining lie-tellers and confessors was similar to that used by Lewis et al. (1989) and Polak and Harris (1999). To assess whether children were able to maintain verbal consistency between their lies and subsequent statements, they were asked: "What do you think the toy is?" If they said it was Barney, the toy was revealed and they were asked how they knew. All the children then received a prize. The procedure used for the control condition was the same as the experimental condition except that the experimenter returned within 2 seconds. No children managed to peek within this short period of time. The control children were asked the same probe questions as those in the experimental condition. The same experimenter interacted with all children.

Preparation of video clips for adult evaluators. A 15- to 30-second clip of each child's responses to the three probe questions was copied from the original tape onto one of three new tapes. These clips were arranged in a random order, subject to the restriction that each tape contained an equal number of lie-tellers and nonliars (natural nonpeekers in the experimental condition and forced nonpeekers in the control condition). On each tape, there were three to four video clips of children who confessed to their peeking (the confessors). These clips were included as a control to monitor whether adult evaluators (see below) were paying attention to the video clips. Because there were unequal numbers of lie-tellers and nonliars, some children's clips appeared on more than one tape to equalise numbers of the lie-tellers and nonliars on each tape. However, no adult observer saw a child's video clip more than once.

Evaluation of children's nonverbal behaviors by naïve adults. University students and parents were randomly assigned to view one of the three tapes. An approximately equal number of undergraduates and parents saw each tape with audio. The adults were not familiar with any of the children on the tape. The tapes were viewed in group sessions with 6–10 adults, who were instructed by the experimenter not to discuss their answers. All participants complied with the rule. The experimenter explained the temptation resistance procedure and the context in which these questions were asked. A demonstration video of the entire temptation resistance situation was then shown on a 24-inch television. The adults were told that some children had lied and some had told the truth and that the clips had been randomised so that there was a 50–50 chance that each child was lying. After viewing each child's response, they were instructed to rate the child on a 7-point Likert scale (1–definitely lying, 2–most likely lying, 3–quite likely lying, 4–not sure, 5–quite likely telling the truth, 6–most likely telling the truth, 7–definitely telling the truth). They were also asked to record any behaviour that helped their rating.

Analytic coding of children's nonverbal behaviour by trained coders. The clips were also viewed by two independent, trained coders who were unaware who had lied and who had told the truth. The coders watched the clips of each child

between three and five times to code whether the child displayed one of the following behaviours. These behaviours fall into five categories: eye movement, facial expression, appearance, body language, and prosody of vocalisation. They were derived from previous studies (Cole, 1986; Lewis et al., 1989; Saarni, 1984). The subcategories for eye movement were: eye contact with the experimenter, avoidance of eye contact, looks down or away, stares at the experimenter, rapid glances at the experimenter, and looks up; for facial expression: big smile, slight smile, mouth closing, down-turned mouth, raised eyebrows, knit eyebrows, pressing/biting lips, tongue out, relaxed mouth, and sober mouth; for appearance: looks serious/concerned, defensive, anxious/nervous, and confident/relaxed; for body language: fingers in/over mouth, leans forward, leans backwards, use of hand gestures while talking, fidgets, scratches head, models behaviour, shakes head, plays with hands, startle response, body inhibition, still, turns, shrug shoulders, sits on hands, and nervous touching (hair, clothes, face, body); for prosody of vocalisation: positive tone of voice, negative tone of voice, neutral tone of voice, giggles/laughs, sharp breath exhalation/sighs, questioning vocalisation, and no vocalisation.

Evaluation of children's verbal statements by naïve adults. After the undergraduate evaluators had watched the video clips, they were given a written transcript of the same children's responses to the three probe questions as well as the follow-up question (Who do you think it is?). They were told that these were the responses of the children they had just seen but that the order of presentation had been randomised. They were instructed to read the responses of each subject and rate each child using the same 7-point scale as before. The purpose of this procedure was to examine whether the adults could differentiate the lie-tellers and nonliars based on the children's verbal statements alone. Parents did not participate in this procedure due to time commitment difficulties.

Results

Children's Peeking Behaviour. In the experimental condition, 82% of children peeked at the toy**.** There was no significant age difference in the number of children who peeked in the experimental condition, χ^2 (4, $N = 66$) = 1.41, n.s. (Table 1). All peekers returned to their original posture (i.e., with their back to the toy) either as soon as they finished peeking or when they heard the experimenter opening the door. These behaviours suggest that the children understood the experimenter's instruction that they should not peek at the toy when she was gone. There was no difference between the number of girls (83%) and of boys (80%) who peeked, χ^2 (1, $N = 66$) = 0.00, n.s.

Twelve children in the experimental condition were natural non-peekers. No children in the forced control condition peeked. As preliminary analyses revealed no differences between natural nonpeekers' and "forced" control nonpeekers' responses, they were collapsed into one non-liar group for subsequent analyses.

Children's verbal responses to the probe questions about peeking. Children's responses to the following three questions were analysed: "Did you turn your head to the side?", "Did you move around in your chair?", and "Did you peek to see who it was?" In the experimental condition, of the 54 peekers, 43 responded that they did not turn around and peek at the target toy and thus lied. There was a significant age difference in terms of the number of the children who told a lie, χ^2 (4, $N = 54$) = 16.78, $p < .01$. Whereas most children between 4 and 7 years of age lied, many 3-year-olds (64%) confessed to peeking (Table 1). Among the peekers, there was no significant difference between the number of girls (79%) and the number of boys (80%) who lied, χ^2 (1, $N = 54$) = 0.00, n.s. In addition, all the natural and forced nonpeekers reported that they did not turn around and peek at the target toy.

Table 1
Percentage (number) of peekers and lie-tellers in Experiment 1 and 2

	Age group				
	3 years	*4 years*	*5 years*	*6 years*	*7 years*
Experiment 1					
Peekers	84.6 (11)	80.0 (8)	80.0 (12)	75.0 (16)	91.7 (11)
Lie-tellers	36.4 (4)	100 (8)	75.0 (9)	83.3 (10)	90.9 (10)
Experiment 2					
Peekers	68.4 (13)	85.0 (17)	70.0 (14)	80.0 (12)	70.0 (14)
Lie-tellers	53.8 (7)	70.6 (12)	78.6 (11)	100 (12)	78.6 (11)

Children's verbal responses to the follow-up question. The children's answers to the follow-up question "Who do you think it is?" were used to assess the child lie-tellers' ability to exercise semantic leakage control. Lie-tellers responded by either saying Barney (74%) and thereby implicating themselves in peeking and lying about it, or they concealed their lie by feigning ignorance (16%), or by guessing another toy (10%). To analyse age differences, the children's responses were collapsed into two groups, those who said the toy was Barney, and those who gave non-Barney responses. The age difference was not significant, χ^2 (4, $N = 43$) = 10.24, n.s. There was, however, a trend for more older children (6–7-year-olds) to give the non-Barney responses than the younger ones (3–5-year-olds; Figure 1). None of the children in the control condition gave the "Barney" response. They gave other

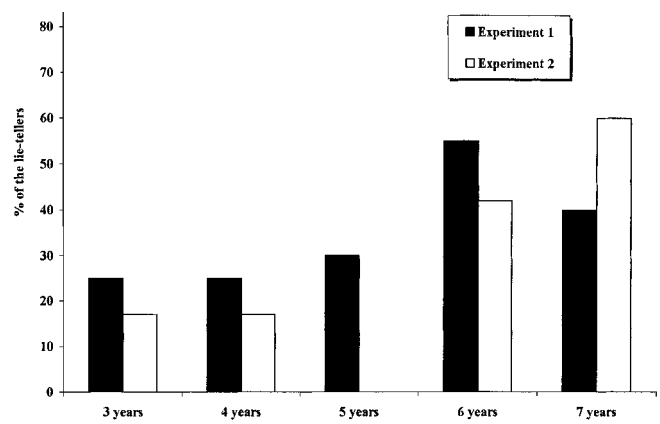

Figure 1. Percentages of the lie-tellers in each age group who gave non-Barney responses in Experiments 1 and 2.

responses such as ''I don't know'' (64%), or the name of another toy or a musical object (36%).

Adults' evaluations of children's verbal expressive behaviours. A linear transformation was performed on each adult's ratings by deducting 4 from the original ratings. Thus, the resultant ratings now ranged from −3 to +3 (−3 = definitely lying, −2 = most likely lying, −1 = quite likely lying, 0 = not sure, 1 = quite likely telling the truth, 2 = most likely telling the truth, 3 = definitely telling the truth). The adults' ratings of the transcript of each child's verbal statements (excluding the confessors) were then pooled and a mean score was derived for each child (Table 2). A 3 (Child Type: lie-tellers who responded Barney, lie-tellers who gave non-Barney responses, and nonliars) × 5 (Age Group: 3, 4, 5, 6, and 7) × 2 (Sex: male vs. female) ANOVA was performed on the mean scores. A limited testing model was used with the following a priori tests: the main effects of Child Type, Age, Sex, and the interactions between Age × Child Type and Sex × Child Type. We were unable to test the 3-way interaction because several cells had only one subject. The main effects for Age and Sex were not significant, $F(4, 87) = 2.17$, n.s., and $F(1, 87) = 1.19$, n.s., respectively. No interaction was found between Age and Child Type, $F(7, 87) = 1.96$, n.s., or for Sex and Child Type, $F(2, 87) = 0.75$, n.s. However, the main effect for Child Type was significant, $F(2, 87) = 175.99$, $p < .001$.

Post hoc analyses (LSD) revealed that those children who gave the ''Barney'' response ($M = -1.38$, SD = 2.45) to the follow-up question were rated as telling lies. Their mean ratings were significantly different from those lie-tellers who gave non-Barney responses ($M = 1.17$, SD = 1.42) as well as from nonliars ($M = 0.98$, SD = 1.02). The ratings for the latter two groups were not significantly different from each other and rated as telling the truth. These results indicated that those lie-tellers who gave the ''Barney'' response failed at semantic leakage control, whereas those lie-tellers who gave non-Barney responses successfully exercised semantic leakage control.

Adults' evaluations of children's nonverbal expressive behaviours. A total of 99 clips containing children's nonverbal expressive behaviours while responding to the first three probe questions were evaluated by parents and undergraduates. Two children's responses were not included due to videotape difficulties. Among the 99 children, 11 children confessed to peeking. These clips were used as a control procedure to monitor whether the adults were paying attention to the video clips. All confessors were rated as telling the truth.

The same linear transformation was performed on the undergraduates' and parents' ratings of nonverbal behaviours. The adults' ratings for each child's nonverbal behaviours (the confessors were excluded) were pooled to obtain a mean score of deceptiveness (Table 2). A 2 (Child Type: lie-teller vs. nonliar) × 5 (Age Group: 3, 4, 5, 6, and 7 years) × 2 (Sex: male vs. female) × 2 (Rater Type: undergraduate vs. parent) mixed-factor ANOVA with the last variable as a repeated measure was conducted on the mean ratings. A limited testing model was used with the following a priori tests: the main effects of Child Type, Age, Sex, Rater Type, and the interactions between Age × Child Type, Sex × Child Type, Child Type × Rater Type, Age × Rater Type, and Sex × Rater Type. We were unable to test the 3- and 4-way interactions because several cells had only one subject.

The main effects for Age and Child Type were not significant, $F(4, 76) = 0.84$, n.s., and $F(1, 76) = 3.44$, $p = .067$, respectively. No significant interactions were found between Sex and Child Type, $F(1, 76) = 0.05$, n.s., Age and Child Type, $F(4, 76) = 1.45$, n.s., and Child Type and Rater Type, $F(1, 76) = 2.83$, n.s. However, the Sex effect was significant, $F(1, 76) = 6.97$, $p < .01$. Boys were more likely to be rated as lie-tellers ($M = -0.58$, SD = 0.93) than girls ($M = 0.02$, SD = 0.94), regardless of whether they were lie-tellers or nonliars. This finding suggests a general bias among parents and undergraduates to view boys as more likely to tell a lie than girls. The main effect for Rater Type was also significant, $F(1, 76) = 25.72$, $p < .001$. Undergraduates were more biased to rate children as lying ($M_{\text{undergraduates}} = -0.51$, SD = 0.87) than parents ($M_{\text{parents}} = -0.11$, SD = 0.81).

Analytical coding of nonverbal expressive behaviours. The two independent coders coded the nonverbal behaviours for each child. Those behaviours that were displayed by less than 20% of the children as coded by both coders were removed. A 20% cutoff removed all categories that had less than 5 data points per cell and hence fulfilled the chi-square requirement for testing without correction.

In the eye movement category, the subcategories that surpassed the 20% cutoff were eye contact with the experimenter, and looks down or away. The subcategory ''eye contact with the experimenter'' was observed by both coders for all the children without exception. In the facial expression category, the subcategories that exceeded the 20% cutoff criterion were big smile, slight smile, and relaxed mouth. The inter-rater reliabilities for these subcategories were 93%, 77%, and 88%, respectively. In the appearance category, the subcategories that reached the 20% cutoff criterion were confident/relaxed (inter-rater reliability: 75%). In the body language category, the subcategories that reached the 20% cutoff criterion were: lean forward, fidget, and shake head. The inter-rater reliabilities for these subcategories were 94%, 85%, and 90%, respectively. In the prosody of vocalisation category, the subcategories that reached the 20% cutoff criterion were positive tone of voice and no vocalisation. The inter-rater reliabilities for the two sub-categories were 85% and 94%, respectively.

Chi-square analyses of the frequencies of the behaviours in these categories between the lie-tellers and non-liars showed no significant differences except for two facial expression subcategories (Table 3). There was a significant difference for big

Table 2
Mean ratings (standard deviations) of children's verbal and nonverbal expressive behaviours by undergraduates and parents in Experiment 1

	Undergraduates	*Parents*
Verbal expressive behaviours		
Lie-tellers giving Barney response	−1.38 (0.02)	
Lie-tellers giving non-Barney responses	1.17 (0.41)	
Nonliars	0.98 (0.15)	
Nonverbal expressive behaviors		
Lie-tellers	−0.77 (0.16)	−0.24 (0.18)
Nonliars	−0.25 (0.16)	0.14 (0.02)

smiles between the lie-tellers and non-liars, χ^2 (1, $N = 88$) = 6.84, $p < .001$, as well as for relaxed mouth category, χ^2 (1, $N = 88$) = 7.32, $p < .01$. The children who lied were more likely to exhibit a big smile (38%) than were the nonliars (11%), whereas the nonliars were more likely to exhibit relaxed mouth expression (76%) than were the lie-tellers (46%). Chi-square analyses comparing the lie-tellers and confessors revealed no differences for any of the expressive behaviours. However, the confessors differed significantly from the nonliars for the "big smile" category, χ^2 (1, $N = 58$) = 7.57, $p < .01$. Like the lie-tellers, more confessors displayed a big smile than did the nonliars.

Discussion

In the temptation resistance situation, the majority of children peeked at the toy when told not to peek. The proportion of children who could not resist the temptation was similar to that reported in previous studies (Cleland & Lewis, 2000; Lewis, 1993; Lewis et al., 1989; Polak & Harris, 1999). Also similar to the findings from these studies, the majority of the peekers in the present experiment lied about their transgression except for 3-year-olds, a third of whom confessed about their transgression.

With regard to whether children were successful at nonverbal leakage control, analyses of children's nonverbal behaviours revealed that adults as a group could not differentiate the lie-tellers from the nonliars. Whether the adults had extensive experience with children did not affect their discrimination of the lie-tellers and nonliars based on nonverbal cues. In-depth analyses of the children's non-verbal behaviours also showed that the nonverbal behaviours of the lie-tellers and nonliars were highly similar. The lie-tellers only differed from the nonliars on 2 out of 11 types of nonverbal behaviours that reached the 20% cutoff criterion: More lie-tellers showed big smiles than did the non-liars, while more nonliars showed relaxed mouth than did the lie-tellers.

Although the child lie-tellers appeared to have the ability to exercise nonverbal leakage control, the examination of the children's verbal responses revealed that they were poor at semantic leakage control. There was, however, a trend that they became more sophisticated as age increased. Many lie-tellers, particularly younger ones, revealed their lies by responding that the toy was Barney when asked, "Who do you think it is?" However, some lie-tellers (mostly older ones) gave various verbal responses inconsistent with their true knowledge of the identity of the toy (e.g., feigning ignorance or suggesting that the toy could be another toy). When our children's verbal responses to the probe questions and the follow-up question "Who do you think it is?" were transcribed and presented to the naïve undergraduates, the adults correctly identified those children (63% of the lie-tellers) who responded "Barney" as lie-tellers. In contrast, the adults rated those lie-tellers who gave other responses (37% of the lie-tellers) as likely to be telling the truth. Thus, most children were limited in their semantic leakage control ability.

One could argue, however, that the child lie-tellers' failure at semantic leakage control might be due to the specific nature of the guessing game used in the present experiment. In the present procedure, the child lie-tellers were faced with two conflicting goals: (1) they were motivated to conceal the fact that they had peeked (because they failed to comply with the experimenter's instruction), and (2) they were also motivated to guess the identity of the toy correctly in order to gain the reward (because the experimenter promised the children that they would receive a prize if they guessed correctly). It is possible that the second goal overrode the first one such that the children revealed their knowledge of the toy and therefore failed to conceal their transgression. To rule out this possibility, one needs to remove the reward component from the current procedure to examine whether child lie-tellers would continue to fail at semantic leakage control. Experiment 2 was conducted specifically to address this issue.

Experiment 2

Experiment 2 was similar to Experiment 1 except children were not placed in a situation with two conflicting goals. The experimenter never promised the children that they would receive a prize if they guessed the identity of the toy correctly.

Method

Participants. A total of 94 children from middle and upper-middle income families between 3 and 7 years of age participated: 19 aged 3 years (9 boys), 20 aged 4 years (12 boys), 20 aged 5 years (13 boys), 15 aged 6 years (8 boys), and 20 aged 7 years (13 boys).

Materials and procedures. The procedure was the same as that for Experiment 1 except that there was no mention of a prize for correct guessing. A second procedural modification was that the experimenter left the room for a fixed period of 60 seconds in order to simplify the temptation resistance procedure.

Results

Children's peeking behaviour. The majority of children peeked (76%) at the toy. There was no significant age difference in the number of children who peeked, χ^2 (4, $N = 94$) = 2.19, n.s. (Table 1). Also, there was no difference between the number of girls who peeked (67%) and that of boys (80%), χ^2 (1, $N = 94$) = 1.49, n.s. There was no significant difference in the terms of the number of peekers between Experiments 1 and 2, χ^2 (1, $N = 160$) = 1.13, n.s. Thus, the difference in the time interval when the experimenter left the room in Experiments 1 and 2 had no impact on children's peeking behaviour.

Children's verbal responses to the probe questions about peeking. Of the 71 peekers, 53 responded that they did not peek. Thus, based on the criterion used in Experiment 1, 75% of the children lied and only 25% admitted to their transgression. There was a significant age difference in terms of the number of the lie-tellers, χ^2 (4, $N = 70$) = 9.93, $p < .05$. The significant difference was mainly due to the difference between the 3-year-olds and older children (see Table 1). Among the peekers, there was no significant difference between the number of girls (73%) and the number of boys (75%) who lied, χ^2 (1, $N = 70$) = 1.00, n.s. In addition, all the non-peekers reported that they did not peek. There was no significant difference in the terms of the number of lie-tellers between Experiments 1 and 2, χ^2 (1, $N = 125$) = 0.75, n.s. Thus, the difference in the time interval when the experimenter left the room in Experiments 1 and 2 had no impact on children's lie-telling behaviour.

Children's verbal responses to the follow-up question "Who do you think it is?". Responses were divided into the same three categories as those in Experiment 1. Of the 53 children who lied in Experiment 2, 72% said they thought the toy was Barney, 7% feigned ignorance (i.e., "I don't know"), and 21% gave the name of another toy or a musical instrument. To analyse age differences, the children's responses were collapsed into two groups: those who said the toy was Barney, and those who gave non-Barney responses. The age difference was significant, χ^2 (4, $N = 52$) = 10.61, $p < .05$ (Figure 1). Most 5-year-olds and younger tended to give the Barney response. In contrast, more than half of the 6- and 7-year-olds gave non-Barney responses. None of the nonpeekers gave the "Barney" response.

Discussion

As in Experiment 1, the majority of children older than 3 years of age in the present experiment lied to conceal their transgression whereas about half of the 3-year-olds confessed. As to children's response to the follow-up question "Who do you think it is?", a significant age effect was obtained. Although the results of significance tests were different for the two experiments, the age patterns were similar (Table 1). In this experiment, most children in the younger age groups (3 to 5 years) tended to give the "Barney" response, whereas the 6- and 7-year-olds tended to feign ignorance or respond with the name of another toy or musical instrument. It should be noted, however, that similar to the results of Experiment 1, almost half of the 6- and 7-year-olds also said "Barney". Ninety per cent of the 3-, 4-, and 5-year-olds gave such responses. Given the fact that adults in Experiment 1 tended to use children's Barney responses as a criterion for determining whether they had lied, most lie-tellers in the present experiment (72%) would have been detected by adults, had we shown them the transcripts of these children's verbal responses.

Therefore, the findings of the present experiment suggest that the main reason for most children's failure in Experiment 1 to conceal their knowledge of the target toy's identity was not due to their desire for a reward overriding their motivation to conceal a transgression. Rather, such failure was due to the children's poor semantic leakage control. Our results are consistent with Polak and Harris (1999), who used a method similar to this design, although their study was not specifically designed to examine children's skills at deceiving adults. They found that the majority of children implicated themselves when asked a follow-up question. The results from our two experiments and from Polak and Harris suggest that, although many children under 8 years of age lie to conceal a transgression, they are poor at semantic leakage control regardless of whether there is a reward component in the temptation resistance procedure.

General Discussion

The present study examined the developmental trajectory of children's lying behaviour and their ability to conceal lies both nonverbally and verbally. In the temptation resistance situation, over 70% of children peeked at the toy. When the children were asked about it, an age difference emerged: only about a half of the 3-year-olds lied whereas the majority of the older children did not tell the truth. These results replicated the findings of Lewis and his associates. In their studies, about 50% of 3-year-olds lied (Lewis et al., 1989) and after 3 years of age most children lied (Lewis, 1993). Lewis, Cleland, Kawakami, and Kawakami (2000) found a similar proportion of lie-tellers in Japan. Polak and Harris (1999) found that 8 of the 27 peekers aged 3 years lied about having looked at a toy whereas only 1 of the 30 peekers aged 5 years did so. Similar patterns of results were obtained in other studies using different paradigms. For example, Peskin (1992) reported lie-telling rates ranging from 20% for 3-year-olds and 87% for 5-year-olds in a competitive game. Taken together, these findings suggest that lying behaviour in general may emerge and develop rapidly during the preschool years.

It is worth noting that the present study and previous ones that have used the temptation resistance procedure consistently produced a significant age pattern in which 3-year-olds are relatively less inclined to lie about their transgression than older children. This pattern has been observed among American, Canadian, British, and Japanese children. Hence, there is convergent evidence to suggest that this age pattern is a common phenomenon. Nevertheless, further studies are needed to ascertain whether this finding from laboratory studies can be generalised to natural settings. It should be noted that transgressions committed in the laboratory are often of minor significance and do not lead to any negative consequences, which may be different from children's transgressions at home and schools. For example, in natural settings, many young children may commit such transgressions as physical violence against another child and property damage (Newton et al., 2000; Smith et al., 1997). These transgressions are obviously more serious than peeking or touching a toy in the temptation resistance procedure. The consequence of being caught committing such misdeeds is also more grave. Thus, 3-year-olds may be more motivated to lie in these situations than in the temptation resistance procedure. However, it is also possible that, relative to older children, 3-year-olds may be generally more inclined to confess regardless of the seriousness of their transgression. To date, no empirical evidence exists to confirm either of these possibilities. Specifically designed studies may help address this issue. For example, naturalistic observations can be used to obtain the frequency of 3-year-olds' and older children's confessions after committing transgressions. Laboratory experiments, if ethically possible, can also be used to manipulate the severity of transgressions (e.g., property damage versus peeking) to examine whether such manipulations result in differential age patterns of lying.

With regard to nonverbal leakage control, earlier reports suggest that children are good at manipulating their nonverbal expressive behaviours to deceive others (e.g., Lewis et al., 1989). Consistent with these findings, our adult evaluators failed to discriminate between the lie-telling and truth-telling children based on their nonverbal behaviours. This finding is also in line with previous studies where adults' accuracy of detecting another adult's lies is usually under .60 (DePaulo, Stone, & Lassiter, 1985; Ekman & O'Sullivan, 1991). It should be noted that this poor rate of lie detection was achieved when the adult raters in our study and previous studies were told to expect a high proportion of lie-tellers (50%) and they were also motivated to discriminate lie-tellers from nonliars. In real life situations, adults normally do not expect their interlocutors to lie to them. Also, there is a social and emotional burden

associated with suspecting another individual of lying (DePaulo & Jordan, 1982), and hence adults tend to overlook certain cues displayed by the lie-teller. Consequently, the detection rate may be even lower in real-life situations. On the other hand, it should be also noted that the present and all previous studies asked adults to detect the lies of children who are unfamiliar to them. It is possible that individuals who are familiar with children (e.g., their own parents and teachers) may be better at detecting the children's lies due to the adults' extensive interactions with the children. This intriguing possibility awaits future empirical testing.

Adults' difficulty in discriminating between the nonverbal behaviours of the lie-tellers and those of the nonliars could be due to the fact that the adults were poor lie detectors or that the children were skilled at exercising nonverbal leakage control. The two trained coders' analyses of the children's nonverbal behaviours suggest that the latter was possibly the case. First, the types of nonverbal behaviours displayed by the lie-tellers were very similar to those displayed by the nonliars (Table 3). Second, the nonverbal behaviours displayed by the lie-tellers while lying were mostly positive ones: they made eye contact with the experimenter, smiled; their facial expressions appeared to be relaxed and confident; and when they spoke, their speech had a positive tone of voice. Only three types of negative behaviours (i.e., looking away, fidgeting, and no vocalisation) reached the 20% cutoff criterion and these were displayed by only a quarter of the lie-tellers. Nevertheless, the nonliars also displayed these behaviours in a similar proportion. These findings are consistent with the general conclusion of Lewis et al. (1989) that lie-tellers tend to display positive expressions while attempting to conceal their transgression (also see Saarni, 1984). In contrast, our results did not support the conclusions of those earlier studies (e.g., Feldman et al., 1979; Morency & Krauss, 1982) claiming that children are poor at nonverbal leakage control until late childhood. Our evidence suggests that lie-tellers as young as 3 years of age display nonverbal behaviours similar to those displayed by children who are telling the truth.

Table 3

Percentage of lie-tellers, nonliars, and confessors who exhibited a specific nonverbal behaviour in Experiment 1

Category	*Lie-tellers*	*Non-liars*	*Confessors*
Eye movement			
Looks at experimenter	100	100	100
Looks down or away	82.9	68.1	81.8
Facial expression			
Big smile	38.8	10.6	45.5
Slight smile	68.3	53.2	63.6
Relaxed mouth	46.0	76.6	81.8
Appearance			
Confident/relaxed	58.5	55.3	72.7
Body language			
Lean forward	26.8	29.8	27.3
Fidget	29.3	27.7	36.4
Shake head	85.4	83.0	72.7
Prosody of vocalisation			
Positive tone of voice	61.7	68.3	72.7
No vocalisation	35.0	40.4	45.5

Although the present results demonstrate that children as young as 3 years of age are skilled at exercising nonverbal leakage control, our evidence strongly suggests that they have poor semantic leakage control. When questioned about their knowledge of the target toy, instead of feigning ignorance or faking a response incongruent with their true knowledge but congruent with their lie, the majority of them implicated themselves by making responses inconsistent with their lie. Hence, in view of these results, it appears that children under 8 years of age overall have yet to develop all the skills necessary to deceive adults successfully.

Young children's failure to exercise semantic leakage control in our study as well as in Polak and Harris (1999) was perhaps due to the fact that they were yet to acquire certain cognitive abilities that are essential to successful lying. One of these abilities is children's pragmatic understanding of verbal communication. The referential communication literature (see Beal, 1988, for review) has consistently shown that in both deceptive and nondeceptive settings preschool children are insensitive to inconsistencies in others' and their own verbal statements (Ackerman, 1993; Beal & Flavell, 1984; Robinson, Goelman, & Olson, 1983). This insensitivity may be the reason that most of the young children in the present study blurted out ''Barney'' in response to the question ''Who do you think the toy is?'' without realising that such a statement is inconsistent with the lie.

Another related cognitive ability that is essential to successful semantic leakage control is an advanced ''theory of mind'' understanding. When asked the question ''Did you peek?'', to deny peeking, one only needs to represent a belief that is different from the true state of affairs. This false belief is a first-order one, which is understood by some 3-year-olds (Chandler et al., 1989; Sullivan & Winner, 1993) and most children at 4 years of age and above (Perner & Wimmer, 1985). In contrast, when asked ''Who do you think the toy is?'', to sustain the lie that one has not peeked, the individual must first imagine themselves not having peeked (a false belief) and then infer what belief she or he ought to have given the false belief (a belief based on a false belief). Any response to the follow-up question ''Who do you think the toy is?'' should be based on such a second-order false-belief representation. Previous studies have shown that at 6 and 7 years of age, children are just beginning to develop second-order false-belief understanding (Perner & Wimmer, 1985; Sullivan, Winner, & Hopfield, 1995). This is consistent with the present finding that it was mostly 6- and 7-year-olds who did not implicate themselves in their response to the follow-up question (also see Polak & Harris, 1999, for related discussions). Further studies, however, are needed to establish empirically this link between a second-order false-belief understanding and successful semantic leakage control.

In summary, the findings of the present study indicate children as young as 3 years of age do lie to conceal their transgressions. Although child lie-tellers are difficult to distinguish from nonliars on the basis of nonverbal behaviour, many of them are poor at semantic leakage control and adults can easily identify most lie-tellers based on their verbal statements made in the same context as the lie. This conclusion is inconsistent with that of most of the previous studies that examined the detectability of children's lies. Those studies focused exclusively on the nonverbal behaviours of the child lie-tellers and reported that adults have limited ability to detect children's lies. In the present study, if we had focused

exclusively on the nonverbal data, we would have reached a similar conclusion. However, when the results from both verbal and nonverbal domains are considered together, it becomes clear that children under 8 years of age are not fully skilled lie-tellers.

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