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Children's Development of Lie Telling and Lie Detecting Behaviour in Relation to Cognitive and Socio-Cognitive Factors

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Lie behaviour is an important part of children's moral development and can be conceptualised as including both lie-telling and lie-detecting behaviours. The present study examined age differences in lie behaviour between 5- and 6-year-old children and the differences between lie-telling and lie-detecting abilities of children. Further, it investigated the relation between executive functioning (EF) and theory of mind (ToM) with lie behaviour. Participants were 120 children, 60 each belonging to the age groups of 5 and 6 years, which were divided equally into two groups: telling and detecting lies. To assess lie behaviour, an adapted form of the hide-and-seek paradigm was used. In terms of lie behaviour, 6-year-old children outperformed 5-year-old children. Furthermore, no significant difference between lie-telling and lie-detection was found. ToM and EF were significantly related to lie behaviour, with only EF (particularly inhibitory control) as a significant predictor. The study has implications for parents, psychologists, and counsellors.

Keywords: children, executive functioning, lie telling, lie detecting, moral development, theory of mind

A lie is an utterance by a person who assumes it to be false but intends to lead the person at the other end to believe it as true (Isenberg, 1964). A similar premise runs through all the definitions of a 'lie' (e.g., Chisholm & Feehan, 1977; Primoratz, 1984). It has been found that lying behaviour originates in early childhood but becomes more sophisticated (in terms of plausibility) only in middle childhood (Talwar & Lee, 2008). The hide-and-seek paradigm has been one of the most popular in the area of lie telling (e.g., Ding et al., 2017). In this task, the participant hides a prize (e.g., a toffee or a token) in either of the two inverted cups, and the experimenter has to find it. If the experimenter finds it, the participant loses, and vice versa. In this task, participants misrepresent information for personal gain.

Lie telling can be seen as an indicator of cognitive and socio-cognitive development in children. Lie-telling is often connected with the cognitive skill of executive functioning (EF) and the socio-cognitive skill of theory of mind (ToM) (e.g., Fu et al., 2018; Talwar & Lee, 2008). EF is a higher-order cognitive ability, and inhibitory control (IC) and working memory (WM) are its most studied components. IC helps one to overcome and inhibit a prepotent and instead do what is important and relevant in a situation (Diamond, 2013). WM is the ability to hold information for a short duration while mentally working with it at the same time (Baddeley & Hitch, 1974; Diamond, 2013). These two components have been found to be related to lie telling. In order to lie, children have to hold themselves back from telling the true version while presenting the false statement.

Simultaneously, they have to keep in mind various versions of lies and truths (Talwar & Lee, 2008). An increased tendency to lie has been found in the infancy and early childhood stages of children. This is the stage when EF skills also develop (Polak & Harris, 1999). Further, Evans and Lee (2011) found that EF skills are related to the sophistication of children's lies. However, many studies have not found any relation between WM and lie behaviour, suggesting that lie telling might possibly require more IC than WM abilities (e.g., Leduc et al., 2017; Talwar & Lee, 2008).

Apart from executive functioning, the role of theory of mind (ToM) has also been found to be useful in telling lies. ToM is the ability to attribute mental states to others and to oneself in order to explain and predict behaviours (Premack & Woodruff, 1978). False belief (FB) tasks (Wimmer & Perner, 1983) are widely used as measures to assess ToM. Further, there are two levels of ToM. First-order ToM deals with the beliefs and intentions of other agents, while second-order ToM is recursive and deals with "beliefs about beliefs" and intentions (Arslan et al., 2017; Wimmer & Perner, 1983). Talwar and Lee (2008) propounded that lie-telling behaviour and ToM development are related to each other in a complex way and can be understood through various developmental stages. The primary lie stage involves self-benefiting lies. In this stage, children cannot pass the first-order false-belief task, and their lies are not sophisticated. The secondary lie stage is when children aged 3-5 become more adept at lying. This stage involves passing a first-order false-belief task. In the tertiary lie stage, children aged 7-8 years tell more consistent and sophisticated lies. This stage involves passing a second-order false-belief task. As children grow, their ToM ability improves, and they lie more consistently (Talwar et al., 2007; Talwar & Lee, 2002). A meta-analysis by Sai et al. (2021) investigated the relationship between lying behaviour in children with TOM and EF. They found significant but small effect sizes for lying behaviour with ToM and EF. Further, EF was found to be related more to maintenance lies than initial lies. The authors concluded that both ToM and EF have a positive role to play in children's lying behaviour. Lee and Imuta (2021), in their meta-analysis on the relationship between ToM and lie telling, found that both first- and second-order ToM are related to lie telling, but a stronger relationship could be seen with the former.

The second branch of lie behaviour is lie-detecting ability. For children to detect the lies of others, they have to have the awareness that people do not always tell what they truly think and feel. Although the literature is less oriented towards the lie-detecting behaviour of children, there are still a few studies on it. Ackerman (1981) found that first-graders use a "literal interpretive strategy" to understand the difference between intentional and unintentional false utterances. On the other hand, third graders were able to go beyond the literal and see that difference. Saarni (1979) found that older children are better able to detect false statements as they have a better understanding of culturally appropriate norms, also called "display rules." Baron-Cohen (2009) found that children of age 4 and above are capable of being aware of other people's deception. Lee et al. (2002) found that young children's real-world knowledge has not been synthesised, and they cannot detect implausible lies. Babu and Panda (1990) found that younger children categorise truth and lie statements on the basis of factuality, while older children focus on beliefs and intentions.

Lie-telling and lie-detecting abilities are two aspects of lie behaviour, but the literature indicates that they have never been studied simultaneously in children. Further, studies on children's ability to detect others' lies are few. In this regard, the relationship between

EF and ToM with respect to lie-telling and detecting ability in children becomes an important area of study.

Hence, the present study has four objectives: (i) to examine significant age differences (5 and 6 years) on lie behaviour; (ii) to investigate significant differences between lie telling and lie detecting; (iii) to investigate the role of executive functioning (including inhibitory control and working memory) and lie behaviour; and (iv) to study the role of theory of mind and lie behaviour.

The study has made a few primary research hypotheses: (1) 6-year-old children will be better at lie behaviour than 5-year-olds; (2) there will be a significant difference between lying and lying detection; and (3) there will be a significant relationship between EF and lie behaviour in both age groups. (4) There will be a significant relationship between TOM and lie behaviour in both age groups.

Method

Design

The study followed a 2x2 factorial design with two independent variables: age (5 and 6 years) and condition (telling and detecting).

Participants

The sample consisted of 120 children (n = 120), 60 each from the age group of 5 years (*M* = 5.25 years; SD = 6.16 years; SD = 3.56*;* 35 boys and 25 girls). A group of 60 children from each age group were randomly assigned to two groups: lie-telling and lie-detecting, so that there were four groups of 30 participants each. It has been observed from the review that ages 5 and 6 years are the major transition phases from primary to secondary lies in children, and hence this age group was suitable to explore the development of lying in children (Talwar & Lee, 2008). The participants were recruited randomly from a school in North Delhi, India. All the participants were Indian. They were Hindi-speaking children who went to English-medium schools and belonged to lower-middle socio-economic strata. The children were fluent in both Hindi and English.

Measures

Lie Tasks: A modified version of the hide-and-seek paradigm (e.g., Ding et al., 2017; Fu et al., 2018) was used. The tasks were individually administered. In the lie-telling condition, the participant was given the following instructions: "You have to hide this toffee in either of your hands. If she (pointing to the confederate) guesses the correct hand, she will get the toffee, and you will not get it. She will keep her eyes closed while you are hiding it. After hiding the toffee, she will ask you in which hand you have kept the toffee. You have to answer in such a way that you win and get the toffee. Do you have any questions? Let us start." After the child hid the toffee, the confederate opened her eyes and asked the participant in whose hand the toffee was. The child could either lie or tell the truth. Specific instructions to confederate were given as follows: "You will always point to the same hand the participant indicates at, but you have to pretend to guess the hand in front of the participant." In this manner, if the participant told the truth, the confederate won and got the toffee, and if he or she told a lie, the confederate lost and the participant won the toffee.

In the lie-detecting condition, a reverse of this task was designed. The participant was given the following instructions: "She (pointing to the confederate) will hide a toffee in one of her hands, and you have to close your eyes while she does that. She will then say and point to the hand in which she wants you to believe the toffee is. You will then be asked in which hand you think she has hidden the toffee. She can either lie or tell the truth. If you are able to guess the correct hand, you will get the toffee; otherwise, she will get

the toffee." The confederate was told in advance in which hand she had to keep the toffee in each trial (decided randomly). She was also instructed the following: "You have to always point to the hand with no toffee, such that the participant will get the toffee only when they choose the hand opposite to the hand you have claimed has the toffee."

Each of the lie-telling and lie-detecting tasks had five trial sessions. Further, there were 5 test sessions with a score of 1 each. The score of 1 in the lie-telling task denoted that the child lied and won the toffee in that trial, and in the lie-detecting task, it meant that the child detected the confederate's lie and won the toffee.

Day-Night Stroop Task (Gerstadt et al., 1994): This is one of the executive functioning tasks assessing the inhibitory control (IC) of the participants. Children were presented with 12 cards with images of either day (sun) or night (moon). Out of the 12 cards, 2 were the trial cards of day and night each, and 10 were the test cards. Trial cards were administered with feedback to the participant. If they still failed the trial cards, the task was not administered further. Out of the 10 cards, 5 were day cards and 5 were night cards. They were arranged in random order. The experimenter presented the cards to the children in the same order. The participants were given the following instructions: "I will show you a few cards one by one. Those cards will have a picture of the moon or sun. You have to say 'night' if presented with a day card with the sun on it and "day' if presented with a night card with the moon on it. Each card will be presented for 1 second, after which the next card will be presented. So be quick." A score of 1 was given if the child said the correct word (day or night), and a score of 0 was given if the child said the wrong word or could not say anything in 1 second. The total score was 10 out of 10.

Backward Word Series Recall Task: This is another executive functioning task assessing working memory (WM). A series of three words were read to the participants. The participants were given the following instructions: "I will read three words to you. You have to repeat the words in the same order first, then in reverse order. For example, if the words are "cat-fan-bat," you have to say "cat-fan-bat" first and "bat-fan-cat" after that. I will not repeat the words again, so listen carefully." The task had one sample trial and five main trials. The total score was out of 5, where 1 denoted that the child repeated the series in backward order correctly. The words were a mix of both Hindi and English because the children recognised the things around them in both languages.

False-Belief Task: The task was a measure of the ToM of the participants. The task was adapted from the Theory of Mind Task Battery (Hutchins et al., 2008) to suit the Indian population. The story was narrated through pictures: "You will now listen to a story narrated by me. Listen to it carefully, as I will ask you a few questions after that. Uncle Raghu has kept his car keys on the table (showing picture card 1). He then leaves the room to go to the kitchen (showing picture card 2). While he is away, his daughter Seema comes to the room and moves the keys to a red cupboard (showing picture card 3). She closes the cupboard and goes outside to play (showing picture card 4). Now Uncle Raghu comes back to the room and searches for his keys (showing picture card 5)".

Children were then asked three memory questions to ensure that they remembered the story correctly: (1) "Before going to the kitchen, where did Uncle Raghu keep his keys?" (2) "While he was in the kitchen, where did Seema keep it?" (3) "Now that Uncle Raghu is back from the kitchen, what is he searching for?"

If the child gave the correct answer to each of the questions, they were asked the test question while showing picture card 6, "Where do you think Uncle Raghu will search for his keys first, on the table or in the cupboard?" *The child* was given a score of 1 if they said "table." Any other answer was scored as 0. After that, the child was asked a justification question to explain their answer to the first question. A correct justification was scored as 1, and an incorrect justification was scored as 0. Hence, the total score was 2 out of 2.

Procedure

Informed consent was obtained from the school authorities before the study. From each age group (5 and 6 years), 60 children were randomly divided between two conditions: lie telling and lie detection. The order of presentation of the tasks was randomised for each participant to control for order effects. The children were informed that they would be doing some fun tasks. An informal conversation helped them become comfortable with the experimenter. The executive functioning, false belief, and lie tasks were administered to all children based on the order mentioned in the record sheet. After the experiment was over, children were given a toffee irrespective of their performance on lie tasks to convey the fact that lying is not a means to get things and one can get the desired object without necessarily lying. This was a part of debriefing so that children do not think that lying is the only means of getting things.

Results

Age Differences on Lie Behaviour and Difference between Lie Telling and Lie Detecting

Table 1 describes the mean score and standard deviation (SD) for each division and subdivision of the sample on lie tasks (lie telling and lie detecting tasks). The lie detection task may seem to promote habit formation and may raise concern that, as the trials progress, the children might start to expect lies from the confederate, as she was instructed to always point to the hand without toffee. However, it should be noted that if this was at all habit formation, then all children should have scored 5 out of 5, which was not the case. Many children scored 0, and most of the participants scored less than 5. Moreover, five trials are not enough to form any kind of habit in children.

Table 1. Mean and standard deviation (SD) of lie behaviour scores divided into 2 variables, age (5 and 6 years) and condition (telling lies and detecting lies)

Age	Condition	Mean	SD
5 years	Telling	2.27	1.46
	Detecting	2.17	1.34
	Total	2.22	1.39
6 years	Telling	4.13	1.26
	Detecting	4.07	1.31
	Total	4.10	1.27
Total	Telling	3.20	1.64
	Detecting	3.12	1.63
	Total	3.16	1.63

The first objective of the study was to examine significant age differences (5 and 6 years) in lie behaviour. The lie behaviour score is represented by the scores on both lie-telling and lie-detecting tasks. The second objective was to investigate the significant difference between lying and lying detection. To achieve the first two objectives, data on lie tasks was analysed using a 2x2 ANOVA (Analysis of Variance). There were significant age differences between 5- and 6-year-old children, $F(1,116) = 58.96$, $p < .01$, $h^2p = .34$. Comparing the results with Table 1, it was seen that on lie behaviour, 6-year-old children's ($M = 4.10$) were significantly better

than the 5-year-olds (M = 2.22). No such difference was observed between lie telling and detecting, F (1,116) =.12, p>.05, h^2p=.00. This implies that, irrespective of age, there was no significant difference between the lie telling and lie detection. It was also found that there was no significant interaction effect (age x condition) on lie behaviour, F (1,116) =.005, p>.05, h^2p=.00.

The results support hypothesis 1, i.e., that 6-years-old children will be better at lie behaviour than 5-year-olds, but not hypothesis 2, i.e., that there will be a significant difference between lie telling and lie detecting. Since there was no significant difference between lie telling and detecting, the scores of both tasks were combined for further analysis and were called "lie behaviour scores" collectively.

Relationship between Executive Functioning, Theory of Mind and Lie Behaviour

The third and fourth objectives of the study were to investigate the role of EF (including IC and WM memory) and theory of mind on lie behaviour, respectively. Table 2 depicts the means and standard deviations of EF and ToM scores for both age groups.

Table 2. Mean and standard deviation (SD) of executive functioning (EF) and theory of mind (ToM) for 5- and 6-years old children

Age	EF		ToM	
	Mean	SD	Mean	SD
5 years	5.40	2.99	0.82	.87
6 years	11.27	3.12	1.55	0.72

Table 3 depicts Pearson's r correlation between the variables for 5- and 6-year-old children. The results indicate that there is a significant correlation between EF and lie behaviour and ToM and lie behaviour in 5-year-old children. Further, IC but not WM are significantly related to lie behaviour. Table 3 also indicates a significant correlation between EF and lie behaviour and ToM and lie behaviour in 6-year-old children. The results support hypotheses 3 and 4, i.e., there will be a significant relationship between EF and lie behaviour in both age groups, and there will be a significant relationship between ToM and lie behaviour in both age groups. Further, IC and WM are significantly related to lie behaviour in 6-year-old children.

Table 3. Pearson's r matrix between executive functioning (EF), inhibitory control (IC), working memory (WM), theory of mind (ToM) and lie behaviour for 5- and 6-years old children (n=60)

	IC	WM	EF	ToM	Lie Behaviour
5 years					
IC	1				
WM	.12	1			
EF	-	-	1		
ToM	.48**	.17	.48**	1	
Lie Behaviour	.53**	.21	.54**	.47**	1
6 years					
IC	1				
WM	.32*	1			
EF	-	-	1		
ToM	.46**	.33*	.50**	1	
Lie Behaviour	.53**	.26*	.52**	.44**	1

*p<0.05 **p<0.01

Since the correlation results were significant, the data was further analysed using multiple linear regression. Lie behaviour was taken as the criterion variable. For each age group (5 and 6 years), two multiple regressions were carried out. In the first multiple regression analysis in each age group, EF and ToM were taken as predictors. In the second one, IC and WM were taken as predictors. Table 4 depicts that in 5-year-old

children, EF but not ToM were significant predictors of lying behaviour (â=.41, p<.01 and â=.27, p>.05 respectively). Further, IC (â=.51, p<.01) but not WM (â=.15, p>.05) predicted lie behaviour. Together, EF and ToM explained 35% of the variance (R^2=.35) and IC and WM explained 31% of the variance in lying (R^2=.31). Table 4 also depicts that in 6-year-old children, EF (â=.40, p<.01) but not ToM (â=.24, p>.05) were significant predictors of lie behaviour scores. Further, IC (â=.50, p<.01) but not WM (â=.11, p>.05) predicted lie behaviour. Together, EF and ToM explained 31% of the variance (R^2=.31) and IC and WM explained 29% of the variance in the lie behaviour score (R^2=.29).

Table 4. Multiple regression analyses results predicting lie behaviour scores in 5- and 6-year-old children

Variable	B	SE	β	t
5 years				
Analysis 1a				
EF	.19	.06	.41	3.37**
ToM	.43	.20	.27	2.19
Analysis 2[b]				
IC	.29	.06	.51	4.62**
WM	.15	.11	.15	1.34
6 years				
Analysis 1[c]				
EF	.16	.05	.40	3.15**
ToM	.42	.22	.24	1.87
Analysis 2[d]				
IC	.27	.06	.50	4.26**
WM	.09	.09	.11	.92

[a] R^2= .35; adjusted R^2= .32; F (2, 57) =15.15, p<.01

[b] R^2= .31; adjusted R^2= .28; F (2, 57) =12.49, p<.01

[c] R^2= .31; adjusted R^2= .29; F (2, 57) =12.85, p<.01

[d] R^2= .29; adjusted R^2= .27; F (2, 57) =11.89, p<.01

*p<0.05 **p<0.01

Discussion

The present study aimed to: (i) examine significant age differences (5 and 6 years) on lie behaviour; (ii) investigate significant differences between lie telling and lie detecting; (iii) investigate the role of executive functioning (including inhibitory control and working memory) and lie behaviour; and (iv) study the role of theory of mind and lie behaviour.

It was observed that 6-year-old children were able to tell and detect lies better than 5-year-old children. The findings are in line with previous studies that found similar results: older children told more verbal lies and were better at maintaining their lies (Talwar et al., 2007; Talwar & Lee, 2002, 2008). The possible reasons for the developmental increment in children's lying behaviour (including telling and detecting) can be the development of the cognitive ability of EF and the socio-cognitive ability of ToM. According to the findings of the study, a significant relationship exists between EF and ToM and lying behaviour. In addition, it was discovered that EF was strongly predictive of lying behaviour.

The findings of this study support the findings of other studies (Evans & Lee, 2011; Polak & Harris, 1999; Talwar & Lee, 2008) and indicate that there is a considerable link between EF and lying behaviour. Additionally, substantial correlations were found between IC and WM and lying behaviour in children aged 6 years old. One possible explanation is that in order for the participants to succeed in the lie-telling task, they needed to remember the hand in which they actually held the toffee, as well as the hand to which

they pointed when they demonstrated the false location of the candy. It is possible that they were required to suppress their natural response, which was to point to the correct hand. During the lie detection task, they were required to fight against their natural tendency to believe the confederate and to recall that the confederate had lied to them during previous trials as well. Consequently, WM and IC were both required to successfully complete this task. Previous research has shown that IC, but not WM, is strongly associated with children's lying behaviour when they are 5 years old. This could be because working memory and lying behaviour are still developing in children who are 5 years old, but they have reached their full potential in children who are 6 years old.

It was found that in neither of the two age groups, working memory significantly predicted lying behaviour. The result supports a number of studies (Leduc et al., 2017; Talwar & Lee, 2008). This could be because the activities were not presented in the form of a story. If they had been, the children would have been required to remember a great deal of information, manipulate it, and either tell a lie or detect a lie. However, this did not happen. The children were instructed to maintain control over their prepotent responses, such as opening their hands or directing attention to the candy, most likely through the use of IC. In addition to this, it was necessary for the children to suppress the urge they have to believe the confederate, which calls for a higher level of IC abilities on their part.

The findings of the present research support findings from other studies (for example, Fu et al., 2018; Talwar et al., 2007; Talwar & Lee, 2008) that found a strong association between TOM and lying behaviour. One possible explanation for this is that telling lies and detecting lies both involve an awareness of the mental states of others, which is the foundation of the theory of mind.

Conclusion

The present study concludes that 6-year-old children are better than 5-year-olds in terms of lie behaviour. Furthermore, there is no significant difference between lie-telling and lie-detection. The analysis also shows that ToM and EF are significantly related to lie behaviour. However, only EF, particularly inhibitory control, is a significant predictor.

The study has some limitations and, thus, makes some future recommendations. First, because the study used a between-subject design, it cannot infer that lie-telling and lie detection are unified and develop simultaneously. Repeated measurement studies can determine if these two abilities grow together and are unified. Second, only one measure each of IC and WM was administered. Future studies can validate the data with numerous measures. Third, the study does not consider the emphasis on second-order TOM in lie maintenance. Future studies can explore it with a broader age group. Fourth, the study doesn't emphasise children's verbal skills in lying. Thus, verbal demand can be used to modify tasks. This way, hearing- and speech-impaired children can be tested for lying.

The study has important implications. It makes an essential contribution to the empirical literature by comparing lie-telling and detecting behaviour of children. Further, the study also tries to highlight that both lie telling and detecting are related to the developmental milestones of EF and ToM. While lie detecting is acceptable in our society, lie telling is not so much. The present study doesn't claim that lie telling should be encouraged. It tries to analyse lie behaviour as a manifestation of cognitive and socio-cognitive development. When a child gains the ability to tell and detect lies, it is a sign that the child has gained higher cognitive

abilities, including the ability to represent the mental states of oneself and others. The study gives important insight to parents, psychologists, and counsellors about the developmental nature and reasons of lie behaviour.

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