J Autism Dev Disord (2011) 41:185–195
DOI 10.1007/s10803-010-1045-4

ORIGINAL PAPER

Exploring the Ability to Deceive in Children with Autism Spectrum Disorders

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Published online: 17 June 2010

Abstract The present study explored the relations among lie-telling ability, false belief understanding, and verbal mental age. We found that children with autism spectrum disorder (ASD), like typically developing children, can and do tell antisocial lies (to conceal a transgression) and white lies (in politeness settings). However, children with ASD were less able than typically developing children to cover up their initial lie; that is, children with ASD had difficulty exercising semantic leakage control—the ability to maintain consistency between their initial lie and subsequent statements. Furthermore, unlike in typically developing children, lie-telling ability in children with ASD was not found to be related to their false belief understanding. Future research should examine the underlying processes by which children with ASD tell lies.

Keywords Autism · Lie-telling · Deception · False belief · Theory of mind

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Introduction

Though parents find the emergence of deceptive behaviors and the ability to tell increasingly sophisticated lies a nuisance, lie-telling is an important developmental milestone. The goal of telling a lie is to make the lie-recipient believe something that the lie-teller does not believe to be true. Thus, lie-telling involves intentionally instilling a false belief (FB) in the mind of another (Lee 2000); lie-telling is a real-world application of an understanding of others' minds (Talwar and Lee 2008b), and its emergence in children is an indicator that they have reached an important milestone in socio-cognitive development (Baron-Cohen et al. 2005; Sodian 1994).

Consistent with ToM difficulties in ASD, parents of children with ASD have reported that their children do not tell lies (Baron-Cohen et al. 1994; Leekam and Prior 1994), and studies have shown that children with ASD do experience more difficulty engaging in deception than mental-age-matched children (Baron-Cohen 1992; Sodian and Frith 1992; Yirmiya et al. 1996). However, these studies have generally looked at deception in the context of a competition or trick and did not require participants to lie of their own volition. For example, Sodian and Frith (1992) investigated performance on tasks in which children could help or hinder a puppet's access to Smarties. In the deception task, children were told not to let the "nasty Smartie thief" puppet find the Smarties and were asked if they wanted to tell the puppet that the box was locked (i.e., tell a lie) or open (i.e., tell the truth). Mental-age-matched children with developmental delay and typically developing (TD) children were significantly better at lying to deceive the puppet than children with ASD. Sodian and Frith also found that FB task performance predicted lie-telling ability, and that controlling for FB task performance removed group

differences on the deception task. Furthermore, Leekam and Prior (1994) found that second-order FB understanding was important for distinguishing between antisocial lies and jokes in children with ASD. These studies provide initial evidence that high-functioning children with ASD may understand and engage in deception, and that this ability may be related to ToM. However, there is currently no published empirical research on the ability of this population to spontaneously generate their own lies. The present study explored the propensity and ability of children with ASD to tell a lie *of their own volition*.

Deception in TD Children

Studies have demonstrated deception in TD children as young as 2 years of age (Chandler et al. 1989; Hala et al. 1991; Leekam 1992); however, disagreement exists as to whether deception in such young children signifies the presence of a ToM. To investigate whether the ability to deceive is related to ToM, researchers have examined the relation between lie-telling ability and FB understanding. Polak and Harris (1999) investigated whether the propensity to lie (i.e., denying peeking at a toy) and the ability to feign ignorance of the toy's identity were related to first-order FB understanding in preschoolers. They found that the better children performed on the FB tasks, the more likely they were to deny peeking at the toy. There was no relation between FB performance and the ability to feign ignorance: most of the participants, regardless of their FB performance, did not feign ignorance. Polak and Harris suggested that the ability to feign ignorance may involve second-order belief reasoning. That is, children who are better at assessing beliefs about beliefs (i.e., since I told the experimenter that I did not peek, the experimenter *thinks* that I do not *know* what the toy is so my answer should be consistent with me not knowing what the toy is) may be better at feigning ignorance. This ability to cover up their lie by maintaining consistency between their initial lie and subsequent statements has been termed 'semantic leakage control' (Talwar and Lee 2002a).

Talwar et al. (2007a) investigated whether feigning ignorance does indeed involve second-order belief reasoning by placing children in a situation where they were tempted to peek at the answer to a trivia game. To examine semantic leakage control, children were asked two questions about details on the answer card that they were asked not to peek at. As the details were irrelevant to the trivia answer, children who feigned ignorance about the details exercised semantic leakage control. They found that lie-tellers who feigned ignorance had higher second-order FB scores; that is, children's semantic leakage control was correlated with second-order FB understanding. Thus, the findings of Polak and Harris (1999) and Talwar et al. (2007a) indicate that the propensity and ability to lie is related to ToM development, at least in TD children.

The research cited above investigated children's production of lies for self-serving purposes (e.g., to conceal a misdeed). Children have also demonstrated the propensity to tell lies that are prosocial in nature; those told to maintain amicable relations with others (Talwar and Lee 2002b). Thus, far, researchers have only examined white[1] lie-telling behaviors in TD children. Talwar et al. (2007b) elicited white lie-telling in children using an undesirable gift paradigm. After the children won a game, the experimenter gave them a plain white bar of soap instead of the promised rainbow-colored slinky and asked them if they liked their prize. They found that children as young as 3 years of age could tell a white lie in politeness settings. Older children were more likely to lie than younger children, and they were also more likely to give more elaborate answers (e.g., "We're actually collecting soap at home!"). Furthermore, Broomfield et al. (2002) found a relation between the understanding of white lies (i.e., the effects of a white lie on the lie recipient's beliefs about the lie-teller) and performance on a second-order FB task. Given this relation, it is of interest to explore the relation between the *production* of white lies and FB understanding. Although no research to date has examined the relation between white lie-telling and FB understanding, one would expect that children who are better able to take the perspective of others will be more motivated to tell a white lie to preserve the feelings of others than children who lack a ToM.

The Present Study

The research to date leads us to several important questions that have not been addressed in the literature: Can children with ASD tell lies? Among children with ASD, are children who are better liars more advanced in their understanding of others' minds than those who are not as adept at lying? The goals of the present study were thus to (a) explore the propensity and ability to deceive in higher-functioning children with ASD, and (b) examine whether the relation found in TD children between lying aptitude and FB understanding will hold in children with ASD. We used a modified temptation resistance paradigm (Talwar and Lee 2002a) to investigate antisocial lie-telling, and a modified undesirable gift paradigm (Talwar et al. 2007b) to investigate white lie-telling. We also administered a battery of standard first-order and second-order FB tasks.

Given the extensive literature on ToM deficits in children with ASD, we hypothesized that children with ASD

[1] White lies have also been called prosocial lies; however, we refer to this type of lie as white lies in this paper because research has yet to establish that young children tell white lies for truly prosocial reasons.

would have more difficulty on the FB tasks. Based on Sodian and Frith's (1992) findings, we hypothesized that some higher-functioning children with ASD would tell an antisocial lie. On the other hand, we hypothesized that unlike TD children, children with ASD would not tell a white lie because individuals with ASD have difficulty understanding other's white lies (Happé 1994), as well as in recognizing and understanding other people's affective states (Hobson 1986). Finally, drawing on previous findings (Polak and Harris 1999; Talwar et al. 2007a), we expected that first-order FB understanding would be related to false denials and that second-order FB understanding would be related to semantic leakage control in TD children. As the present study is the first to explore relations between the production of lies and FB understanding in children with ASD, no specific hypotheses were made for this relation.

Method

Participants

Two groups of children were examined in the present study: 19 children on the autism spectrum (the ASD group) and 30 TD children (the TD group). All children were from middle- to upper-middle class families residing in rural and urban areas in Southern Ontario. None of the children had participated in studies examining deception before.

The contact information of families with children with ASD was obtained from our ASD Database, which is populated by families with children with ASD that initiated contact in response to flyers sent through service agencies. Children with ASD between 5 and 12 years of age were selected because children in this age range were old enough to understand the verbal instructions involved, but not too old to be disinterested in the games played in the paradigms.

The ASD group was chosen based on the following criteria:

1. They carried a clinical diagnosis of Autistic Disorder ($n = 11$), Asperger's Syndrome ($n = 4$), Autism Spectrum Disorder ($n = 2$), or PDD-NOS ($n = 2$);
2. They met criteria for an ASD on the *Autism Diagnostic Observation Schedule–General* (*ADOS-G*; Lord et al. 2002); and
3. They received a score of 12 or greater on the *Social Communication Questionnaire–Current* (*SCQ*; Rutter et al. 2003).[2]

[2] This is with the exception of one child, who received a score of 9 on the *SCQ* but was still included in the present study because she clearly met criteria for an ASD on the *ADOS-G*. A second set of analyses were conducted excluding this participants and the results were highly similar to those including this participant.

Table 1 Participant characteristics in the ASD and TD groups

	ASD ($n = 19$)		TD ($n = 30$)	
	M (SD)	Range	*M* (SD)	Range
Chronological age	8.27 (1.72)	6.17–12.83	7.28 (0.88)	6.00–10.25
Verbal mental age	6.79 (1.79)	3.50–10.48	7.47 (1.24)	5.53–11.79

Nine children with ASD were tested but not included in the sample: six children were unable to follow the protocol, and three did not meet criteria on the *ADOS-G*.

TD children were obtained from a database populated by families recruited at local events and through birth announcements. TD children between 6 and 10 years of age were recruited in order to match the groups on verbal mental age (VMA). No TD children had a history of academic, neurological, or psychological problems, and all received a score between 0 and 10 on the *SCQ*. Five TD children were tested but not included in the sample: four who did not return for the second session and one whose data was unavailable due to equipment failure.

The ASD group consisted of 15 boys and 4 girls and the TD group consisted of 22 boys and 8 girls (Table 1). Although the ASD group was on average just over 1 year older than the TD group, the two groups did not differ on VMA, $t(28.87) = 1.45$, $p = .16$.

Materials

VMA

The *Clinical Evaluation of Language Fundamentals—Fourth Edition* (Semel et al. 2003) is a standardized test designed to assess a number of different aspects of language in individuals from 5 to 21 years of age. Each child was administered the core battery for their particular age group using the procedure outlined in the test manual.

ASD Diagnosis

The *ADOS-G* (Lord et al. 2002) is a standardized diagnostic measure designed to assess children on the autism spectrum. The *ADOS-G* was used to verify that the children in the ASD group were on the autism spectrum. Module 3 was used in the present study. This measure was administered and scored according to the manual by the first author, who met reliability criteria with the second author, who was trained to research reliability.

The *SCQ* (Rutter et al. 2003) is a parent-reported screening measure that taps the symptomatology associated with ASD. It was given to parents of both groups of children to verify that the children with ASD still carry their diagnoses and to ensure that the TD children did not have autism or the broader autism phenotype.

FB Understanding

To assess first-order FB understanding, we administered the *Smarties task* (Gopnik and Astington 1988), an unexpected contents task, and the *Maxi task* (Wimmer and Perner 1983), an unexpected displacement task. Children who passed at least one of the first-order FB tasks were given two-second-order unexpected displacement FB tasks: the *Ice Cream Van task* (Perner and Wimmer 1985) and the *Chocolate Bar task* (Hogrefe et al. 1986). All FB tasks were acted out using figurines of people and other objects. The proportion correct on first- and second-order tasks was calculated. If children failed a memory control question on a task, their score on that task was not used in calculating their proportion correct.

Antisocial Lie-Telling Propensity and Ability

A modified temptation resistance paradigm (Talwar and Lee 2002a) was used to investigate children's antisocial lie-telling propensity and ability. The procedure involved placing children in a situation in which they were tempted to commit a transgression (i.e., to peek at a toy when they were asked not to) and then to deny that they had committed the transgression (i.e., to tell a lie). Children played a game with an experimenter (E1) where their task was to guess the identity of different toys based on an audio clue. On the first two trials, the audio clue was associated with the toy placed behind them (e.g., Elmo was paired with Elmo's signature laughter). On the test trial, the toy was paired with a Christmas song such that the child could not guess the identity of the toy based on the sound it made. Before the test trial, a second experimenter (E2) interrupted and asked E1 to leave the room. E1 told the children that she would leave them in the room with the sound playing and instructed them not to turn around to look at the toy while she was gone. After 1 min, E1 re-entered the room with no knowledge of whether or not the child had peeked. Once E1 entered the room, she covered the toy with a large towel, turned the child around to face her, and asked the *antisocial lie question*, "Did you turn around to look at the toy while I was gone?" and *semantic leakage control questions*, "What do you think the toy is?" (*'what' question*) and "Why do you think so?" (*'why' question*). The *antisocial lie question* and *semantic leakage control questions* measured antisocial lie-telling propensity (i.e., whether or not they lied) and ability (i.e., how well they covered up their lie), respectively.

Lie-telling propensity and ability could only be assessed for children who peeked at the toy. For the *antisocial lie question,* a score of one was given for denying they had peeked. For the *'what' question*, a score of one was given for incorrect answers or responses that feigned ignorance. Correct answers received zero because they betrayed the children's knowledge of the toy. For the *'why' question*, a score of one was given for plausible explanations (e.g., "I heard the music and I know Barney's music") and a score of zero was given for answers that implicated themselves in peeking and lying about it (e.g., "I saw it"), answers that did not attempt to answer the question (e.g., "It's a toy"), and implausible explanations. Responses to the *'why' question* were only analyzed in those children who scored zero on the *'what' question*.

White Lie-Telling Propensity and Ability

An undesirable gift paradigm similar to the procedure used in Talwar et al. (2007b) was used to investigate children's white lie-telling propensity and ability. Children were given an unattractive prize for winning a game. To determine what should be used as the unattractive prize, at the beginning of the session children went into the experimental room with E2 while E1 was in another room. E2 took out four attractive, age-appropriate toys and a plain white bar of soap from a basket and asked them which prize they liked the best, and which prize they did not like. If they indicated that the one that they did not like was anything other than the soap, E2 put that toy away and then asked, "Out of these three, which one don't you like?" The toy or object that they did not like was used as their prize (only two children selected a toy other than the bar of soap as their least-liked items). When E1 entered the room, E2 left the room without looking at or speaking to E1. Children played a guessing game with E1 where they were promised a prize for making five correct guesses. After four correct guesses, E2 interrupted and asked E1 to leave the room. Before leaving the room, E1 finished the game with the child and told him/her that she had forgotten to ask E2 what prize he/she liked the best. Since we expected that most children would indicate that they did not like the bar of soap, a bar of soap was pre-wrapped in a piece of black garbage bag when given to the child. E2 told the child to open his or her prize before placing the wrapped bar of soap in front of them and leaving the room for 1 min, during which the child had the opportunity to see what the prize was and to react to such an unexpected prize.[3] Upon

[3] In the two cases where the bar of soap was not one of the child's least-liked items, the toy that they indicated that they did not like was

returning, E1 asked the *white lie question:* "Do you like the prize that I gave you?" White lie-telling propensity was scored on a dichotomous scale: positive responses were given a score of one and negative responses received zero. White lie-telling ability was scored on a scale from zero to three: three was given if they told a convincing lie (e.g., "I finally get my own bar of soap"), two was given if they nodded or said yes, one was given if their lie was unconvincing (e.g., "It's okay"), and zero was given if they shook their head or said no. Children were then asked if they would like to exchange their prize for something else from the basket. Whether or not they chose to exchange their prize was a check that children did not like the bar of soap (or whatever they received as their prize).

Procedure

Children were tested individually in the laboratory over two sessions with each session lasting anywhere from 45 to 90 min. While most participants completed the two sessions on different days, a few participants who travelled from out-of-town completed the sessions in 1 day, with a break in between each session. On average, the second testing session was completed within 3 weeks of the first session. The tasks were partially counterbalanced across children.

Children did not receive feedback on whether their responses were correct on the standardized tests and FB tasks; however, the children received encouragement for staying on task. Breaks were given when the child seemed tired or when necessary for maintaining rapport. All children, regardless of whether or not they had lied, were given a thorough debriefing. Parents were also given a handout of answers to common questions that parents often have about children's lie-telling behavior. The study was approved by the university research ethics board and parental consent as well as child assent was obtained prior to testing each participant.

Results

Preliminary Analyses

Reliability Analysis

The behaviors and responses of all of the children on tasks other than the standardized measures were independently coded by the first author and a research assistant who was blind to diagnosis and the hypotheses of the study. Reliability analyses indicated 100% agreement on second-order FB scores and whether or not children had peeked at the toy, told an antisocial lie, and told a white lie. There was high inter-rater reliability between the two coders on children's first-order FB scores ($\kappa = .97$), white lie-telling ability ($\kappa = .96$), and semantic leakage control in response to the *'what' question* ($\kappa = .91$) and the *'why' question* ($\kappa = .77$). Discrepancies between scores given by the two coders were resolved through discussion.

Order Effects

As participants were randomly assigned one of four testing orders, we ran a series of analyses to ensure there were no effects of condition on any of the variables. We found no significant differences in scores between conditions for the ASD group and for the TD group.

Peeking Behavior in the Temptation Resistance Paradigm

The propensity and ability to tell antisocial lies could only be assessed for those who peeked at the toy. One child in the ASD group could not be included in the analyses on antisocial lie-telling because his actions showed that, unlike all the other children, he did not pay attention to the experimenter's instructions to not peek.[4] Thus, a total of 15 children in the ASD group and 15 children in the TD group were included in the analysis of antisocial lie-telling propensity and ability.

Desirability of the Bar of Soap in the Undesirable Gift Paradigm

The propensity and ability to tell white lies could not be assessed in seven TD children and one child with ASD because they were given a different version of the undesirable gift paradigm. In this earlier version of the paradigm, parents, rather than E2, were sent into the experimental room to probe how their child actually felt about their prize. However, these children claimed that they liked the bar of soap even when they were alone in the room with their mother; thus, we were unable to verify whether they did or did not like the bar of soap. One additional TD child was excluded from the analysis because he did not pass the experimental check on the undesirability of the prize; that is, he did not want to trade

Footnote 3 continued
used as the unattractive prize. Because these prizes could not be wrapped due to practical reasons, E1 made sure she left quickly enough to avoid seeing or hearing children's initial reaction (e.g., disappointment).

[4] The child had seized the toy and the musical card during the experimenter's absence and was playing with them in his lap when the experimenter returned to the experimental room. Thus, he did not bother to hide the fact that he had peeked or did not even remember that he was asked not to peek.

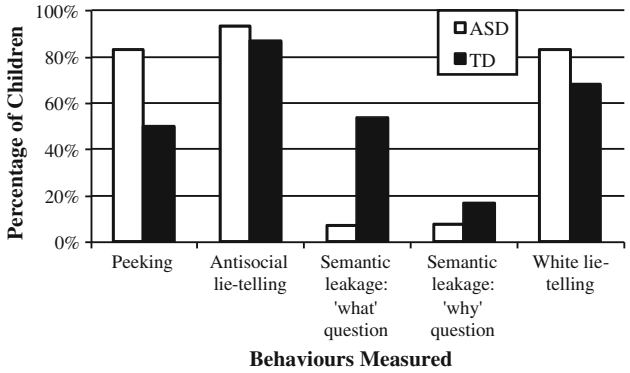

Fig. 1 Percentage of children in the ASD ($n = 18$) and TD ($n = 30$) groups who peeked; told an antisocial lie ($n = 15$ and 15, respectively); exercised semantic leakage control in response to the 'what' question ($n = 14$ and 13, respectively); exercised semantic leakage control in response to the 'why' question ($n = 13$ and 6, respectively); and told a white lie ($n = 18$ and 22, respectively)

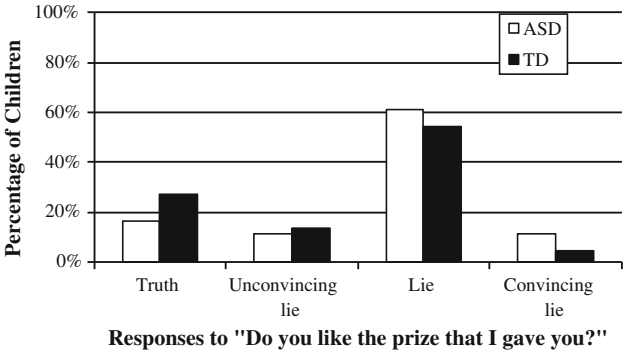

Fig. 2 Percentage of children in the ASD ($n = 18$) and TD ($n = 22$) groups who told the truth, told an unconvincing lie, told a simple lie, or told a convincing lie when asked, "Do you like the prize that I gave you?"

the prize he had received for a more desirable prize. Two of the children with ASD did not show dislike for the bar of soap. These two children were not dropped from the analysis because when given the opportunity, both exchanged their prize for what they liked the best. Thus, a total of 18 children in the ASD group and 22 children in the TD group were included in the analysis on white lie-telling propensity and ability.

Group Differences

FB Understanding

As expected, the TD group (proportion correct on first-order FB tasks: $M = .83$, SD = .24; proportion correct on second-order FB tasks: $M = .68$, SD = .30) scored significantly higher than the ASD group (proportion correct on first-order FB tasks: $M = .54$, SD = .36; proportion correct on second-order FB tasks: $M = .37$, SD = .42) on both first-order, $t(28.76) = 3.12$, $p < .01$, and second-order FB tasks, $t(29.75) = 2.76$, $p = .01$.

Antisocial Lie-Telling Propensity and Ability

Consistent with our hypothesis that both groups would tell antisocial lies, 14 of the 15 (93%) who peeked in the ASD group and 13 of the 15 (87%) who peeked in the TD group told an antisocial lie by making a false denial.[5] No difference was found on the number of antisocial lies told in each group, $\chi^2(1) = .37$, $p = .54$ (Fig. 1).

Semantic leakage control could only be assessed in 14 children with ASD and 13 TD children who peeked and told an antisocial lie. In response to the *'what' question* only 1 of 14 (7%) children in the ASD group while 7 of 13 (54%) children in the TD group feigned ignorance of the identity of the toy, $\chi^2(1) = 7.05$, $p < .01$. No group differences were found in response to the *'why' question*, $\chi^2(1) = .35$, $p = .55$.

White Lie-Telling Propensity and Ability

Contrary to our hypothesis that children with ASD would *not* tell white lies, the majority of children in both groups (83% in the ASD group and 68% in the TD group) responded positively to the experimenter when she asked them if they liked their prize. Moreover, the two groups did not differ significantly on whether or not they told a white lie, $\chi^2(1) = 1.21$, $p = .27$, or how convincing their lies were, $\chi^2(3) = 1.19$, $p = .76$. Figure 2 shows that the majority of children in both groups responded to *white lie question* by nodding or saying yes without elaboration to make their lie more convincing.

Interrelations Among Lie-Telling Ability, FB Understanding, and VMA

Relation Between Lie-Telling Ability and FB Understanding

Neither antisocial lie-telling propensity nor white lie-telling propensity were found to be related to first- or second-order FB understanding in either the ASD group or the TD group (Table 2). Consistent with our hypotheses, scores on second-order FB tasks in the TD group were correlated with responses to the *'what' question*, $r_{pb}(13) = .72$, $p < .01$, but not to the *'why' question*, $r_{pb}(6) = .16$, $p = .76$. Semantic leakage control was not found to be related to FB understanding in the ASD group; however, it

[5] Peekers from the two groups were comparable in terms of VMA, $t(18.90) = .58$, $p = .57$.

Table 2 Intercorrelations among antisocial lie-telling propensity, semantic leakage control, white lie-telling propensity, false belief understanding, and verbal mental age as a function of group

	1	2	3	4	5	6	7
1. Antisocial lie-telling	–	–	–	.68**	−.10	−.39	−.57*
2. Semantic leakage: 'what' question	–	–	–	.08	.11	.29	.20
3. Semantic leakage: 'why' question	–	–	–	.09	.37	.50	.48
4. White lie-telling	−.22	−.40	–	–	.03	−.12	−.13
5. First-order false belief	−.29	.27	.42	.27	–	.76**	.57*
6. Second-order false belief	−.22	.72**	.16	−.12	.57**	–	.76**
7. Verbal mental age	−.09	.69**	−.52	.02	.28	.38*	–

Note: Intercorrelations for the ASD group and TD group are presented above and below the diagonal, respectively. Correlations between antisocial lie-telling ability and measures of semantic leakage control could not be computed because semantic leakage control could only be assessed in children who told an antisocial lie. Correlations between responses to the 'what' and 'why' questions could not be computed because responses to the 'why' question were not analyzed in children who exercised semantic leakage control on the 'what' question. The correlation between white lie-telling propensity and responses to the 'why' question in the TD group could not be computed because all of the TD children who told a white lie also peeked, told an antisocial lie, and exercised semantic leakage control on the 'why' question. For all measures, higher scores are indicative of greater ability

* $p < .05$; ** $p < .01$

should be noted that only one child in this group exercised this level of control.

Because VMA was found to be related to the *'what' question* and second-order FB understanding in the TD group, we ran a partial correlation to explore whether the relation between semantic leakage control and FB understanding would hold after controlling for VMA. The results reveal that semantic leakage control and second-order FB understanding remain significantly correlated with each other even after controlling for VMA, $pr(10) = .68$, $p = .02$.

Relation Between Antisocial and White Lie-Telling Propensity and Ability

In the ASD group, children who told an antisocial lie tended to tell a white lie as well, $r_{\varphi}(14) = .68$, $p = .01$ (Fig. 3). Children in the ASD group who told an antisocial lie also told a more convincing white lie, $r_{pb}(14) = .56$, $p = .04$. In contrast, antisocial lie-telling propensity and ability were not found to be related to white lie-telling propensity and ability in TD children.[6] Even after controlling for VMA, children in the ASD group who told an antisocial lie were more likely to tell a white lie, $pr(11) = .75$, $p < .01$. Moreover, children in the ASD group who told an antisocial lie were more likely to tell a more convincing white lie, $pr(11) = .56$, $p = .05$.

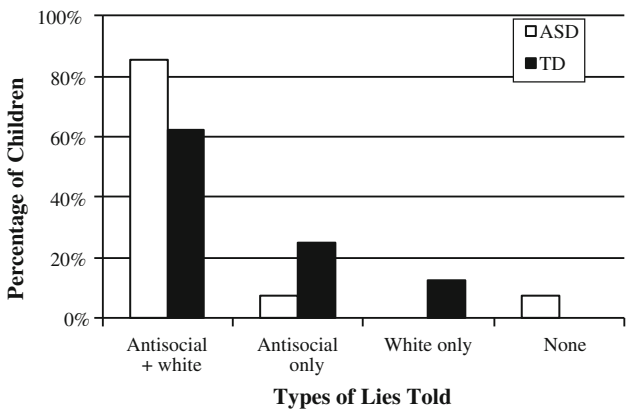

Fig. 3 Percentage of children in the ASD ($n = 14$) and TD ($n = 8$) groups who told both an antisocial lie and a white lie, only an antisocial lie, only a white lie, and no lies

Discussion

The purpose of the present study was twofold: (a) To explore the propensity and ability of children with ASD to tell antisocial and/or white lies in an experimental setting, and (b) to explore the relation between lie-telling ability and FB understanding in children with ASD.

Can Children with ASD Tell Antisocial Lies?

Drawing from the previous finding that a small proportion of children with ASD were motivated to tell a lie (Sodian and Frith 1992), we hypothesized that some children in the ASD group would tell an antisocial lie to conceal a misdeed. Of the children who peeked in the present study, the majority of children with ASD and TD children denied

[6] Note that only 8 TD children peeked in the temptation resistance paradigm *and* participated in the study after we had made modifications to the earlier version of the undesirable gift paradigm and thus had data for this exploratory analysis.

peeking at the toy. Thus, contrary to some parental reports that individuals with ASD are unable to deceive others, our results show that higher-functioning children with ASD are able to tell lies of their own volition.

However, we did find that children with ASD had more difficulty than TD children in covering up their lie by maintaining consistency between their initial lie and subsequent statements; that is, children with ASD had difficulty exercising semantic leakage control. We used two follow-up questions to measure semantic leakage control: "What do you think the toy is?" (*'what' question*) and "Why do you think so?" (*'why' question*). Although half of the TD children in our sample exercised semantic leakage control in response to the *'what' question*, only one child with ASD did so. We did not find significant differences between the two groups in response to the *'why' question*. However, few children had data for this analysis because responses to the *'why' question* were only analyzed for children who peeked, lied about peeking, and did not exercise semantic leakage control in response to the *'what' question*. Thus, higher-functioning children with ASD seem able to tell lies of their own volition, but seem unable to lie convincingly. Although the present findings may seem at odds with parental reports of children with ASD, it is speculated that perhaps parents have focused on children's ability to tell *effective* lies rather than their propensity to tell lies, regardless of whether or not they are effective.

Can Children with ASD Tell White Lies?

Previous research has shown that individuals with ASD have impairments in recognizing and understanding other's white lies (Happé 1994) and affective states (Hobson 1986). Accordingly, we hypothesized that children in the ASD group would not tell a white lie; however, this hypothesis was not confirmed. The two groups did not differ in their propensity or ability to tell a white lie. Because the questions asked in the undesirable gift paradigm were unable to inform us about children's understanding of when and why people tell white lies, we could not be sure that children were lying to be polite to the experimenter or to spare the experimenter's feelings. Therefore, a subset of participants who told a white lie were asked a follow-up question: "Why did you say that you liked your prize even though you don't really like soap?" Responses to the follow-up question revealed that neither children with ASD nor TD children could articulate why people tell white lies, which suggests that children who told a white lie did not necessarily lie to be polite or to protect the experimenter from feeling hurt. The most common response from children from both groups were, "I don't know" and "I forget."

Is Lie-Telling Related to FB Understanding in Children with ASD?

Previous studies examining deception in typical development have shown lie-telling ability to be related to FB performance (Polak and Harris 1999; Talwar et al. 2007a; Talwar and Lee 2008a). The second aim of the present study was to explore if this relation would hold in children with ASD. Given the literature documenting ToM difficulties in individuals with ASD (Baron-Cohen et al. 1985; Happé 1995), we expected TD children to demonstrate greater FB understanding than children with ASD. Children with ASD did indeed score significantly lower than VMA-matched TD children on both first-order and second-order FB tasks.

Antisocial Lie-Telling Propensity and FB Understanding

Contrary to our hypothesis, the propensity to tell antisocial lies was not significantly correlated with FB understanding in children with or without ASD. However, it is important to note that while the TD children in the present study were between 6 and 10 years of age, Polak and Harris (1999) examined 3- to 5-year-olds, and Talwar and Lee (2008a) examined 3- to 8-year-olds. We examined children between 6 and 10 years of age because only older and higher-functioning children with ASD were able to complete the protocol. Since the TD children in the present study were older than those examined in previous studies, they scored much higher on the first-order FB tasks, which may have decreased the variability to detect a potential relation. However, we did not find a relation between antisocial lie-telling propensity and first-order FB scores in children with ASD even though this group scored significantly lower than TD children on the first-order FB tasks.

Antisocial Lie-Telling Ability and FB Understanding

In TD children, we found that children who feigned ignorance about the identity of the toy had better second-order FB understanding; this relation remained even after controlling for VMA. On the other hand, we did not find a significant correlation between children's answers to the *'why' question* and second-order FB scores; however, only six TD children could have their explanations analyzed.

In contrast, semantic leakage control was not found to be correlated with second-order FB understanding in children with ASD. Null findings are difficult to interpret and it is important to use caution when interpreting statistically non-significant findings; yet, they do lead us to speculate on the possibility that lie-telling in children with ASD may not be related to FB understanding. It is possible that the lies told by children with ASD may be learned strategies

used to manipulate others' behaviors and consequently avoid punishment. These strategies may be scripted and may not involve intentionally manipulating the beliefs of another person; thus, they may simply demonstrate that children can manipulate others' behaviors but do not necessarily reflect a conscious attempt to instill a false belief in the mind of another. The pattern of correlations found among lie-telling ability, FB understanding, and VMA provides support for this possibility. We found that children in the ASD group who had a lower VMA tended to have lower FB scores. Thus, children with ASD who had a higher VMA may have passed some of the FB tasks by 'hacking out', or verbally reasoning through, the correct answers. Children in the ASD group who told an antisocial lie also tended to have a lower VMA, while semantic leakage control in this group was not found to be related to VMA or FB scores. Thus, it appears that whether or not a child with ASD tells an antisocial lie may depend on VMA but not on FB understanding.

It should be noted that children in the TD group who had a lower VMA also tended to have lower second-order FB scores. This result is consistent with many previous findings (e.g., Astington and Baird 2005). Although it could be argued that TD children also 'hacked out' correct answers on second-order FB tasks, semantic leakage control in this group was found to be related to second-order FB scores even controlling for VMA. Therefore, it appears that while antisocial lie-telling behavior in TD children is related to their FB understanding, this same relation may not hold in children with ASD. More research is needed to elucidate this disparity.

White Lie-Telling and FB Understanding

White lie-telling propensity and ability were not correlated with first-order or second-order FB scores or VMA in either group. It appears that the propensity and ability to tell white lies may not depend on FB understanding or VMA but on other factors, such as socialization from parents, or the amount of experience in politeness situations like the undesirable gift paradigm that have occurred in the child's life.

Interestingly, antisocial lie-telling propensity was found to be related to white lie-telling propensity in children in the ASD group but not the TD group, even after controlling for VMA. It is speculated that when faced with situations similar to these paradigms in real life, children with ASD may have learned to respond in such a way that enables them to avoid getting into trouble with the lie recipient. In other words, the results of the present study suggest that both antisocial and white lies told by children with ASD reflect scripted knowledge rather than ToM.

Limitations

Results from the present study are based on a small sample size. Of the children who participated in the present study, only those who committed the transgression (i.e., peeked at the toy) in the temptation resistance paradigm could be analyzed on antisocial lie-telling propensity and semantic leakage control. Furthermore, the implications of our findings are limited to higher-functioning children with ASD. Because the tasks involved in the present study required a high level of verbal ability, it was not possible to include lower-functioning children with ASD.

Another limitation of the present study is the lack of a control condition for the temptation resistant paradigm to rule out alternative explanations for why children denied peeking at the toy. For example, Polak and Harris (1999) included a *permission condition*, in which children were told that they were allowed to peek in the experimenter's absence, to rule out alternative explanations for why children denied peeking (e.g., failing to monitor their peeking behaviour, forgetting what they had done, failing to classify their behaviour as an instance of peeking). Polak and Harris found that children as young as 3 years of age did respond differently in the *permission* and *prohibition conditions* and thus they were able to rule out the alternative explanations for children's denials. Given that the children in the present study are much older, however, we believe that we are justified in excluding such a condition. The present study also did not include semantically complex conditions that did not involve lie-telling. However, we believe it was not necessary to include such conditions given that the paradigms used in this study have been successfully used with TD children as young as 3 years of age, and all of the children in the ASD group had a VMA greater than 3 years.

Finally, past research has shown that certain aspects of executive functioning are related to deception (Carlson et al. 1998; Talwar and Lee 2008a) and performance on FB tasks (Carlson and Moses 2001; Perner et al. 2002). Future research should take into account the role of executive functioning in children's lie-telling abilities and FB understanding.

Conclusions

In sum, the present study is an important addition to the literature on deception in children with ASD. While the extant literature concludes that most children with ASD are severely impaired in their ability to engage in deception, the present study is the first to demonstrate that higher-functioning children with ASD can and do tell both antisocial and white lies of their own volition. However, our

results show that although children with ASD can tell very simple lies, they have difficulty maintaining their lies. Furthermore, the present study provides a first glimpse at the cognitive correlates of lie-telling propensity and ability in children with ASD. While lie-telling in typical development has been shown to reflect FB understanding, the present data suggest that this may not be the case in children with ASD. Rather, lie-telling behaviors may simply be learned behaviors that were acquired from past experience. Future research should investigate the underlying mechanisms by which children with ASD tell lies.

Acknowledgments This study was supported by grants from the Canada Foundation for Innovation (CFI) and Queen's University to EAK and by grants from the Social Sciences and Humanities Research Council (SSHRC) and National Institutes of Health (NIH R01) (HD047290) to KL. We wish to thank Dr. Tony Charman and an anonymous reviewer for their helpful comments on an earlier version of this manuscript. We would also like to thank our participants and parents for their participation in this study, Ellen Drumm, Layla Hall, Rachel Leung, and Laura O'Connell for their help with data collection, and Monica Haberl for blind-coding the data. This study was carried out by ASL in partial fulfillment for the requirements of a master's degree in psychology at Queen's University. Portions of this study were presented at the 7th International Meeting for Autism Research in London, the 38th meeting of the Jean Piaget Society in Québec City, the 2009 meeting for the Society for Research in Child Development in Denver, and the 8th International Meeting for Autism Research in Chicago.

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