Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

_____ _____

Cynthia Xinran Guo Date

Predicting Verbal and Nonverbal Deception in 2 ½ - 5-year-olds

By

Cynthia Xinran Guo

Master of Arts

Psychology

Philippe Rochat

Advisor

Sherryl Goodman

Committee Member

Stella Lourenco

Committee Member

Accepted:

Lisa A. Tedesco, Ph.D.
Dean of the James T. Laney School of Graduate Studies

Date

Predicting Verbal and Nonverbal Deception in 2 ½ - 5-year-olds

By

Cynthia Guo

B.A., University of California, Los Angeles, 2016

Advisor: Philippe Rochat, Ph.D.

An abstract of
A thesis submitted to the Faculty of the
James T. Laney School of Graduate Studies of Emory University
in partial fulfillment of the requirements for the degree of
Master of Arts
in Psychology
2018

Abstract

Predicting Verbal and Nonverbal Deception in 2 ½ - 5-year-olds

By Cynthia Guo

The current study investigated 2 ½ to 5 years old children's levels of mental state understanding, inhibitory control, and sensitivity to rules and norms as potential predictors of an inclination to nonverbally cover up and verbally lie about the transgression of an adult, which could be perceived as implicating the child. With a revised temptation resistant paradigm, results from the study show that children, when spontaneously engaged in covering up for the transgression, relied more on nonverbal deception as a function of age. Among the social cognitive factors, only children's sensitivity to social norms was found to be predictive of their level of deception. A gender effect was found in terms that boys deceived at a more advanced level compared to girls. These results provide novel evidence regarding the role of gender and normative understanding in the emergence of deception in early development.

Predicting Verbal and Nonverbal Deception in 2 ½ - 5-year-olds

By

Cynthia Guo

B.A., University of California, Los Angeles, 2016

Advisor: Philippe Rochat, Ph.D.

A thesis submitted to the Faculty of the

James T. Laney School of Graduate Studies of Emory University

in partial fulfillment of the requirements for the degree of

Master of Arts in Psychology

2018

Acknowledgements: I would like to thank Arielle Kahana and Isha Kumar, research assistants in the Emory Infant and Child Lab, for their help in coding. I am also thankful for Natalie Eldred, Emory and Infant and Child Lab Manager, for her support. Lastly, I am grateful for all the parents and children who participated in this research as part of the Emory Child Study Center.

Table of Contents

Contrary to what many people believe, deception is prevalent even in the first few years of life. Darwin (1877) documented his 32-month-old son taking pickle juice from the kitchen even though he was told not to. The child carefully rolled up the pinafore to cover up the spills and denied his transgression when asked by his father. Darwin concluded that children before the age of 3 could engage in intentional deceit. More recently, Wilson, Smith and Ross (2003) audiotaped families in 90-minute sessions longitudinally in a 2-year period. They found that 2-year-old children would lie about once every five hours in their homes, and the frequency of lying increased as children grew older – about once every two hours at the age of 4. Maternal diaries yielded similar results, showing that children could generate a variety of lies at least by 2 ½ years (Newton, Reddy, & Bull, 2000).

Although children's false denial and feigned ignorance of transgressions had been repeatedly observed before the age of 3, some researchers argued that these early lies did not function to the same degree as adults' lies in concealing information and misguiding others – they were "pseudo-lies" instead of genuine deceit (Piaget, 1932). The Piagetian approach suggested that intentionality was the defining characteristic of true deceits – without the intention to misguide another's beliefs, the observed early false utterance and deceptive acts were mistakes rather than deceits. These mistakes were made either because children had forgotten that they had transgressed (Sodian, Taylor, Harris, & Perner, 1991), or because their attention was focused on manipulating another's behaviors rather than beliefs (Peskin, 1992). An alternative explanation was that the pseudo-lies young children produced were desire-driven – they lied to please adults or ward off reprimand instead of installing falsehood in another's mind. According to

Ahern, Lyon and Quas (2011), children as young as 2 ½ years old could produce conscious false statements to a researcher who was aware of the falsehood of the utterance when driven by the desire to win prizes. The results showed that, even without the intention to install falsehood in another's mind, young children could still produce false statements. Therefore, a child could be sensitive enough to another's desire to produce false denials to a question regarding a transgression without the intent to "change someone's mind" (Polak & Harris, 1999).

However, other evidence suggested that, although children's early deceits may not reach the same level of complexity as adult lies, they were still intentional and meant to manipulate others' mind (Chandler, Fritz, & Hala, 1989; Hala, Chandler, & Fritz, 1991; Lewis, Stanger, & Sullivan, 1989). For instance, in a study conducted by Chandler, Fritz and Hala (1989), 2 ½ to 5 years old children engaged in a hide-and-seek board game where they had to wipe out clues and leave misleading cues for their opponents. Children as young as 2 ½ years old could employ these deceptive ploys; and when asked to predict the location where their opponents would look for the hidden items, even the younger children could make predictions based on the misleading information they left instead of giving out the real location. Results from the study indicate that the deceits 2-year-olds carried out were neither unconscious false utterance nor distracted statements driven primarily by the desire to please adults or avoid punishment; rather, they were intentionally produced to create misconception and misguide others.

Lewis et al. (1989) developed the earliest version of what later been referred to as the temptation resistant paradigm. While the hide-and-seek type of games adopted in the earlier studies typically engaged children in a competitive context distant from their real-

life motivational and emotional experiences (Peskin, 1992), the temptation resistant paradigm allows researchers to study very young children's spontaneous lies in a natural situation that mimics their daily experiences. The temptation resistant paradigm places preschool-age children in a tempting situation where they are inclined to violate the rules and transgress (e.g. a researcher puts a toy on the table and instructs the child not to peep at the toy before leaving the room). Because young children lack the inhibitory control to suppress their desires, they often violate the rules during the researcher's absence. After the transgression, researchers can study the onset and prevalence of early deception by simply asking questions about the transgression and evaluating children's answers. Variations of the temptation resistant paradigm have been widely adopted to study the emergence of lying across cultures (e.g. Polak & Harris, 1999; Talwar & Lee, 2008; Ma, Evans, Liu, Luo, & Xu, 2015).

More recently, with the temptation resistant paradigm, researchers have consistently observed verbal deception around 2 ½ years (Evans & Lee, 2013; Leduc, Williams, Gomez-Garibello, & Talwar, 2016; Williams, Leduc, Crossman, & Talwar, 2016). Age has been recognized as an important predictor for children's lie telling, as the prevalence of deception increases significantly from 2 ½ to 8 years (Lavoie et al., 2017; Talwar & Lee, 2002; Talwar & Lee, 2008). Although only around 1/3 3-year-olds would lie to cover up their transgression, most of the 5-year-olds and almost all 7-years-olds told lies after they transgressed. As children get older, their lies also increase in sophistication (Evans, Xu, & Lee, 2011; Talwar, Gordan, & Lee, 2007). While children between the age of 3 and 5 are unable to keep their following statements consistent with their initial lies, the ability to control verbal and behavioral leakage increases

significantly through elementary school (Talwar et al., 2007). By the age of 5, preschoolers can tell lies strategically even when physical evidence of their transgression is present (Evans et al., 2011).

One limitation of the temptation resistant paradigm is that the lying measurements are solely dependent upon children's verbal responses. Children are asked a yes/no question about whether they have transgressed the rules, and they are categorized as lie-tellers or truth-tellers based on their answers (e.g. Evans & Lee, 2013). The sophistication of their lies is evaluated through their answers to a series of follow-up questions. An emphasis on verbal lie-telling in the current literature raises question about whether children's verbal deception is representative of their overall ability to deceive. Only a few studies have examined children's nonverbal deception, all of which employed game-like paradigms that are distant from real-life experiences (e.g. Chandler et al., 1989; Ding, Wellman, Wang, Fu, & Lee, 2015; Hala et al., 1991; Sodian et al., 1991); none of them used the temptation resistant paradigm or similar paradigms to study children's spontaneous deception in naturalistic situations. To the best of our knowledge, none of the studies have explored the development of deception in light of both verbal and non-verbal deception. It is quite possible that a child who verbally lies to deceive another may not be able to physically cover up a transgression, and a child who can physically deceive another may not be able to lie verbally. The ability to deceive both verbally and nonverbally shows that a child is at a more advanced level of deception. However, due to the lack of evidence from the literature, it remains an open question whether the developmental trajectory of deception would change when nonverbal deception is taken into account.

Deception and Theory of Mind

Theory of mind (ToM) refers to our ability to attribute mental states to others – that others may think and act differently from us. Deception – the action of intentionally withholding information or misinforming others – assumes at least a rudimentary understanding that, if someone was unaware of the actual state of the affairs, this person would react differently than someone else with the factual knowledge (Peskin, 1992). As such, if a child fails to apprehend that someone else could misrepresent knowledge, he or she could not possibly grasp the purpose of deceit. Indeed, an understanding of false beliefs was found to be correlated with the ability to produce lies in 3-8-year-old children (Talwar & Lee, 2008). When 3-year-old children who could not deceive others in a hide-and-seek game were offered false beliefs training, they deceived the researchers significantly more both immediately after the 2-week training and in the long-term follow-up session compared to children who received control training on physical concepts (Ding et al., 2015). Therefore, it is likely that an understanding of false beliefs is necessary for the development of early deceptive behaviors.

Although children were observed to produce lies around 2 ½ years, they do not pass the standard false beliefs task until 4 or even 5 (Wimmer & Perner, 1983). Therefore, earlier forms of mental state understanding that are precursors to false beliefs may be instrumental in the emergence of children's early lie-telling. Instead of viewing ToM as a single cognitive process or achievement to evaluate children's understanding of others' mental states, Wellman and Liu (2004) proposed a ToM scale, which incorporates the various tasks existing in the literature that measure different aspects of mental state understanding. The ToM scale reflects a developmental trajectory and is evaluative of

children's emerging ability to appreciate another's mind. As such, the earlier items on the scale capture a more rudimentary understanding of mental states compared to the later ones, and as children get older, they pass a progressively greater number of items on the scale. According to the ToM scale, a child first recognizes that two individuals could have distinctive desires for the same object or situation (diverse desires), and this recognition is typically found to emerge before age 3. At around 4 years, preschoolers start to apprehend that another person could be ignorant of certain information that they know (knowledge access). Diverse desires and knowledge access are considered by Wellman and collaborators as two precursors to the development of false belief understanding, which marks children's grasping that a person could maintain information inconsistent with reality.

Given that first signs of lying emerge before 3 years – around the time children also attain earlier levels of ToM – it is reasonable to ask whether early ToM understandings are associated with children's ability to deceive. Based on Wellman and Liu's (2004) ToM scale and the temptation resistant paradigm, researchers have recently started to investigate preschoolers' understanding of others' mental states in relation to their emerging deceptive ability (Leduc et al., 2016; Ma et al., 2015; Talwar, Wyman, & Crossman, 2017). Among the early ToM skills, knowledge access was found to be a significant predictor of children's early false denials, while diverse desires was found not to be related to children's early deceptive ability (Leduc et al., 2016; Ma et al., 2015). These results suggest that young children are more likely to lie about a transgression when they understand that the other person did not have access to information that they possessed (knowledge access).

In all, findings from recent literature indicate that some rudimentary understanding of other's mental states (i.e. knowledge access) is critical in children's primary stage of false verbal denial. However, none of the existing studies have examined whether early forms of ToM are related to young children's nonverbal deception. Nonverbal deception, defined as the act of restoring a misplaced item to its original state so that another person would not suspect the transgression has occurred in the first place, likely requires a more advanced understanding of another's mind and more active participation from the child. For a child to deceive nonverbally, the child not only needs to understand that another person would suspect the transgression if the item remains misplaced, but the child also needs to act to fix the misplacement. Therefore, it is possible that, when nonverbal deception is considered, children's knowledge access ToM understanding would not be sufficient to account for their deceptive behaviors. In the present study, it is one of our aims to explore the relations between early ToMs and preschoolers' emerging deceptive behaviors including both their verbal and nonverbal responses to a transgression.

Normative Understanding and Deception

From early in development, children learn idiosyncratic acts and acquire conventional, communally shared social norms through other individuals (Rakoczy & Schmidt, 2013). Social norms refer to set of standards in a given context that are shared and accepted by a group of individuals (Tomasello & Rakoczy, 2003), and are applicable in an agent neutral way to any participant in similar situations (Nagel, 1978). For a child to recognize a transgression, and subsequently try to cover up the transgression through

deception, the child needs to understand what is expected of him or her in the particular social context. Therefore, children's sensitivity to social norms could potentially influence their likelihood to deceive.

By preschool age, children could demonstrate their norm sensitivity explicitly through their use of normative language in daily conversations. For example, the great majority of 3-4-year-old children described norm violations when they talked about their peers' behaviors (Ingram & Bering, 2010). Compared to peers, children were even more likely to tattle on their siblings' transgressions of house rules. When Rose and de Bak-Lammers (1998) audio-recorded six 90-minute observation sessions in family homes, they discovered that even 2-year-old children would tattle about 5 times on their older sibling's transgressions in the 9-hour period. This showed that even 2-year-olds were aware of the house rules and the consequences of violating these rules and were able to demonstrate their understanding explicitly through language.

Moreover, preschoolers' normative understanding is demonstrated through their ability to pick up implicit social rules without explicit instructions through a single exposure (Schmidt, Rakoczy, & Tomasello, 2011), and through their faithful reproduction of unnecessary actions (Kenward, Karlsson, & Persson, 2011). Although normativity in children has often been studied through games (Rakoczy, 2008; Rakoczy, Warneken, & Tomasello, 2008; Rakoczy, Warneken, & Tomasello, 2009), recent researchers have become interested in preschoolers' understanding of more serious social institutions and found evidence that children's early normative awareness was genuine and not confined to non-serious, game-like context (Rossano, Rakoczy, & Tomasello, 2011).

Results from normativity literature show that preschool children are aware of social norms, and when the norms are violated, they would react through protests to reinforce those norms (e.g. Rakoczy, Brosche, Warneken, & Tomasello, 2009; Schmidt & Tomasello, 2012). Therefore, it is reasonable to expect preschoolers with a more advanced understanding of norms to be more conscious of rule violations, more aware of the consequences of being perceived as the transgressor, and more likely to cover up a third-party transgression. Few research has explored the relations between early deception and children's normative understanding (Mascaro & Sperber, 2009), and none has focused on their understanding of social norms and the production of deception. In the current research, we hope to investigate whether children's sensitivity to social norms is relevant to their ability to deceive.

Inhibitory Control and Children's Propensity to Deceive

To successfully deceive another, children need to exhibit control over their desire to tell the truth and display misleading cues to cover up the true information. As such, inhibitory control is expected to play a crucial role in children's ability to carry out deception. Indeed, previous research has found that 3-year-old were less successful in deceiving the experimenter when the demand for inhibitory control was high compared to the low demand condition (Carlson, Moses, & Hix, 1998). Children who performed better at an inhibitory control task were also more likely to tell both antisocial and prosocial lies (e.g. Talwar & Lee, 2008; Williams, Leduc, Crossman, & Talwar, 2016; Williams, Moore, Crossman, & Talwar, 2016).

Although past research has established the importance of inhibitory control in children's lie-telling ability, the unique contribution of the Stroop task as a measurement of inhibitory control is debated. Whereas the Wisper Task has been consistently shown to be related to children's deception, research using the Stoop task as a measurement of inhibitory control yielded mixed results. For instance, Talwar and Lee (2008) found that better performance on the Stroop task was related to more spontaneous antisocial lie-telling and the ability to control verbal leakage in their subsequent statements in 3-8 years old children. On the contrary, Talwar et al. (2017) showed that the Stroop task scores were not related to children's propensity to tell self-serving, antisocial lies; the scores were only predictive of children's other-oriented, prosocial lies.

One way to explain this discrepancy is that, even though both the Wisper task and the Stroop task assess children's ability to inhibit desires, the Stroop task is potentially more taxing – children have to not only inhibit their desire to blurt out the fact, but also produce a response that's inconsistent with the truth. If that is the case, the Stroop task could be related to children's more advanced ability to deceive others, rather than their desire-driven denial of transgression to avoid punishment. The current study combines children's verbal denial and nonverbal coverup to construe a more complete profile of children's deceptive response to a transgression. It is one of our goals to examine whether children's inhibitory control, as measured by the Stroop task, is predictive of their deceptive responses when both verbal and nonverbal deception are considered.

Current Study

The current study assesses how children's mental state understanding, inhibitory control, and normative understanding are related to their verbal and non-verbal deception in facing a third-party transgression. Because verbal denial (i.e. saying "no" to deny a transgression) requires much less effort compared to nonverbal coverup (i.e. restoring a misplaced item to its original position so another person would assume that the transgression never happened), we hypothesize that children rely more on nonverbal deception with the increase of age. Secondly, since nonverbal deception requires more effort and intentionality from children, a grasp on how knowledge is acquired (knowledge access ToM) may not account for their deceptive ability when nonverbal deception is taken into account. Therefore, it is hypothesized knowledge access ToM would only be predictive of children's verbal deception, but it would not be predictive of children's level of deception when nonverbal deception is included. Consistent with previous literature, we also predict that diverse desires ToM would not be related to the level at which children deceive. Thirdly, because the Stroop task is more taxing compared to the Wisper task as a measure of inhibitory control, we hypothesize that children's performance on the Stroop task would be predictive of children's level of deception when both verbal and nonverbal deception are considered. Lastly, because children with a more advanced normative understanding are more conscious of the consequences of a transgression, it is hypothesized that children who are more sensitive to rules and norms are also more likely to deceive at a higher level.

Method

Participants

Children between 2 ½ and 5 (N = 77) participated in the study. Six children were excluded from the analyses, including five who did not complete the study, and one child who uncovered and saw the gift before Experimenter 2 entered the room. Therefore, our analyses included 71 children (M = 46.5 months, SD = 8.0, range = 31 to 62 months, 38 females). Parents filled out a demographic questionnaire and reported children's ethnicity as White/Caucasian (56.3%), Black/African American (21.1%), Other (18.3%). Parents also reported the number of siblings of the participating child. The most common numbers of siblings were: 1 sibling (59.2%), 2 siblings (22.5%) and no sibling (12.7%). Seven children were reported to have been born prematurely. Children were recruited through the Child Study Center at Emory University in Atlanta, Georgia. Informed consent was obtained from parents before children participated in the study.

General Procedure and Design

Children were seen individually in a quiet room by a researcher. Children first engaged in a 5-minute warm-up free-play with Experimenter 1. This was to familiarize them with Experimenter 1, and to engage them with toys in the testing room. After the free-play, each child completed the experimental task in the following sequence: deception task, diverse desires ToM task, knowledge access ToM task, inhibitory control task, and normativity task. All children were tested in the order of the sequence above. Two cameras recorded children's behaviors throughout the experiment. One camera was placed behind the child to record the lateral view, and the other camera was placed behind the researcher to record the frontal view of the child. Parents completed a demographic questionnaire while their children played with the researcher.

Materials

Demographic Questionnaire. Parents were asked to complete a demographic questionnaire, including their child's date of birth, gender, ethnicity, the number of siblings, his/ her first language, and whether the child was born prematurely.

Deception task. The procedure for the deception task was adapted from the temptation resistant paradigm (Evans & Lee, 2013; Lewis et al., 1989; Polak & Harris, 1999; Talwar & Lee, 2002). At the start of the task, Experimenter 1 told the child that she prepared a gift for him/her and took out a toy that was wrapped in a towel from a basket. Experimenter 1 then put the toy, still covered by the opaque towel, on the table in front of the child, making sure that the child did not see the toy throughout the process. After setting up the hidden toy, Experimenter 1 told the child that she forgot to ask his/her parent whether she could give the gift to the child, so she had to step outside to inquire. Experimenter 1 instructed the child not to look or touch the gift before she left the room, closing the door behind her and leaving the child alone.

Children were left alone in the testing room for 15 seconds before Experimenter 2 came into the room. The period that children were left by themselves was short because pilot studies showed that some of the younger children exhibited signs of agitation when left in the testing room alone for more than 30 seconds. After Experimenter 2 came into the room, she lifted the towel on the table, uncovered the toy for the child to see, and said in a curious tone "*What's this? Is this a (name of the toy)?*" Afterwards, Experimenter 2 half-covered the toy back up, and said to the child "*Shh! Don't tell!*" before she left the room in a rush and closed the door, leaving half of the toy uncovered on the table in front

of the child. The child's reaction to the half-exposed toy was recorded by two cameras for later coding.

The child was again left alone in the room for another 15 seconds before Experimenter 1 returned. Experimenter 1 then told the child that his/her parent agreed that she could give the gift to the child. If the child left the gift uncovered, Experimenter 1 added "*Oops*" and adjusted the towel to cover up the whole toy prior to asking the following question: "*Did you look at the toy when I was outside?*" The gift was covered up before Experimenter 1 asked any further questions because previous research demonstrated that young children were unable to lie when physical evidence was present (Evans et al., 2011).

If the child denied looking at the gift, then Experimenter 1 asked the follow-up question: "*Can you make a guess what the gift is?*" This question was to examine whether the child could keep his/her subsequent statement consistent with the initial lie and control for verbal leakage. Children who resisted revealing the identity of the gift by guessing something else were considered more advanced in lying. After the child replied, Experimenter 1 asked: "*How do you know?*" in reference to the guess children provided in the previous question. The most advanced lie-tellers were able to feign ignorance (e.g. "*I don't know!*") or come up with an alternative explanation without leaking the truth that they looked at the toy.

If the child admitted looking at the gift, Experimenter said: "It's okay that you looked" to rid the child of any potential guilt of the transgression. At the end of the task, Experimenter 1 put the toy in a small bag for the child to take home after the study.

Measure. To measure a child's nonverbal deception, the child's reaction to the half-exposed gift was coded. Children who covered up the gift using the towel was coded as deceivers, and children who left the gift exposed was coded as non-deceivers. To measure the child's verbal deception, the child's answer to the question: "*Did you look at the gift when I was outside?*" was examined. If the child admitted looking at the gift, s/he was classified as truth-tellers. If the child denied looking at the gift, but leaked information about Experimenter 2, s/he was still classified as truth-tellers. If the child denied looking at the gift and did not leak any information regarding Experimenter 2, s/he was classified as lie-tellers.

To incorporate children's verbal and nonverbal deceptive behaviors in a single measure, an ordinal deception was created to capture children's level of deception. The scale consists of three levels: 0 – no deception; 1 – either verbal or nonverbal deception; 2 – both verbal and nonverbal deception. Although, no previous research has examined children's verbal and nonverbal deception together, the existing literature on verbal deception has demonstrated that children who can keep their subsequent statements consistent with their initial lies (i.e. telling another lie after the first lie) are more advanced at deception than children who can tell one initial lie but give away the truth in the subsequent statements (e.g. Evans & Lee, 2013). The level of deception scale adopted in the current study utilizes a similar rationale – it assumes that children who exhibited nonverbal deception in addition to verbal deception are more advanced at deception compared to children who only exhibited either verbal or nonverbal deception.

For the lie-tellers, their response to the question: "*Can you make a guess what the gift is?*" was also assessed. Lie-tellers who did not give away the name of the toy was

coded as having verbal leakage control. Those who answered with the name of the toy was coded as lacking verbal leakage control. For lie-tellers with verbal leakage control, their answers to the question: "*How do you know?*" was coded. Those who feigned ignorance or came up with an alternative explanation were classified as having good verbal leakage control; those who gave away their transgression were classified as having poor verbal leakage control.

ToM tasks (Wellman & Liu, 2004).

***Diverse desires* (Carlson, Mandell, & Williams, 2004; Repacholi & Gopnik, 1997).** Experimenter 1 put a toy broccoli and a toy cookie on the table in front of the child and asked the child to name the two food items. Experimenter 1 then asked the child: "*Broccoli and cookie, which one do you like better?*" This question was to ask the child's own desire. If a child answered "*Cookie*" to the question, the experimenter then said: "*Well, that's a very good choice. But for me, I like broccoli. Broccoli is my favorite food. Cookie? I do not like cookie.*" If a child answered "*Broccoli*" to the question, Experimenter 1 then expressed her preference for cookie. After that, the child was asked the target question: "*I am very hungry now. But I can only have one food. Can you give me one food to eat?*"

Measure. Pass/Fail. To pass the diverse desires task, the child had to give Experimenter 1 the food item she preferred, rather than the food item the child preferred.

***Knowledge access* (Pillow, 1989; Pratt & Bryant, 1990).** Experimenter 1 introduced a puppet "Bobo" to the child and put the puppet on the table. Next, she showed the child a closed opaque box, with a bouncy ball hidden inside the box

beforehand. Experimenter 1 asked the child: "*Do you want to see what's inside the box?*" After the child expressed willingness to see the content, Experimenter 1 said: "*I want to show it to you too. But I don't want Bobo to see what's inside the box, so I am going to put Bobo under the table, so he cannot see!*" Experimenter 1 then put the puppet under the table, opened the box, and showed the bouncy ball to the child. The child was allowed to engage with the ball briefly before Experimenter 1 put the ball back into the box and closed it. Experimenter 1 then asked the child the target question: "*Now we know what's inside the box. Do you think Bobo knows what's inside the box?*" After the child answered the target question, Experimenter 1 followed up with a memory question to ensure that the child remembered the event correctly: "*Did Bobo see what's inside the box?*" To verify that the child understood the questions, Experimenter 1 put the puppet back onto the table, facing the closed box, and asked the target question and memory question again.

Measure. Pass/Fail. To pass the knowledge access task, the child had to answer both sets of target questions and memory questions correctly.

Inhibitory Control task (Ahern, Lyon & Quas, 2011; Carlson, 2005). Experimenter 1 took out a stack of six cards: three of them had a cartoon bird picture on it, and the other three had a cartoon fish picture on it. The cards were in interleaved order so that two pictures of the same animal did not show up consecutively. The child was randomly assigned to either a bird condition, where the first card of the stack featured a bird, or a fish condition, where the first card of the stack featured a fish. Experimenter 1 showed the child each of the cards from the stack and asked the child to name the animal on each card.

Afterwards, Experimenter 1 put the puppet "Bobo" back onto the table and told the child: "*Bobo really wants to know what's on these cards. But we are going to play a game with him. I will cover his eyes, so he cannot see.*" Experimenter 1 then took out a piece of cloth and covered the puppet's eyes with it. In the bird condition, Experimenter 1 continued: "*You are going to tell Bobo what's on these cards. But you are only going to tell Bobo that you see birds. Even when you see fish, you tell Bobo you see a bird.*" In the fish condition, the child was asked to only tell the puppet that s/he saw fish. Experimenter 1 checked that the child understood the task by asking a memory question: "What do you tell Bobo?" If the child failed to answer the memory question correctly, Experimenter 1 reiterated the task to the child. After that, Experimenter 1 started the task by showing the child each card from the stack again and asked the child to tell "Bobo" the name of the animal.

Measure. The child received one point each time s/he answered correctly to the incongruent pictures, for a maximum of 3 points. Because the majority of participants (69 children) received either a score of 0 or 3, and only two children received a score of 1 or 2, the outcome variable was recoded into a Pass/Fail dichotomous variable for analyses. Children who received scores of 1-3 were recoded as passing the task, and children who received score of 0 were recoded as failing the task.

Normativity task. Experimenter 1 put 10 stickers on the table and told the child that s/he could win some stickers in the game. Experimenter 1 then explained the rule: the child and Experimenter 1 would take turns picking stickers from the table, but they were only allowed to take one sticker each time, until all the stickers ran out. The child was instructed to start the game by picking the first sticker. After two rounds, Experimenter 1

transgressed the rule by taking two stickers during her turn. The child's response to the transgression was coded. Regardless of the child's reaction to the transgression, Experimenter 1 finished playing the game, and the child received the stickers he/she picked as a prize to take home.

Measure. The child's response to Experimenter 1's transgression was coded on a 1-4 scale, with higher level indicating more advanced norm sensitivity: 1) the child showed no reaction to Experimenter 1's transgression; 2) the child stared at Experimenter 1 for a prolonged period of time; 3) the child imitated Experimenter 1 by taking more than one sticker in the next turn; 4) the child verbally protested against the transgression (e.g. "*You took two!*").

Coding. All children's performance on the deception task as well as the social cognitive measurements were coded by two trained independent coders (inter-rater reliability = 93% agreement overall). For the 7% cases with disagreements, the two coders re-watched the videotapes and discussed their decisions. They were able to resolve all the differences and reach 100% agreement after the discussion.

Results

Overview

For the results section, descriptive statistics of the deception task is first presented. Next, preliminary analysis is displayed, examining whether gender was correlated with the social cognitive predictors and deception measurement, whether age was correlated with the social cognitive predictors, and whether the social cognitive predictors were correlated with one another.

To test our first hypothesis, age was put into a binary logistic regression model with nonverbal deception as the dependent measure. To test the rest of the hypotheses, the social cognitive predictors (i.e. diverse desires ToM, knowledge access ToM, inhibitory control, and normativity) were individually put into an ordinal regression model, with level of deception as the dependent variable. Children's level of deception – a three-level deception scale – was construed based on children's nonverbal deception and verbal deception, with higher level on the scale being more advanced compared to the lower level: 0 – no deception; 1 – either only verbal deception or only nonverbal deception; 2 – both verbal and non-verbal deception.

Lastly, all predictors that were found to be individually predictive of level of deception were entered into an ordinal logistic regression model together to examine whether these measures were uniquely predictive of level of deception.

Descriptive Statistics for the Deception Task

In our deception paradigm, only 17 children (23.9%) did not engage in any type of deception; the rest (76.1%) deceived the researcher verbally, non-verbally, or both. Among children who deceived the researcher, 18 children (25.4%) deceived both verbally and non-verbally, 25 children (35.2%) deceived only verbally, and 11 children (15.5%) deceived only non-verbally. For verbal deception, children's responses to the question "*Did you look at the gift when I was outside?*" were coded. A total of 43 children (60.6%) denied looking at the gift, therefore deceiving Experimenter 1 verbally. Among the deceivers, only six (14%) maintained their lies when responding to the follow-up question "*Can you make a guess what the gift is?*" and only five (11.6%) kept good

verbal leakage when answering the question "*How do you know?*" As for nonverbal deception, a total of 29 children (40.8%) used the towel to cover up the gift after Experimenter 2 exposed the gift, while the other 42 children (59.2%) let the gift remain exposed.

Preliminary Analysis

To examine whether gender was correlated with any of the measures, chi-square analysis was conducted. Chi-square analysis revealed no significant gender differences across any of the social cognitive measurements (see Table 1), so subsequent analyses were collapse across gender for these measurements. However, gender yielded significant differences on children's level of deception ($p = .015$) and was therefore included in the final model (see Table 2).

To examine whether age was correlated with any of the measures, binary logistic regression analyses were conducted with age as covariate, and diverse desires ToM, knowledge access ToM and inhibitory control as outcome variables. Age was a significant predictor of knowledge access ToM ($p = .003$) and inhibitory control ($p = .000$) but was not predictive of diverse desires ToM ($p = .538$) (see Table 3). Because children in the sample showed ceiling effect for the diverse desires ToM task, results should be interpreted with caution. Since the normativity measurement was a categorical variable, multinomial logistic regression analysis was used to examine whether age was predictive of children's sensitivity to norms. The model was not significant ($p = .189$) (see Table 4).

To examine whether social cognitive measures were correlated with one another, chi-square analysis was conducted (see Table 5 through Table 10). Only knowledge access ToM and inhibitory control were found to be correlated with one another (p = .000).

Age and Children's Deceptive Behaviors

To test our first hypothesis that nonverbal deception increased as a function of age, a binary logistic regression was conducted with children's nonverbal deception as dependent measure and age in months as covariate. The model was significant (p = .046). Coefficients of the regression model are displayed in Table 11. Consistent with hypothesis one, children relied more on nonverbal deception with the increase of age.

Deception and Mental State Understanding

To test our second hypothesis that knowledge access ToM was only predictive of children's verbal deception, two separate regression analyses were conducted. First, to test whether knowledge access ToM was predictive of children's verbal deception, a binary logistic regression analysis was conducted, with verbal deception as outcome variable and knowledge access ToM as predictor. The model was not significant (p = .172). Coefficients of the regression model are displayed in Table 12. Contrary to our second hypothesis, knowledge access ToM was not predictive of children's verbal deception. Next, to test whether knowledge access ToM was predictive of children's level of deception, an ordinal logistic regression analysis was conducted, with level of deception as outcome variable and knowledge access ToM as predictor variable. Ordinal

logistic regression takes into account the order of the dependent variable without assuming the same distance among different levels (Anderson, 1984; McCullagh, 1980; Scott, Goldberg, & Mayo, 1997). The model was not significant (p = .238). Coefficients of the regression model are displayed in Table 13. Therefore, our second hypothesis was partially supported: knowledge access ToM was neither predictive of verbal deception, nor predictive of children's level of deception when both verbal and nonverbal deception were considered.

To test our third hypothesis that diverse desires ToM was not predictive of children's level of deception, an ordinal logistic regression analysis was conducted with level of deception as dependent measure, and diverse desires ToM as predictor variable. The model was not significant (p = .301). Coefficients of the regression model are displayed in Table 14. Results from the ordinal regression supported our hypothesis that diverse desires ToM was not predictive of children's level of deception when both verbal and nonverbal deceptive behaviors were taken into account.

Deception and Inhibitory Control

To test our fourth hypothesis that children's performance on the Stroop task was predictive of their level of deception, an ordinal logistic regression was conducted, with children's deception level as dependent variable, and children's inhibitory control as predictor. The model was not significant (p = .221). Coefficients of the regression model are displayed in Table 15. Contrary to our hypothesis, inhibitory control, as measured by the Stroop task, was not predictive of children's level of deception when facing a third-party transgression.

Deception and Norm Sensitivity

To test our last hypothesis that children who demonstrated heightened sensitivity to norms would also show more advanced level of deception, an ordinal logistic regression was conducted, with children's level of deception as dependent variable, and children's performance on the normativity task as predictor. The model was significant (p = .043). Coefficients of the regression model are displayed in Table 16. Consistent with our hypothesis, children's normative understanding was a significant predictor of their level of deception.

Predictors of Preschoolers' Level of Deception

Finally, to examine whether age, gender, and norm sensitivity uniquely predicted preschoolers' level of deception, an ordinal logistic regression was conducted with children's level of deception as the dependent variable, and age, gender and normativity score as predictors. The model was significant (p = .005). Coefficients of the ordinal regression model are displayed in Table 17. Gender and normativity were uniquely predictive of level of deception in the final model, while age was not a significant predictor of level of deception.

Discussion

The current paper examined preschoolers' spontaneous verbal and nonverbal deception in relation to their early mental state understanding, inhibitory control skill, and norm sensitivity. To the best of our knowledge, none of the existing literature studied

early deception in light of both verbal and nonverbal deceptive responses to a transgression. Prior research on deception in preschoolers focused primarily on verbal deception, with only a few studies exploring nonverbal deception in game-like contexts (Carlson et al., 1998; Chandler et al., 1989; Sodian et al., 1991). Yet, given that early deception has been observed both in the form of verbal and nonverbal deception, it is important to investigate both in a naturalistic situation to unveil the cognitive correlates of deception (Darwin, 1977; Newton et al., 2000). The present study assessed children's emerging deceptive behaviors in relation to their developing social cognitive skills, taking into account both verbal and nonverbal deception as responses to a third-party adult transgression.

Deception in Preschoolers

In the revised temptation resistant paradigm, the majority of children (54 participants; 76.1%) demonstrated deceptive behaviors in an attempt to verbally and nonverbally cover up a transgression conducted by an unfamiliar adult; only 17 out of 71 children (23.9%) did not engage in any kind of deception in response to the transgression. However, out of the 54 children who deceived the researcher, only 18 (25.4%) displayed deceptive behaviors both verbally and nonverbally; the rest of children relied on either only verbal deception (35.2%) or only nonverbal deception (15.5%), thus giving away the truth to the researcher. This shows that children who could verbally lie to the researcher might not be able to cover up the transgression nonverbally, and vice versa. Therefore, a child might rely on either deceptive method before s/he could use both verbal and nonverbal deception concurrently to engage in more advanced concealment of misdeed.

Consistent with prior studies, only a very small portion of lie-tellers could keep their subsequent statements consistent with their initial lie (e.g. Leduc, Williams, Gomez-Garibello, & Talwar, 2016). In the current study, only six (14%) out of the 43 children who denied peeking at the gift maintained verbal leakage when researcher asked the follow-up question "*Can you make a guess what the gift is*?" Among those six children, five (11.6%) could come up with an alternative explanation other than the truth to the question: "*How do you know*?" The small percentage of children who kept verbal leakage control demonstrates that preschool-age children have difficulty keeping track of their temporal behaviors, and that the majority of children are unable to maintain their lies until school-age (Evans & Lee, 2013).

The Effect of Age on Nonverbal Deception

Consistent with our first hypothesis, children's likelihood to nonverbally cover up the third-person transgression increased as a function of age. Although only a few studies have investigated children's ability to nonverbally cover up to deceive another, results from the current study is consistent with findings from Sodian et al. (1991), where 2-3-year-old children deceived significantly less often compared to 4-year-olds in a hide-and-seek board game. While Sodian et al. examined nonverbal deception in a game-like context, the current project investigated children's ability to cover up a transgression nonverbally in a paradigm that mimics real-life circumstances. Therefore, the current finding provides further evidence to the argument that children's ability to nonverbally deceive another increases with age, similar to the age effect found in verbal deception (e.g. Talwar & Lee, 2002).

Social Cognitive Predictors of Deception

Previous studies have shown that children's developing cognitive abilities are important predictors of their propensity to deceive (e.g. Ding et al., 2015; Evans & Lee, 2013; Evans et al., 2013). The present study sought to explore whether social cognitive skills, including mental state understanding, inhibitory control, and norm sensitivity, were essential components of children's deceptive ability when both verbal and nonverbal deception were taken into consideration.

Existing literature documents that developmental milestones that are precursors to ToM understanding are critical to young children's primary stages of false denials (Leduc et al., 2016; Ma et al., 2015). To be specific, knowledge access ToM, as an early level of mental statemen understanding defined by Wellman and Liu's (2004) ToM scale, was found predictive of preschoolers' verbal lie-telling, such that children who passed the knowledge access ToM task were more likely to deny a transgression they previously engaged in. Because nonverbal deception represents another dimension of deception in addition to verbal lie-telling, children's deceptive behaviors became more complex when both verbal and nonverbal deception were considered. Therefore, it was hypothesized that knowledge access ToM was only predictive of children's verbal deception, but not predictive of their level of deception.

The hypothesis that knowledge access ToM was only predictive of children's verbal deception was partially supported. Findings from the current study show that knowledge access ToM was neither predictive of verbal deception, nor predictive of children's level of deception. The results are in contrast to findings from Leduc et al.

(2016), where knowledge access ToM was found to be a significant predictor of 2-3-year-olds' lie-telling behaviors. In Leduc et al. (2016), children participated in the standard temptation resistant paradigm, in which children's verbal denial to their own transgression was measured in relation to the ToM measurements. In the revised temptation resistant paradigm adopted in the present study, children's denial to another person's transgression was measured, instead of their own transgression. Although 60.6% children still denied the transgression, the motivation for covering up the transgression might be different. In addition to the antisocial motivation to avoid blame from the researcher, there could have been a prosocial motivation behind children's deception – children could have deceived the researcher due to a desire to comply to the request of the adult transgressor.

Indeed, existing literature has documented a lack of relation between ToM and other-motivated lies (Moore & Macgillivray,2004; Talwar et al., 2017). Because lying for another can be largely explained by motivational factors and individual variability, it could be the case that cognitive abilities provide limited explanation for preschoolers' engagement in prosocial behaviors. Consistent with this explanation, when Moore and Macgillivray (2004) examined children's false beliefs understanding in relation to altruistic sharing, they found that ToM was no longer predictive of children's prosocial behaviors at 4 ½ years. In the current study, due to the potential prosocial motivation behind the third-party deception, children's deceptive behaviors may not be explained by their understanding of how knowledge was acquired, as measured through the knowledge access ToM task.

We also hypothesized that diverse desires ToM, which emerged precursor to knowledge access ToM, was not predictive of children's level of deception. In our study, the majority of children passed the diverse desires ToM task – only three out of the 71 participants failed the task. The lack of variability among children's performance on the diverse desires ToM task indicates that diverse desires ToM was not a valid predictor of deception as measured by the present paradigm.

Another goal of the present study was to investigate whether children's performance on the Stroop task was predictive of their level of deception. Although previous research has consistently found that inhibitory control played a crucial role in children's propensity to lie, the relations between children's performance on the Stroop task and deception yielded mixed results (Talwar et al., 2017; Talwar & Lee, 2008). This is potentially because the Stroop task captures not only children's ability to inhibit a correct response, but also their ability to verbalize an incorrect answer, therefore it posts more challenges for young children compared to the Wisper task. Because level of deception incorporates both verbal and nonverbal deceptive behaviors, it was hypothesized that the Stroop task, as a more taxing measure of inhibitory control, would be a predictor of level of deception.

However, contrary to our prediction, analysis shows that children's performance on the Stroop task was not predictive of level of deception. One possible explanation is that, the Stroop task captures an array of cognitive abilities beyond the ability to inhibit, such as working memory, which may not be relevant for children to display deceptive behaviors. If this explanation was true, other measures of inhibitory control that capture only the ability to inhibit, such as the Wisper task, would be found predictive of

children's level of deception. Another possible explanation for the lack of relationship between the Stroop task and level of deception is that the motivation behind children's deceptive behaviors in the present study was more complex. As mentioned above in the discussion of knowledge access ToM, children in the deception paradigm may have deceived for either self-serving reason to rid themselves of blame, other-serving reasons to comply to the request of the adult transgressor, or a combination of both. Talwar et al. (2017) found that the Stroop task was only predictive of children's other-motivated lies, but not predictive of their self-motivated deception. Therefore, the complex nature of the deception paradigm in the present study might have been the reason why the Stroop task was not found predictive of children's level of deception.

Lastly, it was hypothesized that children's sensitivity to rules and norms was predictive of their level of deception. The normativity literature has documented preschool-age children demonstrating their emerging understanding of norms and rules by 3 years, and often through protests against the rule violator (e.g. Kenward, 2012; Keupp, Behne, & Rakoczy, 2013; Rakoczy et al., 2009). The current study developed a novel paradigm that resembles the rule games typically used in normativity research with children. In the present study, the researcher and the child engaged in a simple rule game in which the researcher later transgressed the rule, and children's responses to the transgression were analyzed. Consistent with our hypothesis, children's normative understanding was predictive of their level of deception. Specifically, children who showed no reaction to the researcher's rule transgression and children who only stared at the researcher during the transgression displayed deceptive behaviors at a lower level compared to children who verbally protested the transgression. In other words, our results

indicate that children who were more aware of the rules and norms were also more conscious of the consequence of a third-party transgression, and therefore more likely to verbally deny and nonverbally cover up the transgression.

The current study was a first to examine preschool-age children's norm sensitivity as predictor of their early deception. Contrary to the belief that children who are apprehensive of what is expected of them are more likely to be honest, as honesty is an important moral value communicated to children early in development, preschoolers who are more sensitive to the structure of their environment are more likely to use deception to cover up a misdeed. This finding is consistent with evidence in the literature that an environment where harsh punishment is the established norm would foster deception. For example, when Talwar and Lee (2011) compared deceptive behaviors in 3-4 years old children in West Africa, they found that children from a punitive school lied significantly more about their transgression compared to children from a non-punitive school. This shows that when preschool children comprehend corporal punishment as the "norm" to transgression, they are more likely to adopt deception as a way to avoid reprimand. Together with existing literature, the current finding adds support to the argument that the established rules and norms are important moderators of young children's developing deceptive behaviors.

Gender Differences in Deceptive Behaviors

An unexpected effect of gender was found on children's level of deception after age and normative understanding were controlled for, such that boys deceived at a higher level compared to girls. Most studies that investigated preschool-age children's

development of deception failed to reveal gender differences in lie-telling behaviors (e.g. Leduc et al., 2016; Hala et al., 1991). Among one of the few studies that showed gender differences in deceptive behaviors, Bottoms, Goodman, Schwartz-Kenney, and Thomas (2002) found that 3-6 years old girls were more likely to conceal the transgression of a familiar adult compared to boys in free narratives. Because girls were more prone to express shame (Lewis, Alessandri, & Sullivan, 1992) and embarrassment (Lewis, Sullivan, Stanger, & Weiss, 1989), experienced a stronger need for social approval (Huston, 1983), and were more sensitive to social-emotional concerns (Cole, 1986), it is likely that they would cover up another's transgression more compared to boys of the same age.

However, results from the current study demonstrates gender differences in a different direction – that boys were more likely to carry out both verbal and nonverbal deception, thus deceiving at a higher level, compared to girls. A possible explanation of this is that girls were more sensitive to the instruction of the researcher not to look at gift, and therefore were less likely to comply to the request of the adult transgressor, and more likely to reveal the truth to the researcher. The present study was a first to reveal gender differences when investigating both verbal and nonverbal deception in preschool-age children. Therefore, more research is needed to draw conclusion about the potential differential trajectory in the development of deception in boys and girls.

Implications and Future Directions

When taking into account both verbal and nonverbal deception, the rate of deception (76.1%) in the current paradigm is consistent with existing literature on

children's propensity to tell self-motivated antisocial lies (e.g.Talwar & Lee, 2002a; Talwar & Lee, 2008) and prosocial white lies (e.g. Popliger et al., 2001; Talwar & Lee, 2002b; Talwar, Murphy, & Lee, 2007), where the rate of lying in children typically ranged around 70 - 80%. However, the deception displayed by children in the present paradigm cannot be simply categorized as antisocial or prosocial. In the revised temptation resistant paradigm, children were put in a situation where an unknown adult stranger transgressed the rule set up by the researcher. Therefore, for children in our study, the act of denying the transgression could be for self-serving reasons – to avoid being blamed for looking at the gift by the researcher. It could also be for other-serving reasons to cooperate with the adult stranger who explicitly asked children to not tell the researcher about the transgression. Furthermore, children could have deceived for both self-serving and other-serving reasons – that children felt caught in the middle of the transgression and were trying to rid themselves of repercussion as well as to comply to the request of the transgressor.

The present paradigm encompasses a complicity that mimics the real-world situations where children are involuntarily involved in an act of transgression and need to choose between truth-telling that could potentially invite blame to the self or lie-telling that could benefit the true transgressor. To understand children's tendency to cover up for a third party has important legal implications, as children in North America are often called to testify about their alleged abuse by another adult (Talwar, Lee, Bala, & Lindsay, 2004). Most research that examined children's tendency to cover up for another individual has been done with a familiar adult with whom children have important relationship with (e.g. Bottoms et al., 2002). Only a few studies have examined children's

covering up for another adult stranger. For instance, Wilson and Pipe (1989) found that 5-6 years old children were able to conceal an adult magician's mistake when explicitly asked to keep it a secret. However, studies that investigated children's deception for a third-party adult stranger almost exclusively focused on children's "lying by omission" – their failure to voluntarily disclose certain critical information about a transgression (Bok, 1978). Therefore, the revised temptation resistant paradigm adopted in the current study adds to the existing literature by investigating children's active nonverbal cover up and verbal denial of an adult stranger's transgression.

Findings from current study invite further studies to examine the particular kind of rules and norms that, when children showed heightened sensitivity to, would result in more covering up for another adult's transgression. In addition, follow-up studies can further investigate potential gender differences in the development of deception when verbal and nonverbal deception are considered together, and the potential socialization factors that contribute to this difference. If girls and boys were to follow different developmental trajectory when covering up for a third-party deception, different gender-based legal practice would need to be done in court during child eye-witness testimony.

Conclusion

The current study examined 2 ½ to 5 years old preschool children's emerging deception using a revised temptation resistant paradigm when an adult stranger violated the rule set up by the researcher. Children's reaction to verbally and nonverbally deny the transgression were analyzed in relation to their mental state understanding, inhibitory control, and normative understanding. Results from the present study show that,

preschool-age children relied more on nonverbal deception to cover up the third-party transgression as a function of age. Additionally, preschoolers' sensitivity to social norms was found predictive of their level of deception, such that children with more advanced normative understanding were more likely to cover up the transgression both verbally and nonverbally. Moreover, results from the study show a significant effect of gender, such that boys were more likely to deceive at a higher level compared to girls. The present study is the first to investigate verbal and nonverbal deception together, and the results provide novel evidence that children's gender socialization and sensitivity to rules and norms may be important moderators in their development of deception in response to a third-party transgression.

References

Ahern, E. C., Lyon, T. D., & Quas, J. A. (2011). Young children's emerging ability to make false statements. *Developmental Psychology*, *47*(1), 61. doi:10.1037/a0021272

Anderson, J. A. (1984). Regression and ordered categorical variables. *Journal of the Royal Statistical Society. Series B (Methodological)*, *46*(1), 1-30.

Bok, S. (1978). *Lying: Moral choice in public and private life*. New York: Pantheon Books.

Bottoms, B. L., Goodman, G. S., Schwartz-Kenney, B. M., & Thomas, S. N. (2002). Understanding children's use of secrecy in the context of eyewitness reports. *Law and Human Behavior*, *26*(3), 285.

Carlson, S. M. (2005). Developmentally sensitive measures of executive function in preschool children. *Developmental Neuropsychology*, *28*(2), 595-616. doi:10.1207/s15326942dn2802_3

Carlson, S. M., Mandell, D. J., & Williams, L. (2004). Executive function and theory of mind: stability and prediction from ages 2 to 3. *Developmental Psychology*, *40*(6), 1105. doi:10.1037/0012-1649.40.6.1105

Carlson, S. M., Moses, L. J., & Hix, H. R. (1998). The role of inhibitory processes in young children's difficulties with deception and false belief. *Child Development*, *69*(3), 672-691.

Chandler, M., Fritz, A. S., & Hala, S. (1989). Small-scale deceit: Deception as a marker of two-, three-, and four-year-olds' early theories of mind. *Child Development, 60* (6), 1263-1277. doi:10.2307/1130919

Cole, P. M. (1986). Children's spontaneous control of facial expression. *Child Development*, *57*, 1309–1321.

Darwin, C. (1877). A biographical sketch of an infant. *Mind, 7,* 285-293. doi:10.1093/mind/os-2.7.285.

Ding, X. P., Wellman, H. M., Wang, Y., Fu, G., & Lee, K. (2015). Theory-of-mind training causes honest young children to lie. *Psychological Science, 26*(11), 1812-1821. doi:10.1177/0956797615604628

Dunn, J., & Munn, P. (1985). Becoming a family member: Family conflict and the development of social understanding in the second year. *Child Development*, 480-492.

Evans, A. D., & Lee, K. (2013). Emergence of lying in very young children. *Developmental Psychology*, *49*(10), 1958-1963. doi:10.1037/a0031409

Evans, A. D., Xu, F., & Lee, K. (2011). When all signs point to you: Lies told in the face of evidence. *Developmental Psychology*, *47*(1), 39-49. doi:10.1037/a0020787

Fenson, L., Pethick, S., Renda, C., Cox, J. L., Dale, P. S., & Reznick, J. S. (2000). Short-form versions of the MacArthur communicative development inventories. *Applied Psycholinguistics*, *21*(1), 95-116.

Fu, G., Heyman, G. D., Qian, M., Guo, T., & Lee, K. (2016). Young children with a positive reputation to maintain are less likely to cheat. *Developmental Science*, *19*(2), 275-283. doi:10.1111/desc.12304

Hala, S., Chandler, M., & Fritz, A. S. (1991). Fledgling theories of mind: Deception as a marker of three-year-olds' understanding of false belief. *Child Development*, *62*(1), 83-97. doi:10.2307/1130706

Huston, A. C. (1983). Sex typing. In P. H. Mussen (Series Ed.) & E. M. Hetherington (Vol. Ed.), Handbook of child psychology: Vol. 4. Socialization, personality, and social development (4th ed., pp. 387–468). New York: Wiley.

Ingram, G. P., & Bering, J. M. (2010). Children's tattling: The reporting of everyday norm violations in preschool settings. *Child Development*, *81*(3), 945-957. doi:10.1111/j.1467-8624.2010.01444.x

Kenward, B. (2012). Over-imitating preschoolers believe unnecessary actions are normative and enforce their performance by a third party. *Journal of Experimental Child Psychology*, *112*(2), 195-207.

Kenward, B., Karlsson, M., & Persson, J. (2011). Over-imitation is better explained by norm learning than by distorted causal learning. *Proceedings of the Royal Society of London B: Biological Sciences*, *278*, 1239-1246. doi:10.1098/rspb.2010.1399

Keupp, S., Behne, T., & Rakoczy, H. (2013). Why do children overimitate? Normativity is crucial. *Journal of Experimental Child Psychology*, *116*(2), 392-406. doi:10.1016/j.jecp.2013.07.002

Lavoie, J., Leduc, K., Arruda, C., Crossman, A. M., & Talwar, V. (2017). Developmental profiles of children's spontaneous lie-telling behavior. *Cognitive Development*, *41*, 33-45. doi:10.1016/j.cogdev.2016.12.002

Leduc, K., Williams, S., Gomez-Garibello, C., & Talwar, V. (2016). The contributions of mental state understanding and executive functioning to preschool-aged children's lie-telling. *British Journal of Developmental Psychology*. doi:10.1111/bjdp.12163

Lewis, M., Alessandri, S. M., & Sullivan, M. W. (1992). Differences in shame and pride as a function of children's gender and task difficulty. *Child Development*, *63*(3), 630-638.

Lewis, M., Stanger, C., & Sullivan, M. W. (1989). Deception in 3-year-olds. *Developmental Psychology*, *25*(3), 439-443. doi:10.1037/0012-1649.25.3.439.

Lewis, M., Sullivan, M. W., Stanger, C., & Weiss, M. (1989). Self development and self-conscious emotions. *Child Development*, 146-156.

Ma, F., Evans, A. D., Liu, Y., Luo, X., & Xu, F. (2015). To lie or not to lie? The influence of parenting and theory-of-mind understanding on three-year-old children's honesty. *Journal of Moral Education*, *44*(2), 198-212. doi:10.1080/03057240.2015.1023182

Mascaro, O., & Sperber, D. (2009). The moral, epistemic, and mindreading components of children's vigilance towards deception. *Cognition*, *112*(3), 367-380. doi:10.1016/j.cognition.2009.05.012

McCullagh, P. (1980). Regression models for ordinal data. *Journal of the Royal Statistical Society. Series B (Methodological)*, *42*(2), 109-142.

Moore, C., & Macgillivray, S. (2004). Altruism, prudence, and theory of mind in preschoolers. *New Directions for Child and Adolescent Development*, *2004*(103), 51-62.

Nagel, T. (1978). *The possibility of altruism*. Princeton, NJ: Princeton University Press.

Newton, P., Reddy, V., & Bull, R. (2000). Children's everyday deception and performance on false-belief tasks. *British Journal of Developmental Psychology*, *18*(2), 297-317. doi:10.1348/026151000165706

Peskin, J. (1992). Ruse and representations: On children's ability to conceal information. *Developmental Psychology, 28*(1), 84-89. doi:10.1037/0012-1649.28.1.84

Piaget, J. (1932). *The Moral Judgement of the Child*. New York, NY: The Free Press.

Pillow, B. H. (1989). Early understanding of perception as a source of knowledge. *Journal of Experimental Child Psychology*, *47*(1), 116-129. doi:10.1016/0022-0965(89)90066-0

Pipe, M. E., & Wilson, J. C. (1994). Cues and secrets: Influences on children's event reports. *Developmental Psychology*, *30*(4), 515. doi:10.1037/0012-1649.30.4.515

Polak, A., & Harris, P. L. (1999). Deception by young children following noncompliance. *Developmental Psychology, 35*(2), 561-568. doi:10.1037/0012-1649.35.2.561

Popliger, M., Talwar, V., & Crossman, A. (2011). Predictors of children's prosocial lie-telling: Motivation, socialization variables, and moral understanding. *Journal of Experimental Child Psychology*, *110*(3), 373-392. doi:10.1016/j.jecp.2011.05.003

Pratt, C., & Bryant, P. (1990). Young children understand that looking leads to knowing (so long as they are looking into a single barrel). *Child Development*, *61*(4), 973-982. doi:10.2307/1130869

Rakoczy, H. (2008). Taking fiction seriously: Young children understand the normative structure of joint pretence games. *Developmental Psychology*, *44*(4), 1195-1201. doi:10.1037/0012-1649.44.4.1195

Rakoczy, H., Brosche, N., Warneken, F., & Tomasello, M. (2009). Young children's understanding of the context-relativity of normative rules in conventional games. *British Journal of Developmental Psychology*, *27*(2), 445-456. doi: 10.1348/026151008X337752

Rakoczy, H., & Schmidt, M. F. (2013). The early ontogeny of social norms. *Child Development Perspectives*, *7*(1), 17-21. doi:10.1111/cdep.12010

Rakoczy, H., Warneken, F., & Tomasello, M. (2008). The sources of normativity: Young children's awareness of the normative structure of games. *Developmental Psychology*, *44*(3), 875-881. doi:10.1037/0012-1649.44.3.875

Rakoczy, H., Warneken, F., & Tomasello, M. (2009). Young children's selective learning of rule games from reliable and unreliable models. *Cognitive Development*, *24*(1), 61-69. doi:10.1016/j.cogdev.2008.07.004

Repacholi, B. M., & Gopnik, A. (1997). Early reasoning about desires: Evidence from 14-and 18-month-olds. *Developmental Psychology*, *33*(1), 12. doi:10.1037/0012-1649.33.1.12

Rossano, F., Rakoczy, H., & Tomasello, M. (2011). Young children's understanding of violations of property rights. *Cognition*, *121*(2), 219-227. doi:10.1016/j.cognition.2011.06.007

Ross, H. S., & den Bak-Lammers, I. M. (1998). Consistency and change in children's tattling on their siblings: Children's perspectives on the moral rules and procedures of family life. *Social Development*, *7*(3), 275-300. doi:10.1111/1467-9507.00068

Schmidt, M. F., Rakoczy, H., & Tomasello, M. (2011). Young children attribute normativity to novel actions without pedagogy or normative language. *Developmental Science*, *14*(3), 530-539.

Schmidt, M. F., & Tomasello, M. (2012). Young children enforce social norms. *Current Directions in Psychological Science*, *21*(4), 232-236. doi:10.1177/0963721412448659

Scott, S. C., Goldberg, M. S., & Mayo, N. E. (1997). Statistical assessment of ordinal outcomes in comparative studies. *Journal of Clinical Epidemiology*, *50*(1), 45-55.

Sodian, B., Taylor, C., Harris, P. L., & Perner, J. (1991). Early deception and the child's theory of mind: False trails and genuine markers. *Child Development*, 468-483. doi:10.1111/j.1467-8624.1991.tb01545.x

Talwar, V., & Crossman, A. (2011). From little white lies to filthy liars: The evolution of honesty and deception in young children. *Advances in Child Development and Behavior*, *40*, 139-179. doi:10.1016/B978-0-12-386491-8.00004-9

Talwar, V., Crossman, A., & Wyman, J. (2017). The role of executive functioning and theory of mind in children's lies for another and for themselves. *Early Childhood Research Quarterly*, *41*, 126-135. doi:10.1016/j.ecresq.2017.07.003

Talwar, V., Gordon, H. M., & Lee, K. (2007). Lying in the elementary school years: Verbal deception and its relation to second-order belief understanding. *Developmental Psychology*, *43*(3), 804-810. doi:10.1037/0012-1649.43.3.804

Talwar, V., & Lee, K. (2002). Development of lying to conceal a transgression: Children's control of expressive behavior during verbal deception. *International Journal of Behavioral Development*, *26*(5), 436-444. doi:10.1080/01650250143000373

Talwar, V., & Lee, K. (2008). Social and cognitive correlates of children's lying behavior. *Child Development*, *79*(4), 866-881. doi:10.1111/j.1467-8624.2008.01164.x

Talwar, V., & Lee, K. (2011). A punitive environment fosters children's dishonesty: A natural experiment. *Child Development*, *82*(6), 1751-1758.

Talwar, V., Lee, K., Bala, N., & Lindsay, R. C. L. (2002). Children's conceptual knowledge of lying and its relation to their actual behaviors: Implications for court competence examinations. *Law and Human Behavior*, *26*(4), 395-415. doi:10.1023/A:1016379104959

Talwar, V., Lee, K., Bala, N., & Lindsay, R. C. L. (2004). Children's lie-telling to conceal a parent's transgression: Legal implications. *Law and Human Behavior*, *28*(4), 411. doi:10.1023/B:LAHU.0000039333.51399.f6

Talwar, V., Murphy, S. M., & Lee, K. (2007). White lie-telling in children for politeness purposes. *International Journal of Behavioral Development*, *31*(1), 1-11. doi:10.1177/0165025406073530

Tomasello, M., & Rakoczy, H. (2003). What makes human cognition unique? From individual to shared to collective intentionality. *Mind & Language*, *18*(2), 121-147. doi:10.1111/1468-0017.00217

Wellman, H. M., & Liu, D. (2004). Scaling of theory-of-mind tasks. *Child Development*, *75*(2), 523-541. doi:10.1111/j.1467-8624.2004.00691.x

Williams, S., Moore, K., Crossman, A. M., & Talwar, V. (2016). The role of executive functions and theory of mind in children's prosocial lie-telling. *Journal of Experimental Child Psychology*, *141*, 256-266. doi:10.1016/j.jecp.2015.08.001

Williams, S., Leduc, K., Crossman, A., & Talwar, V. (2016). Young deceivers: Executive functioning and antisocial lie-telling in preschool aged children. *Infant and Child Development, 26*(1). doi: 10.1002/icd.1956

Wilson, A. E., Smith, M. D., & Ross, H. S. (2003). The nature and effects of young children's lies. *Social Development*, *12*(1), 21-45. doi:10.1111/1467-9507.00220

Wilson, J. C., & Pipe, M. E. (1989). The Effects of Cues on Young Children's Recall of Real Events. *New Zealand Journal of Psychology*, *18*, 65-70.

Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition*, *13*(1), 103-128. doi:10.1016/0010-0277(83)90004-5

Table 1

Contingency Table for Gender and Social Cognitive Measures

	Diverse Desires ToM		Knowledge Access ToM		Inhibitory Control		Normativity			
	Pass	Fail	Pass	Fail	Pass	Fail	No Reaction	Stare	Imitation	Protest
Male	31	2	16	17	16	17	8	5	11	9
Female	37	1	19	19	15	23	14	7	9	8
Total	68	3	35	36	31	40	22	12	20	17
Chi-Square Sig.	.474		.899		.445		.596			

Table 2

Contingency Table for Gender and Level of Deception

	No Deception	Either Verbal or Nonverbal Deception	Both Verbal and Nonverbal Deception
Male	4	16	13
Female	13	20	5
Total	17	36	18

Note: Result from chi-square analysis was significant, $p = .015$.

Table 3
Age as a Predictor of Social Cognitive Measures

	Unstandardized B	*Odds Ratio*	*S.E.*	*Sig.*
Diverse Desires ToM				
Age	.047	1.05	.077	.538
Knowledge Access ToM				
Age	.104	1.11	.035	.003
Inhibitory Control				
Age	.163	1.18	.042	.000

Table 4

Age as a Predictor of Normativity

	Unstandardized B	*Odds Ratio*	*S.E.*	*Sig.*
No Reaction	-.088	.915	.044	.045
Prolonged Stare	-.053	.949	.050	.286
Imitation	-.027	.973	.043	.527
Protest	——			

Note: Multinomial logistic regression compares each category to the last category. In this case, "Protest" is the reference category. The model was not significant, $p = .189$.

Table 5

Contingency Table for Diverse Desires ToM and Knowledge Access ToM

		Knowledge Access ToM (%)		
		Pass	Fail	Total
Diverse Desires ToM (%)	Pass	34 (47.9%)	34 (47.9%)	68 (95.8%)
	Fail	1 (1.4%)	2 (2.8%)	3 (4.2%)
	Total	35 (49.3%)	36 (50.7%)	71 (100%)

Note: Result from chi-square analysis was not significant, $p = .572$.

Table 6

Contingency Table for Diverse Desires ToM and Inhibitory Control

		Inhibitory Control (%)		
		Pass	Fail	Total
Diverse Desires ToM (%)	Pass	30 (42.3%)	38 (53.5%)	68 (95.8%)
	Fail	1 (1.4%)	2 (2.8%)	3 (4.2%)
	Total	31 (43.7%)	40 (56.3%)	71 (100%)

Note: Result from chi-square analysis was not significant, $p = .712$.

Table 7

Contingency Table for Diverse Desires ToM and Normativity

		Normativity (%)				
		No Reaction	Stare	Imitation	Protest	Total
Diverse Desires ToM (%)	Pass	21(29.6%)	10 (14.1%)	20 (28.2%)	17 (23.9%)	68 (95.8%)
	Fail	1 (1.4%)	2 (2.8%)	0 (0%)	0 (0%)	3 (4.2%)
	Total	22 (31.0%)	12 (16.9%)	20 (28.2%)	17(23.9%)	71 (100%)

Note: Result from chi-square analysis was not significant, $p = .101$.

Table 8

Contingency Table for Knowledge Access ToM and Inhibitory Control

		Inhibitory Control (%)		
		Pass	Fail	Total
Knowledge Access ToM (%)	Pass	23 (32.4%)	12 (16.9%)	35 (49.3%)
	Fail	8 (11.3%)	28 (39.4%)	36 (50.7%)
	Total	31 (43.7%)	40 (56.3%)	71 (100%)

Note: Result from chi-square analysis was significant, $p = .000$.

Table 9

Contingency Table for Knowledge Access ToM and Normativity

		Normativity (%)				
		No Reaction	Stare	Imitation	Protest	Total
Knowledge Access ToM (%)	Pass	8 (11.3%)	7 (9.9%)	9 (12.7%)	11 (15.5%)	35 (49.3%)
	Fail	14 (19.7%)	5 (7.0%)	11 (15.5%)	6 (8.5%)	36 (50.7%)
	Total	22 (31.0%)	12 (16.9%)	20 (28.2%)	17(23.9%)	71 (100%)

Note: Result from chi-square analysis was not significant, $p = .305$.

Table 10

Contingency Table for Inhibitory Control and Normativity

		Normativity (%)				
		No Reaction	Stare	Imitation	Protest	Total
Inhibitory Control (%)	Pass	7 (9.9%)	5 (7.0%)	7 (9.9%)	12 (16.9%)	31 (43.7%)
	Fail	15 (21.1%)	7 (9.9%)	13 (18.3%)	5 (7.0%)	40 (56.3%)
	Total	22 (31.0%)	12 (16.9%)	20 (28.2%)	17(23.9%)	71 (100%)

Note: Result from chi-square analysis was not significant, $p = .075$.

Table 11

Age as a Predictor of Children's Nonverbal Deception

	Unstandardized B	S.E.	Wald	Sig.	95% CI
Age	.065	.033	3.99	.046	[1.00, 1.14]
Constant	-3.42	1.56	4.82	.028	

Note: The model was significant, $p = .046$.

Table 12

Knowledge Access ToM as a Predictor of Children's Verbal Deception

	Unstandardized B	S.E.	Wald	Sig.	95% CI
Knowledge Access ToM	.669	.494	1.83	.176	[741, 5.14]
Constant	.111	.334	.111	.739	

Note: The model was not significant, $p = .172$.

Table 13

Knowledge Access ToM as a Predictor of Children's Level of Deception

	Estimate	S.E.	Wald	Sig.	95% CI
Knowledge Access ToM	-.534	.454	1.38	.240	[-1.43, .356]

Note: The model was not significant, $p = .238$.

Table 14

Diverse Desires ToM as a Predictor of Children's Level of Deception

	Estimate	S.E.	Wald	Sig.	95% CI
Diverse Desires ToM	-1.37	1.16	1.41	.236	[-3.64, .896]

Note: The model was not significant, $p = .301$.

Table 15

Inhibitory Control as a Predictor of Children's Level of Deception

	Estimate	S.E.	Wald	Sig.	95% CI
Inhibitory Control	-.558	.458	1.48	.223	[-1.46, .340]

Note: The model was not significant, $p = .221$.

Table 16

Normativity as a Predictor of Children's Level of Deception

		Estimate	*S.E.*	*Wald*	*Sig.*	*95% CI*
Normativity	No reaction	-1.60	.649	6.05	.014	[-2.87, -.324]
	Stare	-1.73	.752	5.31	.021	[-3.21, -.259]
	Imitation	-.776	.639	1.48	.224	[-2.03, -.476]
	Protest	———				

Note: The model was significant, $p = .043$. The first three levels of Normativity (i.e. No reaction, Stare and Imitation) was compared to the fourth level (i.e. Protest) in the regression model.

Table 17

Age, Normativity and Gender as Predictors of Deception

		Estimate	S.E.	Wald	Sig.	95% CI
Age		.029	.031	.869	.351	[-.032, .089]
Normativity	No reaction	-1.32	.673	3.86	.050	[-2.64, -.003]
	Stare	-1.68	.772	4.75	.029	[-3.20, -.169]
	Imitation	-.924	.658	1.98	.160	[-2.21, .365]
	Protest					
Gender	Male	1.33	.504	6.97	.008	[.342, 2.32]
	Female					

Note: The model is significant, $p = .005$. The first three levels of Normativity (i.e. No reaction, Stare and Imitation) is compared to the fourth level (i.e. Protest) in the regression model.