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Epistemic Vigilance in Early Ontogeny: Children's Use of Nonverbal Behavior to Detect Deception

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Abstract

This study examines the development of children's ability to modulate their trust in verbal testimony as a function of nonverbal behavior. Participants included 83 children (26 four-year-olds, 29 five-year-olds, and 28 six-year-olds) that were tasked with locating a toy hidden in one of two boxes. Before deciding the location, participants watched a video of an adult providing verbal and nonverbal cues about the location of the toy. We hypothesized that older children would display epistemic vigilance, trusting nonverbal information over verbal information when the two conflict. Consistent with our expectations, when sources were consistent, all children trusted the verbal testimony. By contrast, and as predicted, when they were inconsistent, only 6-year-olds distrusted verbal testimony and favored nonverbal cues; 4- and 5-year-olds continued to trust verbal testimony. Thus, 6-year-old children demonstrate an ability to modulate their trust in verbal testimony as a function of nonverbal information. Younger children's inability to do this is not due to their being unaware of non-verbal behavior; indeed, when nonverbal information was offered exclusively, children of all ages used it to find the object.

Keywords

social cognition, epistemic vigilance, detecting deception, nonverbal communication, theory of mind, executive function, social learning

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Developmental psychologists have noted that "there is a profound limit to the role that first-hand experience can play in cognitive development . . . testimony of other people is likely to be just as important" (Harris, 2012, p. 2). We agree with the centrality of testimony, and here we explore a key corollary: the importance of being able to use relevant cues to modulate one's trust in the testimony of others.

An important consequence of communicative exchanges between individuals is the potential for deception and misinformation. Speakers' interests often diverge and are rarely perfectly aligned. In other words, there is typically some non-zero chance of being deceived or manipulated. If this was also true during human evolution, these selection pressures would have driven the evolution of protective mechanisms to defend against such deception (e.g., Al-Shawaf et al., 2015). The evolutionary advantages that result from our ability to learn from others can only exist in tandem with the coevolution of mechanisms that protect against deception and misinformation. According to this logic, it is possible that even young children are equipped with such defenses. Drawing from empirical evidence of children's selective trust, we argue that children do indeed possess such protective mechanisms. However, existing studies focus primarily on children's ability to judiciously learn from some informants over others. There remains a gap in our understanding of children's ability to detect cues that indicate a bad source of information. The aim of the current research is to

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expand our understanding of children's ability to practice epistemic vigilance against misinformation when different sources conflict. In this study, our focus is on the conflict between verbal and nonverbal behavior in children's decisions of trust.

Epistemic Vigilance

The process of cumulative cultural evolution benefits hugely from the capacity for communication, whereby members of a species purposefully relay useful information to other members who, in turn, comprehend the communicated content. The veracity of the information transmitted from one person to another depends on at least two factors: a) the communicator's ability or competence as a source of information and b) the communicator's intentions in the exchange (Knapp, 2008). Indeed, communicators have differing chances of successfully transmitting relevant and reliable information, and this depends in part on their level of competence and their intentions.

Communication of this sort—defined in terms of competency and intention to affect a listener in some way—can be understood by drawing an analogy to animal signaling behavior. Krebs and Dawkins (1984) understand animal signaling as adaptations that enable organisms to influence the behavior of others. Traditional examples of animal signals include mating songs, territorial songs, and chemical messages that signal ovulation; these all share in common the function of causing some reaction in another organism—sometimes a conspecific and sometimes an organism from a different species (Tinbergen, 1952). Communication, then, resembles the more generalized animal capacity for influencing other animals, and can be viewed as a type of signaling behavior that allows speakers to influence listeners in some desired way. Furthermore, human communication, in order to confer these advantages, may sometimes be manipulative.

According to Krebs and Dawkins (1984), manipulative communication drives the co-evolution of mechanisms that protect against manipulation. The risk of exploitation creates a selection pressure that favors those who are able to avoid manipulation and exploitation. Over time, individuals who are better at avoiding this threat are more likely to survive and reproduce. This reciprocal relationship between the benefit of exploitative behaviors and the benefit of protective mechanisms creates a "coevolutionary arms race" (Krebs & Dawkins, 1984) in which mechanisms of deception and counter-deception become increasingly sophisticated over time.

This is arguably what we see in the human repertoire of social interaction. Our complex brains are so well attuned to the threatening factors of our environment, including the threat of being used for the benefit of another agent, that we have likely evolved protective mechanisms against exploitation (Al-Shawaf et al., 2015; Buss & Duntley, 2008). Communication presents exactly this dynamic. Because communication comes with the threat of being accidentally or intentionally misinformed, this threat should create a selection pressure that favors protective mechanisms against being misinformed. Stated differently, the risks inherent in communication prompt the development of mechanisms that modulate trust in others – humans practice *epistemic vigilance*, a process of attending to cues that index the likelihood of being misinformed by others (Sperber et al., 2010).

Practicing epistemic vigilance protects us from forming false beliefs based on what other people tell us. It involves a) taking a critical stance toward the information we receive and b) paying special attention to cues that suggest deception or misinformation (see also Mills, 2012). For children, who acquire much of their knowledge through the testimony of other people, epistemic vigilance is immensely useful. Vigilance helps children detect inferior sources of information (e.g., speakers who lack relevant knowledge) as well as deceptive sources of information (e.g., someone who is intentionally misleading). Because such deception can be harmful to the interests of the deceived, detecting deceptive behavior is a primary goal of epistemic vigilance. Ample research has demonstrated children's ability to preferentially trust some speakers over others (Birch et al., 2008; Corriveau & Harris, 2009a, 2009b; Fusaro et al., 2011; Harris et al., 2018; Jaswal & Neely, 2006; Koenig & Harris, 2005; Sobel & Macris, 2013). By contrast, empirical work specifically examining children's vigilance toward misleading or deceptive others is limited.

Children's Selective Trust

Research indicates that a range of speaker attributes affect children's selective trust. These include perceived speaker age, moral characteristics, familiarity, previous accuracy, and expertise. **C**hildren as young as 4 years understand that, on average, adults know more than children (Taylor et al., 1991), and usually prefer to learn from adults over children (Jaswal & Neely, 2006; VanderBorght & Jaswal, 2009). Young children also use information about speakers' personalities in judging their trustworthiness, including benevolence (Mascaro & Sperber, 2009) and past moral actions (Doebel & Koenig, 2013). Children also preferentially trust familiar speakers over strangers (Corriveau & Harris, 2009). Importantly, by 4 years, children become adept not only at recognizing inaccurate informants, but at judiciously preferring to learn from those who have a history of accuracy (Clément et al., 2004; Corriveau & Harris, 2009; Koenig & Harris, 2005a). Four-year-olds can also correctly identify the domains of knowledge with which different experts are associated and, by age 5, recognize that some areas of expertise are more closely related than others (Aguiar et al., 2012; Bergstrom et al., 2006). Furthermore, Koenig and Jaswal (2011) found that preschool-age children understand that experts are more likely to know about facts within their domain than are non-experts (see also Nurmsoo & Robinson, 2009). Taken together, these studies demonstrate that children use heuristics that guide them to preferentially trust some informants over others. There is a paucity of work, however, on a) the extent to which children can detect cues of a potentially deceptive or misleading speaker and b) what cues they might use to spontaneously identify misleading information.

Children's Understanding of Deception

Developmental research on deception has been dominated by studies focused on children's developing concepts of lying and deception (Bussey, 1992, 1999; Lee et al., 2001; Strichartz & Burton, 1990; Talwar & Lee, 2002) and children's ability to produce lies (Lewis et al., 1989; Polak & Harris, 1999; Popliger et al., 2011; Talwar & Lee, 2002, 2008; Talwar et al., 2007). Some evidence shows that 5-year-olds are able to cite some reliable differences between lying and other false statements (Taylor et al., 2003). For example, they drew a moral distinction between lying and pretense, stating that lying is bad and pretending is good.

Even by 2 years, children produce statements they know to be false. In their study, Evans and Lee (2013) found that 40% of children between 2 and 3 years of age lied to an experimenter about having peeked at a toy in her absence. Children also appear to understand the utility of a pro-social lie. In a study by Talwar et al. (2007), children between 3 and 11 years were asked to provide feedback about an "undesirable gift" which they had received. Researchers found that 68% of children in their study lied about liking the gift they received.

According to the evolutionary reasoning presented above, as children's lying behavior becomes more sophisticated and their conceptual understanding more mature, we should expect these behaviors to be accompanied by an emerging ability to detect deception and to show epistemic vigilance when speakers provide conflicting information. However, studies that investigate children's epistemic vigilance toward speakers that may be lying are rare.

Children's Ability to Detect Deception

Plausibility. In a series of studies by Lee et al. (2002), children between 3 and 6 years of age heard a young girl testify to her mother that a ghost was responsible for breaking a glass of liquid. Children younger than 5 years of age believed the girl's statements, and only the older age groups consistently disbelieved what she said. This provides some evidence that children can discriminate truth from falsity, specifically through cues of plausibility.

Nonverbal leakage. Nonverbal cues may be important indicators of deception. Knapp (2008) argues that listeners use information about *how* a statement is made to judge the veracity of the statement. Speaking indirectly or circuitously, for example, can signal deceptive intent. In addition to indirect or circuitous speech, nonverbal leakage—instances in which a speaker's nonverbal behavior is inconsistent with the intended message—may also indicate deceptive behavior. Nonverbal leakage occurs when a speaker is unable to behave consistently with the intended (false) message or is unable to inhibit behaviors consistent with the (concealed) truth (Knapp, 2008). Thus, listeners may be able to detect manipulative communicators by attending to their nonverbal leakage.

The role of nonverbal behavior in children's epistemic vigilance toward possible deception has received limited attention. One study by Rotenberg et al. (1989) appears to show that children's understanding of the relevance of verbal-facial inconsistency is late-developing. However, this conclusion may have been affected by methodological peculiarities of the study. In their study, preschool, second, and fourth grade students heard an adult declare either a positive, neutral, or negative statement coupled with either a positive, neutral, or negative facial expression. For example, a consistent speaker smiled while declaring that she liked a particular shirt, whereas an inconsistent speaker frowned while declaring that she liked a particular shirt. The participants were asked to judge whether the speakers were lying, telling the truth, or unsure. Results showed that preschoolers performed poorly and did not use inconsistency as a cue to lying. This ability increased with age, such that second and fourth graders attributed truth more often to consistent speakers than to inconsistent speakers.

These results are open to interpretation. Although they seem to suggest that young children fail to use inconsistency as a cue to lying, the procedure used in this study required that children verbally accuse an adult of lying—something the younger children might have been hesitant to do. To address this, it would be advisable to use a behavioral, non-confrontational method of assessing children's trust in the speaker. One of the goals of the current study is to address this methodological limitation.

Similarly, of the published studies that have examined children's ability to use cues to infer that someone might be lying to them, most do not investigate children's *spontaneous* use of epistemic vigilance against misleading informants. Indeed, most existing studies *explicitly label or highlight the informant's intention to deceive or be tricky* (e.g., Couillard & Woodward, 1999; Heyman et al., 2013; Jaswal et al., 2010; Mascaro & Sperber, 2009). Other studies in this area present evidence of children's ability to protect against deceptive information after multiple exposures with the same speaker, which gives children a chance to learn over time that a particular informant has a history of deception (e.g., Jaswal et al., 2010). Such studies contribute to our understanding of how young children can come to practice epistemic vigilance against bad sources of information, but do not offer evidence of how children may engage in this important process spontaneously and without the help of explicit labeling or multi-trial learning.

The last few decades of research have made it clear that children are equipped with mechanisms that guide whom they trust and from whom they prefer to learn. Nevertheless, there remains a large gap in our knowledge about how children protect themselves against potentially deceptive speakers—when these defensive mechanisms develop, what cues they are based on, and how successful they are. This study aims to begin filling this gap by examining the development of children's spontaneous ability to use nonverbal behavior to modulate trust in verbal testimony.

Rather than asking children to explicitly attribute lying to an adult speaker, we asked our participants to make a behavioral decision to trust or distrust an adult's verbal testimony. Based on evolutionary reasoning, we hypothesized that children would show epistemic vigilance when verbal and non-verbal testimony conflict. Based on the existing developmental literature, we expected that this ability would be more pronounced in older

children and weaker or non-existent in younger children. Our specific predictions were that 1) all children would trust adult testimony in the case of consistent verbal and nonverbal information, and 2) when verbal and nonverbal information are *not* consistent, only older children will choose to ignore the verbal testimony in favor of nonverbal behavioral cues because nonverbal behaviors are less easily manipulated and therefore more likely to reveal the speaker's true beliefs and intentions.

Method

Participants

In this study, 26 typically developing 4-year-olds ($M = 4.3$ years, range = 4.03–4.74, 13 female), 29 five-year-olds ($M = 5.5$, range = 5.01–5.96, 17 female), and 28 six-year-olds ($M = 6.6$, range = 6.08–7.05, 10 female) were recruited to participate. The study was conducted by the lead author and a team of research assistants in the Children's Research Lab at a major southwestern university. These ages were chosen based on previous research which strongly suggests that the interval between 4 and 6 years is associated with dramatic improvements in children's selective trust (e.g., Koenig & Jaswal, 2011; Pasquini et al., 2007). Sample sizes were also determined using previous research (e.g., Koenig & Jaswal, 2011; Pasquini et al., 2007).

Materials

Testimony videos. We created four types of videos for this study. All children received two familiarization videos and then three trials of each type of video for a total of 14 videos. In all videos, an adult was shown sitting behind a table, facing the camera with a clear, full frontal view of his or her face, arms, and upper body. Two different colored boxes of equal size and shape were shown resting on the table in front of the adult. The position of the boxes was randomized in order to prevent response patterns based on the color or position of the boxes. To minimize any unintended effects of speaker, no two videos had the same speaker and all actors were asked to wear a solid grey t-shirt provided by the researchers. Of the 12 testimony videos, five were filmed with male actors.

During the verbal testimony videos, the adult opened each box in sequence and looked inside, keeping a neutral expression. After looking into both boxes, the adult looked up at the camera and said, "you should look in the (color) box," verbally suggesting one of the two boxes. In the nonverbal testimony videos, the adult opened each box, in sequence, and looked inside. The adult looked into one of the boxes with a neutral expression but reacted excitedly upon looking into the other box. This nonverbal expression of excitement was achieved through a gasp, a smile, and raised eyebrows, and was meant to indicate that the contents of the box were interesting and highly desirable. In the consistent testimony videos, the adult expressed excitement nonverbally toward the contents of one box and verbally suggested that the object was in that same box. During the inconsistent videos, the adult expressed excitement nonverbally toward one of the boxes but verbally suggested that the object was in another.

Theory of mind measures. Children who understand that people have different beliefs or that a person can appear to feel one way but actually feel a different way might be better equipped to understand deception and detect it than are children who lack this level of social cognition (Mills, 2012). To examine this empirically, children completed a battery of tasks designed to assess their level of mental state understanding. The battery was adapted from Wellman and Liu (2004) and assesses five concepts central to theory of mind understanding, following a Guttman scaling method with increasing difficulty. The Guttman-scaled theory of mind battery measures five concepts, listed here in order of increasing difficulty: divergent desires, divergent beliefs, knowledge access, contents false beliefs, and real vs. apparent emotion.

Executive function measures. If children have a bias to trust what they are told, then they may require some degree of executive functioning to overcome this bias when conflicting nonverbal testimony is present (Evans & Lee, 2013; Jaswal et al., 2014; Mills, 2012). To measure the role of executive function in children's performance in the testimony videos, participants completed three validated and widely used tasks as a measure of three focal executive functions—inhibitory control, working memory, and mental flexibility. Children completed the Day vs. Night task for inhibitory control (Carlson & Moses, 2001), the backward digit span for working memory (Davis & Pratt, 1996), and the dimensional change card sorting task for mental flexibility (Diamond et al., 2005).

Procedure

Children watched a set of videos showing an adult sitting behind two boxes, and were told that only one box has a toy inside it. At the start of the task, the experimenter explained that after watching each video, participants would decide where they thought the toy was located.

Familiarization phase. To ensure that children understood the task, all participants first viewed two familiarization videos. Both trials featured a female speaker providing only verbal testimony about the location of the box. After opening and looking into both boxes, the speaker verbally indicated which box the child should look in. After each familiarization video, children were asked to indicate which of the two boxes they thought had the toy and their responses were recorded. After children made their selection, they were shown the contents of the box they had chosen. Children who chose the box indicated by the adult's verbal testimony were shown a toy hiding in that box. Children who chose the box not indicated by the adult's verbal testimony were shown an empty box.

Testing phase. Following the two familiarization trials, children went on to watch a series of 12 videos. All children received three trials of each type of video for a total of twelve videos. To

minimize any unintended effects of speaker, a different adult was recorded for each video and no two videos had the same speaker. All children received a verbal testimony video first, followed by an inconsistent testimony video, and the remaining 10 videos were presented in random order. Following each video, children were asked to choose the box they believed had the hidden toy. Additionally, we solicited their explanations for each of their choices. Children did not receive feedback on their choices during the testing phase and therefore did not know whether or not their choices were correct.

Theory of mind scale. Following the computer search task, children completed a theory of mind battery following protocol described by Wellman and Liu (2004). The experimenter continued through the scale until the child answered incorrectly.

Executive function. Finally, children completed three executive functioning tasks in the following order: Day vs. Night task, backward digit span task, and dimensional change card-sorting task (DCCS).

At the end of the procedure, children were given a sticker or age-appropriate toy to thank them for their participation in the study.

Coding

Video task. Children's responses were coded dichotomously. In the verbal testimony videos, responses in favor of the verbally indicated box received a 1. Responses in favor of the alternative received a 0. In the nonverbal testimony videos, responses in favor of the nonverbally indicated box received a 1. Responses in favor of the alternative received a 0. In the consistent testimony videos, responses in favor of the box indicated by both sources received a 1, whereas responses in favor of the alternative received a 0. In the inconsistent testimony videos, responses in favor of the nonverbally indicated box received a 1, whereas responses in favor of the verbally indicated box received a 0. For ease of discussion throughout the remainder of the paper, all choices coded as 1 were considered the correct response for that video type.

The goal of this study was to examine the effect of nonverbal behavior in children's decisions of trust. If young children choose in favor of the nonverbal testimony in the inconsistent trials, this would suggest that they are, indeed, able to draw on nonverbal behaviors when deciding whether to trust a speaker's words. Such a finding would contribute significantly to our understanding of children's developing ability to detect deception, and would provide strong evidence that children are equipped, from an early age, with defensive mechanisms of epistemic vigilance.

Theory of mind task. Children received a score out of 5 for the number of questions they answered correctly.

Executive function tasks. For the Day vs. Night task, children received a percentage score for the number of cards they correctly labeled out of 16. For the Backward Digit Span task, children received a point for each sequence they correctly repeated backward. For each digit span, children were allowed up to three trials to respond correctly. Once children responded correctly on a given digit span, they immediately moved on to a larger sequence. If they responded appropriately on the first trial, they received three points for that digit span, whereas if they responded correctly on the second trial, they only received two points. Children started with two digits and could go up to six digits, resulting in a maximum score of 15. Children's final score was calculated as a percentage out of 15. For the Dimensional Change Card Sorting Task, children received a score out of 6 for the number of correctly sorted cards in the post-switch phase. Again, this score was converted to a percentage.

Results

Only one child in each age group failed both familiarization trials. These children were included in all analyses. Preliminary analyses revealed no significant effect of gender or trial order on children's decisions; thus, these variables were excluded from further analyses.

To assess whether the likelihood of choosing the correct box is dependent on age, video type, and their interaction, we conducted a mixed effects logistic regression with age, video type, and their interaction as fixed effects. To account for the repeated measures for each participant, a subject variable was included as a random effect. The deviance between the models with and without the interaction term was significant ($\lambda^2 = 73.78$, $p = .001$), suggesting that the likelihood of choosing the correct box depends on both a child's age and the type of video. When only verbal testimony was offered, 4 (*odds ratio* $= .22$, $z = -1.76$, $p = .08$) and 5-year-olds ($OR = .17$, $z = -1.85$, $p = .06$) were marginally more likely than 6-year-olds to choose the verbally indicated box. When only nonverbal testimony was offered, 4-year-olds were significantly less likely than 5-year-olds ($OR = .29$, $z = -1.91$, $p = .05$) and 6-year-olds ($OR = .27$, $z = -2.06$, $p = .04$) to choose the box indicated by the nonverbal testimony, and there was no difference in likelihood for 5- and 6-year-olds. When verbal and nonverbal testimony were in agreement, children of all ages performed equally well, overwhelmingly choosing the box indicated by the two sources of testimony. However, in the inconsistent videos when verbal testimony was contradicted by nonverbal testimony, 6-year-old children were significantly more likely to choose the box indicated by the nonverbal testimony compared to 4-year-olds ($OR = 37.37$, $z = 6.15$, $p < .001$) and 5-year-olds ($OR = 20.47$, $z = 5.92$, $p < .001$). Both 4- and 5-year-olds chose to look in the verbally indicated box, and there was no difference in the performance of these age groups.

The predicted probabilities for this model are summarized in Figure 1. The predicted probability of choosing the correct box in the inconsistent videos was .13 for 4-year-olds, .13 for 5-year-olds, and .75 for 6-year-olds, illustrating the dramatic improvement in children's performance between the ages of 5 and 6. For all other testimony videos, children at all ages were highly likely to choose the correct box; their predicted

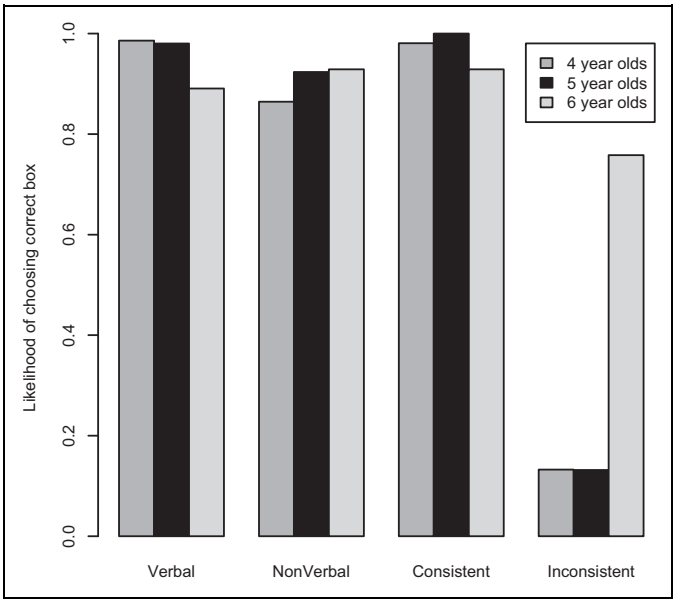

Figure 1. Predicted probabilities of choosing the correct box.

probabilities ranged between .89 and .99 for verbal testimony videos, .87 and .93 for nonverbal testimony videos, and .93 and 1.0 for consistent videos, respectively.

To further understand the differences in performance for across the four types of videos, we conducted a Poisson regression using age and video type to predict the number of correct responses (out of the three trials). The results of this analysis revealed a significant interaction between age and video type on average number of correct responses. Specifically, 6-year-old children scored significantly higher on inconsistent trials compared to both 4-year-olds ($z = 5.11$, $p < .001$) and 5-year-olds ($z = 4.61$, $p < .001$). The average number of correct responses was not significantly different between 4- and 5-year-olds. Furthermore, there were no significant age differences on any of the remaining types of videos. A summary of age differences in the average number of correct responses for each type of video is provided in Table 2. Indeed, children of all ages performed similarly in verbal testimony videos, nonverbal testimony videos, and consistent testimony videos. Only inconsistent testimony videos revealed significant differences such that 6-year-olds, on average, performed dramatically better than 4- and 5-year-olds. Importantly, although the odds ratios reported from the logistic model indicated that when children only received verbal testimony, 6-year-olds were marginally significantly likely to chose the box not indicated by verbal testimony, the results from the Poisson regression indicated that on average, there was no significant difference in the accuracy of the three age groups on the verbal testimony videos.

Cognitive Correlates

To explore the relation between each cognitive measure and performance on the inconsistent testimony videos above and beyond the effect of age, we computed four partial correlations. After controlling for the effect of age, analyses revealed no significant correlations between any of the cognitive measures and performance on the inconsistent videos (see Table 1, where children's average scores on the four cognitive measures are presented by age group). Thus, individual differences in children's performance on the inconsistent testimony videos do not appear to be driven by differences in their theory of mind or their level of executive functioning.

To examine this statistically, we conducted a separate Poisson regression of the main effect of age, each cognitive measure, and their interaction on the number of correct responses in the inconsistent videos. The results revealed no significant interaction effect and no significant main effects for any of the cognitive measures.

Table 1. Average Score on Cognitive Measures Across Age. Standard Deviations Reported in Parentheses.

	ToM	D/N	BDS	DCCS
Four-year-olds	2.12 (1.48)	.73 (.22)	.15 (.15)	.88 (.27)
Five-year-olds	3.86 (1.30)	.79 (.25)	.30 (.22)	.87 (.30)
Six-year-olds	4.29 (1.24)	.89 (.10)	.46 (.20)	.95 (.20)

Table 2. Number of Correct Responses Across Video Types and Age Groups. Means, (Standard Deviation), and Range.

	Verbal	Nonverbal	Consistent	Inconsistent
Four-year-olds	2.92 (.27) 2–3	2.38 (.75) 1–3	2.88 (.43) 1–3	.50 (.95) 0–3
Five-year-olds	2.93 (.26) 2–3	2.76 (.58) 1–3	3.00 (.00) 3	.76 (1.2) 0–3
Six-year-olds	2.68 (.55) 1–3	2.79 (.57) 1–3	2.79 (.57) 1–3	2.36 (1.06) 0–3

Discussion

Children, like adults, depend on others to learn about the world (Harris, 2002). Decades of research have demonstrated children's ability to learn from others (Vygotsky, 1980) as well as their developing ability to select good sources of testimony (e.g., Jaswal & Neely, 2006; Doebel & Koenig, 2013). In these studies, children are often provided with two informants and asked to select the better source. By contrast, in the current study children were shown a single adult informant and had to choose whether or not to trust the adult's verbal testimony.

When no other information was offered, children as young as 4 years demonstrated a clear and systematic ability to learn from adults' verbal testimony. Children neither chose randomly nor showed systematic distrust in what the adult said. Instead, children of all ages used the adult informant's verbal statement as a true indication of the toy's location. When the two sources of testimony offered consistent information, children's decisions were also overwhelmingly based on the

testimony. In fact, all 5-year-olds chose the box indicated by testimony on all three trials and only two 4-year-olds and four 6-year-olds chose to look in the contraindicated box on at least one trial. Importantly, no children chose to distrust testimony on all three consistent trials. This provides strong evidence that, when verbal and nonverbal testimony accord, children trust this information when making decisions.

When verbal and nonverbal testimony did not match, children were forced to make a decision favoring one source over the other. On the basis of evolutionary reasoning, we predicted that in the face of conflict between these two sources of information, children would favor nonverbal over verbal information because the latter is more easily manipulable, whereas the former is harder to manipulate and therefore more likely to reveal the speaker's true beliefs and intentions. Based on existing findings in the developmental literature, we predicted that this would apply to older children rather than younger ones. As expected, we found that this hypothesis was supported for 6 year olds, but not for younger children.

Our results show that before 6 years of age, young children primarily base their decisions on a speaker's verbal testimony. In all three inconsistent testimony situations, a majority of 4- and 5-year-olds (73% and 62%, respectively) chose to look in the box indicated by the adult's verbal statement rather than the one that elicited a nonverbal gasp. This is *not* due to a lack of understanding that nonverbal behavior is communicative. By 4 years of age, children clearly demonstrate the ability to infer the location of an object when only nonverbal cues are provided; in the nonverbal testimony videos, 85% chose the box indicated by the gasp on at least two out of three trials. Thus, when no verbal testimony is provided, even young children reliably draw on nonverbal behaviors to inform their decisions. It is in the presence of verbal testimony that preschool aged children overwhelmingly trust a speaker's words over inconsistent nonverbal behavior.

By contrast, and as predicted, the majority of 6 year olds (68%) privileged nonverbal information on all three trials that included inconsistencies between verbal and nonverbal information. From an evolutionary perspective, animal communication can be seen as a means of influencing another organism's behavior. Speakers are expected to attempt to influence listeners in ways that conform to the speakers' fitness interests. While these may sometimes align with the interests of the listener, many times they do not. This sets up a strong selection pressure on listeners to be able to detect deception and misinformation in others' speech. While children have sometimes been regarded as passive receptacles or near-blank slates, evolutionary and developmental perspectives both emphasize children's active roles, sophisticated learning abilities, and rapidly developing capacities. These considerations—together with the notion that being deceived is rarely in a child's interest—led us to predict that children would be able to detect deception, operationalized as trusting nonverbal information (harder to manipulate) over verbal information (easier to manipulate) when the two conflict. This hypothesis received support among 6 year olds, but not among 4 or 5 year olds.

There was a slight, albeit statistically non-significant, improvement between 4- and 5-year-olds. This suggests during this time, there is a period of transition away from the strong bias to trust verbal testimony despite conflicting nonverbal behavior. The nature of this transition should be a focus of subsequent research.

The results of the current study thus suggest that 4- and 6-year-olds differ remarkably in their ability to detect deception through nonverbal behavior. During these ages, children appear to undergo a dramatic developmental change in their understanding of the relation between verbal and nonverbal behaviors and their utility in decisions of trust. Although children as young as 4 years extract information from nonverbal behavior when verbal testimony is either absent or consistent, they do not seem to grasp its role in indicating deceptive testimony until age 6. Once children have this understanding, they become able to use nonverbal behaviors to modulate their trust in the testimony they receive. Indeed, 79% of 6-year-olds chose nonverbal cues over verbal testimony in at least two of the three inconsistent videos, representing a dramatic improvement over their younger peers.

Contrary to the results of the current study, some researchers have argued that the ability to evaluate the veracity of verbal testimony through nonverbal cues appears earlier than 6 years of age. Freire et al. (2004) claim that children as young as 4 and 5 years are able to use a speaker's eye gaze as an indication of the truthfulness of the speaker's words. In their study, adults gave children conflicting information about the location of a ball—they said one thing verbally and indicated the opposite with their gaze. Children completed six trials and received feedback after each one. Despite feedback, 3-year-olds in their study continuously chose the cup indicated by the adult's words, whereas 5-year-olds chose the cup indicated by the adult's eye gaze. Four-year-olds, however, performed more variably, only sometimes choosing the cup that the adult was looking at. The authors argue that at around 4 years of age, children transition from a reliance on verbal cues to an understanding that nonverbal behavior can be revealing in deceptive situations.

Two important differences might account for the discrepancy between the results of the current study and those reported by Freire and colleagues (2004). First, their study focused solely on eye gaze. There is ample evidence that children have experience tracking eye gaze from a very early age (Brooks & Meltzoff, 2002, 2005; Tomasello et al., 2007). As early as 6 months, infants are known to follow the direction of someone's gaze, especially when the gaze is accompanied by infant-directed speech (Senju & Csibra, 2008). Eye gaze therefore seems to enjoy a special status as a nonverbal cue that children have been using since infancy and have been relying on as a source of accurate information about the world for years. As such, children may have long ago formed a representation of eye gaze as a reliable source of information. If this is correct, and eye gaze has a special status, then children may be much more likely to trust eye gaze relative to other nonverbal cues when there is a conflict between verbal and nonverbal information.

There is a second key difference between our study and that of Freire et al. (2004). In their experiment, both the researcher and the adult in the video explicitly admitted the adult's intention to trick the child. Consequently, children in their study did not have to infer the intention to deceive; rather, they were explicitly informed of deceptive intent and then only had to infer that nonverbal eye gaze can reveal the true state of affairs when verbal testimony is untrustworthy. While this is an important developmental achievement and reveals that young children can negotiate different sources of information to extract truth, it does not reveal that they are intrinsically vigilant toward verbal testimony. Instead, young children require explicit warning that they are at risk of being deceived. Consequently, these results speak less about children's ability to spontaneously practice vigilance and more about the cues they use to determine the truth in a known (pre-established) deceptive situation. Important as that is, it is also important to ascertain how and when children spontaneously practice epistemic vigilance and decide for themselves that there is a reason to doubt.

Mills (2012) suggests that children have a strong bias to trust new information, particularly when there is "no clear reason to doubt" (p. 5). The current study demonstrates that when children are not warned of deceptive intent, 4- and 5-year-olds do *not* readily infer deceptive intent on the basis of inconsistency between verbal and non-verbal testimony. Only by 6 years does inconsistency lead children to infer deceptive intent. Indeed, when 6-year-olds in this study were faced with conflicting verbal and nonverbal testimony, they systematically chose to trust the nonverbal testimony rather than the verbal testimony, indicating that they perceived nonverbal behavior as a better indicator of truth. Arguably, by this age, children treat nonverbal behavior as a leakage cue; that is, they understand that nonverbal behavior that is inconsistent with the verbal message is a sign of deception and may indicate information the speaker wants to conceal. Indeed, of the 6 year olds who chose the nonverbal box across all three inconsistent trials, *all but one* child gave at least one explanation that referred to nonverbal behavior (e.g., "Because he was like ['gasp'] when he opened the blue box.") and 31% of these children gave at least one explanation that explicitly referred to trickery or deception ("She gasped. They're trying to trick you, but what I see with their expressions is what I know is true. Because they can't really control it, right?"). This is doubly impressive in that children seem to make two important changes between the ages of 5 and 6: a) realizing that inconsistent information may signal deception, and b) privileging non-verbal information as more likely to be veridical. It is also impressive that some children are even able to articulate the reasons for their decision, but it is important to note that children may be able to detect trickery without being able to adequately articulate what they are doing. Indeed, a sizeable literature shows that adults are often unable to articulate the reasons for their behavior or for a choice they made (Ariely, 2008). It is thus worth bearing in mind that children who made the right decision appear to be demonstrating epistemic vigilance and correctly picking non-verbal cues over verbal ones, even if they are unable to express this in language.

It is interesting to consider how children come to understand that nonverbal cues are better indicators of the truth. Zuckerman and Driver (2014) present one view of nonverbal leakage which suggests that the reason nonverbal behavior is seen as a sign of deception is that nonverbal behavior is often harder to control than verbal statements. In contexts in which the two sources are inconsistent, nonverbal behaviors are perceived as harder to manipulate and therefore more likely to be truthful. Though a direct exploration of whether children view nonverbal behavior as harder to control than verbal statements is lacking, research suggests that an understanding of the distinction between voluntary and involuntary action appears around 6 years of age (e.g., Rosset & Rottman, 2014), a finding that fits nicely with the explanation provided here.

The extent to which children evaluate the difference in manipulability of verbal and nonverbal behavior is an open question. The 6-year-old's response quoted above is at least proof of concept that children at this age are capable of making such evaluations. Future research should consider asking children whether the deceivers were aware of their nonverbal behaviors and whether they could have avoided gasping or acted differently. Researchers might ask children to explain why the speakers gasped if they were trying to be tricky or deceptive. Perhaps children's explanations will align with their ability to extract truth from nonverbal cues in the face of contradictory verbal testimony, though it is important to note that their explicit awareness of the manipulability of nonverbal behaviors might not emerge until much later. Indeed, children may not be conscious of the strategies they are employing to detect deception and misinformation.

Some might argue that older children's advantage over their younger counterparts stems not from an increased ability to detect deception, but rather from a higher level of general skepticism toward testimony. For example, Lee et al. (2002) argue that preschool-aged children are quite gullible and that older children become increasingly better at resisting their bias to trust what they are told. But if older children were approaching the testimony videos with an inclination to distrust what they were told, their performance on the verbal testimony videos would have been significantly worse than that of younger children. Such a finding was not supported by the present data. Across the three verbal testimony videos, average accuracy was not significantly different across ages. This strongly indicates that 6-year-olds were *not* generally more skeptical than younger children. Their skepticism was triggered by the specific condition of encountering inconsistent verbal and nonverbal information, at which point they distrusted the verbal information and followed the nonverbal cues instead.

Cognitive Correlates. Many elements of deception detection abilities seem intimately tied to aspects of cognitive functioning (Koenig & Harris, 2005b; Vanderbilt et al., 2011). In the current study, we administered four cognitive measures and assessed their relation to children's ability to detect deception

through nonverbal cues. Children completed a theory of mind scale to measure mental state reasoning, a day vs. night task to assess inhibitory control, a backward digit span task to index working memory, and a dimensional card sorting task to measure mental flexibility. Partial correlation analyses found no relation between any of the cognitive factors and children's decisions in the inconsistent videos when controlling for age. This strongly indicates that it is not level of theory of mind or executive function that facilitates children's ability to use nonverbal cues to detect deception. These findings are consistent with previous research by Palmquist et al. (2018) in which executive function was not significantly related to 4-year-olds' ability to distrust a deceptive pointer. Despite the absence of any association between these aspects of cognitive function and the ability to detect deception in this study, future studies might consider employing different measures of cognitive function to further document the relationship or lack thereof.

Fitness costs and benefits. Two interrelated future directions strike us as worthy of consideration: first, investigating the domain-specificity vs. generality of children's ability to detect deception, and second, varying the costs and benefits of failing to detect deception and testing whether this affects children's degree of success in detecting deception. In other words, some instances of deception are much more costly than others—and failing to detect these is correspondingly more costly. If a child fails to detect that she has been lied to about where a certain toy was purchased, she is unlikely to suffer large fitness costs. By contrast, if she fails to detect that she has been lied to about whether a food is safe to eat, or whether a dangerous predator is nearby, she may suffer large fitness costs. We may reasonably expect children's deception-detection abilities to be more sophisticated when the stakes are higher and failure brings greater fitness consequences. Additionally, from an evolutionary perspective, some actors are much more likely to harmfully deceive children than others—for example, a child's parents' rivals are more likely to engage in harmful deception than are a child's parents or kin. Consequently, we should expect to see greater epistemic vigilance among children toward non-kin—perhaps especially to strange adult males, paralleling the finding that children's fear and stranger anxiety are especially pronounced toward strange males (Hahn-Holbrook et al., 2010). In sum, we should expect children's deception-detection abilities to be context-sensitive (Al-Shawaf et al., 2019) and specifically to be more sophisticated when the stakes are higher and failure brings greater fitness consequences. We suggest that future research in this area would benefit from these considerations, enabling researchers to investigate children's deception-detection abilities in a manner that is both more fine-grained and more theoretically sophisticated.

Conclusion

These results provide exciting new evidence of the development of epistemic vigilance, specifically children's ability to modulate trust in verbal testimony based on the presence of conflicting nonverbal behavior. Not only do children show the ability to identify and preferentially learn from good sources of information, but also, by 6 years, children are able to judiciously lower their trust in adults who appear to be lying. Before 6 years, children reliably extract information from verbal and nonverbal testimony, except when the two sources conflict. In such cases, young children show a strong bias to trust what adults say. Instead, older children show heightened epistemic vigilance when confronted with an inconsistency between verbal testimony and nonverbal cues. Even more impressive, they correctly prioritize the truth-value of nonverbal information over verbal testimony in such situations.

The findings reported here represent strong evidence that children are equipped with a capacity for epistemic vigilance based on nonverbal cues. Our findings suggest that 6-year-olds correctly interpret the presence of conflicting verbal and nonverbal information as a cue to possible deception, and in such cases judiciously choose to trust nonverbal over verbal testimony. Such epistemic vigilance is important across the lifespan because of the protective role it serves against the risk of deception and manipulation, which is an inherent part of communication.

In line with decades of research, the present study reveals that children's decision of trust depends both on what people say and what they do. When either of these sources of information is offered exclusively or when they are in agreement, children as young as 4 years rely on them to guide their decisions. When these sources of information do not agree, they must somehow be reconciled. At the age of 6, children appear to use this conflict of information as a cue to deception, perhaps by implicitly considering nonverbal information a leakage cue. When faced with this possibility, 6-year-olds show the relatively sophisticated response of decreasing their trust in verbal testimony and regarding nonverbal behavior as a superior source of information. We hope these novel findings contribute to the growing literature demonstrating children's sophisticated cognitive abilities, and simultaneously motivate researchers to pose new questions about the development of children's strategies for detecting deception.

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References

Aguiar, N. R., Stoess, C. J., & Taylor, M. (2012). The development of children's ability to fill the gaps in the knowledge by consulting experts. *Child Development*, *83*(4), 1368–1381.

Al-Shawaf, L., Conroy-Beam, D., Asao, K., & Buss, D. M. (2015). Human emotions: An evolutionary psychological perspective. *Emotion Review*, *8*, 1–14.

Al-Shawaf, L., Lewis, D. M. G., Wehbe, Y. S., & Buss, D. M. (2019). Context, environment, and learning in evolutionary psychology. In: T. K. Shackelford & V. A. Weekes-Shackelford (Eds.), *Encyclopedia of evolutionary psychological science* (1st ed.). Springer International Publishing.

Ariely, D. (2008). *Predictably irrational: The hidden forces that shape our decisions*. HarperCollins.

Bergstrom, B., Moehlmann, B., & Boyer, P. (2006). Extending the testimony problem: Evaluating the truth, scope, and source of cultural information. *Child Development*, *77*(3), 531–538.

Birch, S. A., Vauthier, S. A., & Bloom, P. (2008). Three-and four-year-olds spontaneously use others' past performance to guide their learning. *Cognition*, *107*(3), 1018–1034.

Brooks, R., & Meltzoff, A. N. (2002). The important of eyes: How infants interpret adult looking behavior. *Developmental Psychology*, *38*(6), 958–966.

Brooks, R., & Meltzoff, A. N. (2005). The development of gaze following and its relation to language. *Developmental Science*, *8*(6), 535–543.

Buss, D. M., & Duntley, J. D. (2008). Adaptations for exploitation. *Group dynamics: Theory, Research, and Practice*, *12*(1), 53.

Bussey, K. (1992). Lying and truthfulness: Children's definitions, standards, and evaluative reactions. *Child Development*, *63*(1), 129–137.

Bussey, K. (1999). Children's categorization and evaluation of different types of lies and truths. *Child Development*, *70*(6), 1338–1347.

Carlson, S. M., & Moses, L. J. (2001). Individual differences in inhibitory control and children's theory of mind. *Child Development*, *72*(4), 1032–1053.

Clément, F., Koenig, M., & Harris, P. (2004). The ontogenesis of trust. *Mind & Language*, *19*(4), 360–379.

Corriveau, K., & Harris, P. L. (2009). Choosing your informant: Weighing familiarity and recent accuracy. *Developmental Science*, *12*(3), 426–437.

Couillard, N. L., & Woodward, A. L. (1999). Children's comprehension of deceptive points. *British Journal of Developmental Psychology*, *17*(4), 515–521.

Davis, H. L., & Pratt, C. (1996). The development of children's theory of mind: The working memory explanation. *Australian Journal of Psychology*, *47*, 25–31.

Diamond, A., Carlson, S. M., & Beck, D. M. (2005). Preschool children's performance in task switching on the dimensional change card sort task: Separating the dimensions aids the ability to switch. *Developmental Neuropsychology*, *28*(2), 689–729.

Doebel, S., & Koenig, M. A. (2013). Children's use of moral behavior in selective trust: Discrimination versus learning. *Developmental Psychology*, *49*(3), 462–469.

Evans, A. D., & Lee, K. (2013). Emergence of lying in very young children. *Developmental Psychology*, *49*(10), 1958–1963.

Freire, A., Eskritt, M., & Lee, K. (2004). Are eyes windows to a deceiver's soul? Children's use of another's eye gaze cues in a deceptive situation. *Developmental Psychology*, *40*(6), 1093–1104.

Fusaro, M., Corriveau, K. H., & Harris, P. L. (2011). The good, the strong, and the accurate: Preschoolers' evaluations of informant attributes. *Journal of Experimental Child Psychology*, *110*(4), 561–574.

Hahn-Holbrook, J., Holbrook, C., & Bering, J. (2010). Snakes, spiders, strangers: How the evolved fear of strangers may misdirect efforts to protect children from harm. In J. M. Lampinen & K. Sexton-Radek (Eds.), *Protecting children from violence: Evidence-based interventions* (pp. 263–289). Psychology Press.

Harris, P. L. (2002). Checking our sources: The origins of trust in testimony. *Studies in History and Philosophy of Science Part A*, *33*(2), 315–333.

Harris, P. L. (2012). *Trusting what you're told: How children learn from others*. The Belknap Press of Harvard University Press.

Harris, P. L., Koenig, M. A., Corriveau, K. H., & Jaswal, V. K. (2018). Cognitive foundations of learning from testimony. *Annual Review of Psychology*, *69*, 251–273.

Heyman, G. D., Sritanyaratana, L., & Vanderbilt, K. E. (2013). Young children's trust in overtly misleading advice. *Cognitive Science*, *37*(4), 646–667.

Jaswal, V. K., Croft, A. C., Setia, A. R., & Cole, C. A. (2010). Young children have a specific, highly robust bias to trust testimony. *Psychological Science*, *21*(10), 1541–1547.

Jaswal, V. K., & Neely, L. A. (2006). Adults don't always know best: Preschoolers use past reliability over age when learning new words. *Psychological Science*, *17*(9), 757–758.

Jaswal, V. K., Pérez-Edgar, K., Kondrad, R. L., Palmquist, C. M., Cole, C. A., & Cole, C. E. (2014). Can't stop believing: Inhibitory control and resistance to misleading testimony. *Developmental Science*, *17*(6), 965–976.

Knapp, M. L. (2008). *Lying and deception in human interaction*. Pearson Education/Allyn & Bacon.

Koenig, M. A., & Harris, P. L. (2005a). Preschoolers mistrust ignorant and inaccurate speakers. *Child Development*, *76*(6), 1261–1277.

Koenig, M. A., & Harris, P. L. (2005b). The role of social cognition in early trust. *Trends in Cognitive Sciences*, *9*(10), 457–459.

Koenig, M. A., & Jaswal, V. K. (2011). Characterizing children's expectations about expertise and incompetence: Halo or pitchfork effects? *Child Development*, *82*(5), 1634–1647.

Krebs, J. R., & Dawkins, R. (1984). Animal signals: Mind-reading and manipulation. *Behavioural Ecology: An Evolutionary Approach*, *2*, 380–402.

Lee, K., Cameron, C. A., Doucette, J., & Talwar, V. (2002). Phantoms and fabrications: Young children's detection of implausible lies. *Child Development*, *73*(6), 1688–1702.

Lee, K., Xu, F., Fu, G., Cameron, C. A., & Chen, S. (2001). Taiwan and mainland Chinese and Canadian children's categorization and evaluation of lie- and truth-telling: A modesty effect. *British Journal of Developmental Psychology*, *19*(4), 525–542.

Lewis, M., Stanger, C., & Sullivan, M. W. (1989). Deception in 3-year-olds. *Developmental Psychology*, *25*(3), 439–443.

Mascaro, O., & Sperber, D. (2009). The moral, epistemic, and mind-reading components of children's vigilance towards deception. *Cognition*, *112*(3), 367–380.

Mills, C. M. (2012). Knowing when to doubt: Developing a critical stance when learning from others. *Developmental Psychology*, *49*(3), 404–418.

Nurmsoo, E., & Robinson, E. J. (2009). Children's trust in previously inaccurate informants who were well or poorly informed: When past errors can be excused. *Child Development*, *80*(1), 23–27.

Palmquist, C. M., Kondrad, R. L., & Norris, M. N. (2018). Follow my point? Preschoolers' expectations about veridicality disrupt their understanding of deceptive points. *Cognitive Development*, *48*, 190–202.

Pasquini, E. S., Corriveau, K. H., Koenig, M., & Harris, P. L. (2007). Preschoolers monitor the relative accuracy of informants. *Developmental Psychology*, *43*(5), 1216–1226.

Polak, A., & Harris, P. L. (1999). Deception by young children following noncompliance. *Developmental Psychology*, *35*(2), 561–568.

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.

Rosset, E., & Rottman, J. (2014). The big 'whoops!' in the study of intentional behavior: An appeal for a new framework in understanding human actions. *Journal of Cognition and Culture*, *14*(1–2), 27–39.

Rotenberg, K. J., Simourd, L., & Moore, D. (1989). Children's use of a verbal-nonverbal consistency principle to infer truth and lying. *Child Development*, *60*(2), 309–322.

Senju, A., & Csibra, G. (2008). Gaze following in human infants depends on communicative signals. *Current Biology*, *18*(9), 668–671.

Sobel, D. M., & Macris, D. M. (2013). Children's understanding of speaker reliability between lexical and syntactic knowledge. *Developmental Psychology*, *49*(3), 523.

Sperber, D., Clément, F., Heintz, C., Mascaro, O., Mercier, H., Origgi, G., & Wilson, D. (2010). Epistemic vigilance. *Mind & Language*, *25*(4), 359–393.

Strichartz, A. F., & Burton, R. V. (1990). Lies and truth: A study of the development of the concept. *Child Development*, *61*(1), 211–220.

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

Talwar, V., & Lee, K. (2008). Social and cognitive correlates of children's lying behavior. *Child Development*, *79*(4). 866–881.

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.

Taylor, M., Cartwright, B. S., & Bowden, T. (1991). Perspective taking and theory of mind: Do children predict interpretive diversity as a function of differences in observers' knowledge? *Child Development*, *62*(6), 1334–1351.

Taylor, M., Lussier, G. L., & Maring, B. L. (2003). The distinction between lying and pretending. *Journal of Cognition and Development*, *4*(3), 299–323.

Tinbergen, N. (1952). "Derived" activities; Their causation, biological significance, origin, and emancipation during evolution. *The Quarterly Review of Biology*, *27*(1), 1–32.

Tomasello, M., Hare, B., Lehmann, H., & Call, J. (2007). Reliance on head versus eyes in the gaze following of great apes and human infants: The cooperative eye hypothesis. *Journal of Human Evolution*, *52*(3), 314–320.

Vanderbilt, K. E., Liu, D., & Heyman, G. D. (2011). The development of distrust. *Child Development*, *82*(5), 1372–1380.

VanderBorght, M., & Jaswal, V. K. (2009). Who knows best? Preschoolers sometimes prefer child informants over adult informants. *Infant and Child Development*, *18*(1), 61–71.

Vygotsky, L. S. (1980). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Wellman, H. M., & Liu, D. (2004). Scaling on theory-of-mind tasks. *Child Development*, *75*(2), 523–541.

Zuckerman, M., & Driver, R. E., (2014). Telling lies: Verbal and nonverbal correlates of deception. In A. W. Siegman & S. Feldstein, *Multichannel integrations of nonverbal behavior* (pp. 129–147). Psychology Press.