

Children's Use of
Gaze, Limb Movement, Vocal Pitch and Valence
Cues to Infer Deception

by
Carey Sullivan ©

LAKEHEAD UNIVERSITY

FACULTY OF ARTS

**Children's Use of Gaze, Limb Movement, Vocal Pitch and Valence Cues
to Infer Deception**

Carey Sullivan

**Masters thesis submitted to the department
of psychology in partial fulfillment for
the requirements of Master of Arts.**

Lakehead University

June 1992

ProQuest Number: 10611393

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



ProQuest 10611393

Published by ProQuest LLC (2017). Copyright of the Dissertation is held by the Author.

All rights reserved.

This work is protected against unauthorized copying under Title 17, United States Code
Microform Edition © ProQuest LLC.

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

Acknowledgements

Above all I would like to thank my thesis supervisor, Dr. Rotenberg. I consider myself fortunate to have been able to work with someone as knowledgeable and experienced in the area of research. His patience and perseverance throughout the study were sincerely appreciated. I would also like to thank the principals and teachers of Heath Park School, Balsam St. School and Forest Park School for allowing the study at their schools as well as their cooperation during the data collection. As well, I would like to express my thanks to Dr. O'Connor for taking on the responsibility of second reader. Finally I would like to express my thanks to John Bonofiglio for his help with the research.

TABLE OF CONTENTS

Acknowledgements.....	i
Table of Contents	ii
List of Tables	iii
List of Figures.....	iv
List of Appendices.....	v
Abstract.....	vi
I INTRODUCTION.....	1
II METHOD.....	16
Subjects	16
Stimuli and Measures.....	17
Procedure	18
III RESULTS.....	20
IV DISCUSSION.....	26
V REFERENCES.....	34
VI FIGURES.....	38
VII TABLES.....	40
VII APPENDICES.....	46

LIST OF FIGURES

1. Figure 1. Lying Judgments as a Function of Valence and Grade.....38
2. Figure 2. Lying Judgments as a Function of Sex and Grade.....39

LIST OF TABLES

1. Table 1. Frequencies of Cue Categories as a Function of Grade, Sex and Gaze	40
2. Table 2. Frequencies for Cue Categories for Gaze as a Function of Grade and Sex.....	41
3. Table 3. Frequencies of Cue Categories as a Function of Grade, Sex and Limb Movement.....	42
4. Table 4. Frequencies of Cue Categories as a Function of Cues and Limbs.....	43
5. Table 5. Frequencies of Cue Categories for Limbs as a Function of Cues and Sex	43
6. Table 6. Frequencies of Cue Categories as a Function of Grade, Sex and Pitch.....	44
7. Table 7. Frequencies of Cue Categories as a Function of Cues and Pitch	45
8. Table 8. Frequencies of Cue Categories for Pitch as a Function of Cues and Sex	45

APPENDICES

A. Parental Consent Form for Subjects.....46

B. Parental Consent for Acting.....48

C. Coding Sheet for Explanations.....49

Abstract

A substantial body of research has accumulated on the types of cues individuals use to determine whether others are lying rather than telling the truth (Depaulo, Stone & Lassiter, 1985). The bulk of the research, however, has dealt with adults. The present research was designed to fill in the gap in our knowledge about such processes in children. In particular, the study examined children's use of gaze cues, limb movement cues, vocal pitch cues and valence cues to determine whether others are lying or telling the truth. Children from senior kindergarten, second and fourth grades were presented videotapes of actors who stated their liking and disliking for clothes, movies and T.V. programs. The actors displayed different types of gazes (direct versus indirect), limb movements (active versus nonactive), vocal pitches (high versus normal) and valence (liking versus not liking). The children judged on 3-point scales how much they believed the actors were lying or telling the truth and provided explanations for their judgments. It was found that the children did not use the anxiety cues in their judgments, although they did show consideration of the cues in their explanations. Age differences were found in children's use of the valence cues in their lying judgments; senior kindergarten and second grade, judged the negative statements as being more indicative of lying than were the positive statements and the reverse was shown by the fourth graders. Close scrutiny of the data revealed that fourth grade children tended to

use the anxiety cues in their lying judgments. It was proposed that the children's use of the anxiety cues may emerge later in development.

Can individuals detect whether others are lying?

Additionally, what cues do individuals use to decide whether or not others are lying? These questions have provided the impetus for a substantial body of research (see Depaulo, Stone & Lassiter, 1985). Unfortunately, research on the latter question has addressed such functioning primarily in adults rather than children. The present thesis is designed to fill in that gap in our knowledge and address, in particular, the types of cues that children use to decide whether others are lying rather than telling the truth.

The presently proposed research is an extension of research carried out by Rotenberg (1991). Rotenberg (1991) found that children reported using a variety of cues to detect deception, including cues for anxiety (e.g. nervous movement) and leakage cues (e.g. inconsistencies). One primary limitation with Rotenberg's (1991) study is that the findings reflect children's reports of the cues that they use. The purpose of the present thesis research is to investigate children's use of cues to detect deception by assessing their responses to systematically varied concrete stimuli such as gaze, limb movements, and pitch of speech. The results will reveal more definitive evidence about children's cue use by indicating: (1) responses to concrete rather than abstract stimuli; (2) the effects of

actual variations in cues rather than reported variations; and (3) the exact association between the variation in cues and attributed lying.

Accuracy in Identifying Deception

One question addressed by researchers is whether children are able to detect whether others are lying rather than telling the truth. Although the research is limited, the existing data suggest children, as well as adults, are not particularly good at detecting lying (see Depaulo, Stone & Lassiter, 1985). Typically, adults are able to detect lying versus truth telling at 60% success rate which is significantly better than chance but falls considerably below perfect detection. Age changes in the detection of deception have been found. For example, DePaulo, Jordan, Irving, and Laser, (1982) found increases with age, from 12 years through college age, in the detection of deception.

One principal reason why the detection of deception increases with age is that it requires the ability to accurately decode nonverbal communications which develops throughout the childhood years (Feldman & Philippot, 1991). A second reason for such changes resides in the notion that children acquire with age the social knowledge of display rules, specifically the social rules that govern when individuals fail to reveal their inner feelings and feign

their expressions of emotion (Saarni, 1979; 1988). Finally, the age changes may result from increases with age in children's' direct experience with deceptive communications (Depaulo, Stone, & Lassiter, 1985).

The Issue of Children's Perception of Deception and Related Cues

The poor ability of children to detect lying has led a number of researchers to focus on the types of cues that children believe reveal lying. For example, based on similar findings, Depaulo et al (1985), proposed that the appearance of being truthful plays a very important part in finding out whether a communication is believed to actually be the truth. Depaulo et al (1985) have suggested that sometimes the cues that individuals should be using in attempting to detect lies are not even noticed and that cues which may be helpful are not regarded as important or are used in the wrong ways. This suggests that just because someone is being truthful does not mean that they will be perceived by others in that fashion. As a result, it would appear to be important to know what cues children believe to be signs of deceit and this will add to their perception of the honesty of other individuals. Consistent with this reasoning, researchers have discovered proof for a "demeanour bias" in which some individuals seem to be telling the truth even when they are lying while some

individuals seem to be lying even when telling the truth (Bond, Kahler & Paolicelli, 1985). Following this same logic, it would appear to be important to examine the types of cues that children believe reveal deception because they contribute substantially to their perception of whether others are telling the truth as opposed to lying.

In order to address the issue of children's use of cues to detect deception two issues must be considered: (a) children's ability to understand deception; and (b) children's understanding of lying, comprising both their literal (lexical) definition, and moral evaluation of it. In order to adequately address the question of what cues children use to detect deception, it is important to determine when in the course of development children understand the act of deception, and the nature of children's understanding/evaluation of the term and act of lying.

Children's Understanding of Deception

Children's understanding of deception depends on their ability to form theories of mind. That is, to recognize mental states, such as beliefs, desires, and intentionality in themselves and in others (Olson, Astington, & Harris, 1988). In order to distinguish truth from deceit, children must realize that there is deception and that there are defining features of deceit (Depaulo, Jordan, Irvine, & Laser,

1982). Accordingly, children need to be provided with two concepts in order to understand deception. First, they must understand that what a person actually feels, believes, or thinks and what is shown through his/her actions are not always the same. That is, peoples' overt expressions do not always correspond to their internal states (see Harris, Donnelly, Guz & Pitt-Watson, 1986). Second, in order to realize that others can be or are deceived it is essential that children understand that others can hold false beliefs. Children must learn that people can simulate different expressions of an emotion and that these simulations can cause others to hold a false belief about how the individual really feels (Chandler & Hala, 1991).

It is important to examine at what age children understand deception. Chandler, Fritz, and Hala (1989) discuss the early onset versus later onset account of the development of children's understanding of deception. The early onset account proposes that children as young as two or three are capable of recognizing false beliefs and of using this knowledge to purposely mislead others. The later onset account advanced by Wimmer and Perner (1983), proposes that the emergence of ability to understand another's belief, how the person will react because of the belief, and their understanding of deception, emerges in the period of four to six

years.

Children's understanding of deception is shown by research on an aspect known as children's understanding of display rules, that is, the norms prescribing the appropriateness of specific facial expression in a given context (Feldman & Philippot, 1991; Saarni, 1979; 1988). In other words, they determine who can show which emotion to whom, when, where, and how. It is necessary to understand how and when individuals mislead others about their emotional states either by controlling them or by substituting other emotions. These are all acts of deception, but ones understood to be socially acceptable (e.g. a child saying that he/she is sorry, even when he/she is not, in order to spare another child's feelings). Generally, the studies show an age-related increase from 4 to 9 years in children's understanding of the various situations and communication channels. With increasing cognitive ability and socialization, children are able to understand and use display rules more effectively.

Children's Understanding of Lying

Whether or not children are able to understand that others may engage in lying behaviour must also be established. Researchers have attempted to determine how children's cognitions

about lying, both lexically and morally, are different from those of adults (Peterson, 1991). The lexical dimension describes the individual's implicit answer to the question "what is a lie?" or the concepts that distinguish between lying and being truthful. The moral dimension of lying describes cognitions that evaluate how right or wrong it is to deceive, and about the relative goodness or naughtiness of various untrue statements (Peterson, 1991).

Most recent developmental studies of children understanding lying have been inspired by Piaget's (1932) research into the theory of moral development in children. He found in his interviews that children of 5 to 7 label both intentional acts and involuntary mistakes as being lies, even though the children were aware of the difference between the two. These children also categorized fantasies, exaggerations, and jokes as being lies. This definition of the lie is called "lexical realism" (Wimmer, Gruber, & Perner, 1984). Further research by Wimmer and Perner (1984) was conducted through a series of experiments to test Piaget's view that children are lexical realists. Subjects were told stories about a character's search for a hidden object. Some included the unintentional communication of a false belief to another. It was found that 70% of the 4.5- to 6.5- year-olds believed that the character had lied despite the children's'

research by Peterson, Peterson and Seeto (1983) on students ranging from age 5 to adulthood. Exaggerations, jokes, and even wrong guesses were depicted as lying by many adults as well as most children up to 11 years. This suggests that the transition may not be as sudden or absolute as Piaget believed. According to Piaget, it is age 10 or 11 before the child defines a lie the way an adult would, that is, as any statement that is intentionally false.

Research suggests that there is a gradual developmental pattern in understanding lying. Some relevant concepts appear to be in place by the age of 4, while others evolve gradually with great variation through adulthood. It has been shown that children as young as 4 can distinguish between truth and lying. Young children's "lexical realist" definitions of lying develop further into the mature intention-based definition of lying (Peterson, 1991). Five-year-old children (kindergarten) and 7-year-old children (2nd grade) label both intentional acts and involuntary mistakes as lies. For most 9-year-old children (4th grade) identifying mistakes as lies is no longer a problem. However, for some 8- to 10-year-olds to adults exaggerations and wrong guesses are still considered lies. It would then appear that from very young ages, children have already begun to form concepts of what lies are, and that these concepts are

continually developed as the individual matures.

Aspects of both intentionality and consequences have also been examined as they relate to the moral aspect of lying. Piaget indicated that children under 10 years ignore the liar's intention or motive and judge only on the likelihood of the lie. Contrary to this, however, Lickona (1976) found that children as young as six ignored likelihood and judged lies in relation to the speaker's selfish versus innocent motives. Wimmer, Gruber and Perner (1984) found little support for Piaget's hypothesis that young children's moral reasoning is dominated by the truth value of the consequences. Instead results showed that 4 to 6 year olds based their moral evaluations solely on the speaker's intention to speak honestly versus deceptively. Speakers with truthful intentions were praised equally highly whether the messages were true or false. Peterson (1991) believes that research shows that when a lie's consequences are examined by literal truth value or listener's belief, there is little support for young children being moral realists as suggested by Piaget. Both the very young and the older children based their moral ratings of untrue statements on intention.

Piaget also found that children under age 9 or 10 judged harmful accidental lies as the naughtiest. This finding has been

supported by Lickona (1976). Peterson (1991) adds that if moral realism is a tendency to evaluate lies not so much by intention as in relation to the level of material damage their consequences produce, this tendency is not confined to the young as Piaget implies, but instead extends to adults. In sum, it can be seen that both the intentions and the consequences of any lie are relevant to moral consideration by both adults and children.

Children's Use of Cues to Infer Lying

There are many contexts in which children can learn skills of deceiving and detecting deception. Because children participate in activities with other children every day, an obvious opportunity for identifying cues for deception as well as for creating strategies for detecting deception, is in the context of play (Depaulo, Stone & Lassiter, 1985). Board games, party games, and sports are a few areas in which lying is evident. Card games such as "cheat" and children's "poker" require that the children learn how to bluff or lie as well as be able to detect cues that others are bluffing or lying in order to be successful at the games. Children learn to look to the face, voice and body movements of others as indicators of lying. Children's experiences with such deception and their use of cues to infer lying will probably increase with experience, and thus with age.

Extensive research on adult's actual and perceived cues for deception provides us with cues that children may view as revealing deception. In fact, children should learn those perceived cues simply because they eventually become adults. Four types of "adult" cues have been studied: verbal cues, vocal/paralinguistic cues, visual cues (comprising visual-facial and visual-body cues) and miscellaneous cues. DePaulo et al (1985) proposed that individuals are better able to control their visual-facial aspects more than the other domains and, therefore, visual-facial cues are the most misleading to others when individuals try to deceive. The cues that adults believe to reveal deception are: (1) the vocal/paralinguistic cues of speech hesitations, pitch, speech errors, latency, and speech rate; (2) visual cues of gaze, postural shifts and smiling; and (3) the discrepancy between facial and vocal cues (Zuckerman et al, 1982).

Researchers have tried to determine whether children think that discrepancy cues reveal lying/telling the truth (Bugental, Kaswan, & Love, 1970; Friedman, 1976; Rotenberg, Simourd & Moore, 1989). Rotenberg et al (1989) have examined this in the context of the verbal-nonverbal consistency principle. This principle suggests that "the perceived truthfulness of a person varies as a function of the consistency between the affect exhibited in verbal communication

and the affect exhibited in nonverbal communication" (p. 309). Researchers have discovered that children's use of the verbal-nonverbal consistency principle increases with age from kindergarten through to fourth grade at which time it is evident (Rotenberg et al, 1989). Previous researchers also reported that facial cues play an important role in children's perceptions of lying/truth, with positive facial expressions being linked with being truthful.

As well, when Rotenberg et al (1989) studied valence in their research, they found that the valence of their communications played a role in the judgments of lying given by the children. Specifically they found that senior kindergarten children associated positive facial expressions or verbal communications with the truth and negative facial expressions of verbal communications with lying. This finding was age-related, however, as this effect decreased across fourth grade.

The role of valence in the perception of statements has also been examined by DePaulo, Jordan, Irvine and Laser (1982). These researchers had students from sixth grade, eighth grade, tenth grade, twelfth grade and college listen to tape recordings of adults expressing feelings toward other people. The descriptions made by the adults included a person they liked and a person they did not like.

They also gave two deceptive descriptions; they pretended to like a person they disliked, and to dislike a person they liked. The degree of positivity covaried with deceit. The adults provided more positive comments and fewer negative ones when describing the person they liked than when describing the person they were pretending to like. As well, more negative comments were made and fewer positive ones when describing the person they did not like than when describing the person they were pretending not to like. DePaulo et al (1982) found that subjects across all grade levels were able to differentiate between truthfulness and lying by their liking ratings. They found that younger subjects, from sixth, eighth and tenth grade, perceived the adults as being more deceptive when they expressed negative (dislike and pretend-to-dislike) feelings than when they expressed positive (like and pretend-to-like) feelings. With age, however, this tendency reversed, and the older subjects perceived the adults as being more dishonest when their descriptions were positive as opposed to when they were negative.

The types of cues that children use to detect deception has been investigated by Rotenberg (1991). Also investigated were the types of strategies that children use in their detection of deception. Strategies are the actions that children would use in deciding

whether others are lying or telling the truth. The actions are a result of children's intended or planned means of revealing deception. How the children would determine whether others were lying or telling the truth was determined by children's reported strategies for detecting deception. This research provided some tentative evidence for two conclusions. First, the children appeared to understand that deception was accompanied by anxiety that was revealed by physiological and overt behavioral cues, involuntarily. Children frequently identified as cues for deception, limb movements, gaze, and vocal pitch, which are all common signs for anxiety. Second, children identified various types of discrepancy cues for lying or telling the truth, and therefore, demonstrated some appreciation of "emotional control-multichannel" principle whereby persons leaked their emotion in other channels of communication (Rotenberg, 1991). Children's appreciation of this principle was shown further by their reference to the use of testing strategies to detect deception. As well some interesting sex differences were found in the children's' identification of the cues. No age differences in the males' identification of visual-facial cues were found although the identification of the visual - paralinguistic cues increased with age. In contrast, females showed a curvilinear pattern in which the

frequencies of cues increased from second to fourth grade but then decreased from fourth to sixth grade. Further research should be undertaken in an attempt to explain these sex differences

The limitation of Rotenberg's (1991) study is that the findings reflect children's reports of their cue use. The purpose of the present research was to examine whether children of different ages use anxiety cues (limb movements, gaze, and vocal pitch) and valence of statements to detect deception, as assessed by their judgments of concrete stimuli that vary on the relevant dimensions. If children were considering anxiety, it was expected that they would infer greater lying to; (1) indirect than to direct gaze, (2) limb movement than to no limb movement, and (3) high pitch than to normal pitch.

Method

Subjects

The subjects were 24 children (12 males and 12 females) from each of senior kindergarten, second, and fourth grades of public elementary schools, located in Thunder Bay, Ontario. The mean ages of the children in the three grades were 5 years 11 months, 7 years 9 months and 10 years, respectively. The children's' participation was secured by parental letters and consent (shown in Appendix A).

Stimuli and Measures

Two females and two males who were solicited from acting schools served as the actors. These children's participation was secured by parental letters and consent (shown in Appendix B). The actors were videotaped while providing seventy-two various verbal communications and cue combinations. The verbal communications were comprised of children's statements of their preferences for a movie they had seen, a T.V. program they had watched, or a shirt that another child was wearing. In total six communications were used, the result of two types preferences (liking/not liking) and of three objects (movie versus T.V. program versus shirt). These were the following: (1) he/she liked that movie; (2) he/she did not like that movie; (3) he/she liked that T.V. program; (4) he/she did not like that T.V. program; (5) he/she liked that shirt; (6) he/she did not like that shirt. The cues accompanying each communication were systematically varied by gaze, limb movement and vocal pitch in the following fashion; (1) the actor gazed to the side (indirect) or gazed directly at the camera (direct); (2) the actor rubbed his hands (active) or kept them still (nonactive); and (3) the actor's pitch was high (high) or normal (normal).

Each subject was presented one of twelve different subsets

(each subset was made up of six combinations of verbal communications and cue variations) of the seventy-two which were contained on the videotape. The six combinations contained liking preferences for three objects and not liking preferences for three objects. As well, these six statements were combined with one of the six cue variations (direct gaze, indirect gaze, limb movement, no limb movement, normal vocal pitch and high vocal pitch). One subset was given to each by the two same-sex actors (three from one and three from the other). A complex scheme of counterbalancing was employed such that across children within each grade and sex, the different cues were systematically varied across the verbal communications.

Procedure

The subjects were tested individually by the experimenter. Each subject was shown a videotape of one of the same-sex actors presenting the first three, and the other same-sex actor presenting the other three verbal communications. The procedure for presenting each of the six verbal communication consisted of the following steps. The experimenter verbally provided the child with the following directions:

I'm going to show you a videotape of some children saying some things. What I'd like you to do is to tell me whether you think the boy/girl is telling the truth or whether he/she is lying. If you aren't sure which he/she is doing then tell me that you are not sure. It will take a few minutes. Do you want to come out of your class and do this or would you rather not? Do you understand what I mean?

If the child agreed to do the experiment, he/she was taken to the testing room and provided with the following instructions.

I'm going to show you a boy/girl and I want you to tell me what the boy/girl said. Then I'll ask you to tell me whether you think the boy/girl was lying, was telling the truth or that you aren't sure. Then I'll ask you why you think that way about the boy/girl. Do you understand? Do you have any questions about what I've said? There are no right or wrong answers, I'm just interested in what you think. In a few seconds I'm going to show you

the videotape. I want you to watch and listen really carefully to the boy/girl. O.K.? What did the boy/girl say? Do you think the boy/girl is telling the truth, lying or you aren't sure? Why did you think that? Why else did you think that?

The researcher copied down the subject's judgment as it corresponded to 3-point scale (1 = thinks he/she was telling the truth, 2 = unsure whether he/she was telling the truth or lying, 3 = thinks he/she was lying). The researcher also wrote verbatim the subject's explanations for each judgment.

Results

Truth/Lying Judgments

Subjects' truth/lying judgments were scored with larger numbers corresponding to greater lying. The lying scores were subjected to 2(sex of child) x 3(grade of child) x 2(levels of cue) ANOVA with repeated measures on the last variable. This ANOVA was carried out separately for each of the four types of cues: valence, gaze, limb movement, and vocal pitch. In those ANOVAs, the levels of cue corresponded to the two levels of cue under consideration: (a) for valence, liking vs not liking; (b) for gaze, direct vs indirect; (c) for limb

movement, nonactive vs active; and (d) for vocal pitch, normal vs high. The ANOVA of the valence cues included an additional variable of order as a repeated measure that corresponded to the order (1st, 2nd and 3rd) in which each liking and each not liking statement was presented. Significant differences between the means were determined by Tukey a posteriori comparisons at the .05 criteria.

Valence. The 2 x 3 x 2 x 3 (order) ANOVA of the lying scores yielded an effect of valence, $F(1, 66) = 8.74, p < .01$ that was qualified by a grade x valence interaction, $F(2, 66) = 6.55, p < .01$. The means are graphically shown in Figure 1. There was a decrease in lying scores assigned to “not liking” statements as a function of age; specifically, senior kindergarten subjects assigned greater lying to the “not liking” statements than did fourth grade subjects ($p < .01$). The senior kindergarten and second grade subjects assigned greater lying judgments to the “not liking” statements than the “liking” statements ($p < .01$ and $p < .05$, for the two grades respectively). Additionally, there was a tendency for fourth grade subjects to display the opposite pattern of judgment but that did not achieve significance.

Gaze. The 2 x 3 x 2 ANOVA of the lying scores yielded a sex x grade interaction, $F(2, 66) = 3.33, p < .05$. The means are

graphically shown in Figure 2. There was a decrease with age in females' lying judgments, with senior kindergarten females providing greater lying judgments than did fourth grade females ($p < .01$). Also, at senior kindergarten, females provided higher lying judgments than did males ($p < .05$). A trend towards a reverse pattern was shown by fourth grade, with males assigning greater lying judgments than did females.

One issue of concern during these analyses was whether there was any tendency for the older subjects to display the expected pattern of cue use. There was some evidence of this regarding gaze. Consistent with expectation, fourth grade subjects tended to assign greater lying judgements to indirect gaze ($M = 1.86$) than to direct gaze ($M = 1.63$).

Limb movement. The $2 \times 3 \times 2$ ANOVA of the lying scores did not yield significance. As in the previous analysis, an attempt was made to examine whether the expected pattern of cue use was evident in the older subjects. Consistent with expectations, fourth grade children did tend to assign greater lying judgments to limb movement ($M = 2.00$) than to no limb movement ($M = 1.67$) communications.

Vocal pitch. The $2 \times 3 \times 2$ ANOVA of the lying scores did not

yield significance. Although some differential pattern of cue use appeared to emerge in the older subjects, the pattern was contrary to expectation. Contrary to expectation, fourth grade subjects tended to assign higher lying judgments to normal vocal pitch ($M = 2.04$) than to high vocal pitch ($M = 1.71$).

Explanations

The subjects' explanations were coded by two naive raters, for reference to gaze, limb movements, and vocal pitch. The explanations were coded according to the categories of voice, face, eyes and body (the definitions for the categories are shown in Appendix C). Interrater agreement was examined by having the two naive coders score the same 25% of the protocols. The interrater agreement was 94% (agreements/ agreements and disagreements) which was an acceptable level. Then each of the two raters coded 50% of the protocols. The explanations were subjected to a 2(sex of child) x 3(grade of child) x 2(levels of cue) x 4 (explanation categories) hiloginear analysis. Similar to the ANOVAs, the analysis was carried out separately for three types of cues: gaze, limb movement, and vocal pitch. In those analyses, the levels of cue corresponded to the two levels of cue under consideration: (a) for gaze, direct vs indirect; (b) for limb movement, nonactive vs active;

and (c) for vocal pitch, normal vs high.

Gaze. The 2 x 3 x 2 x 4 hiloglinear analysis of gaze, indicated that one-way effects significantly accounted for the data , $\chi^2(7, N = 72) = 58.213, p < .01$ and also that a two-way interaction tended to account for the data, $\chi^2(17, N = 72) = 27.287, p = .06$. A main effect was found for category, $\chi^2(3, N = 72) = 39.205, p < .01$ in which facial expression (total = 21) and voice (total = 24) were the most dominant cue categories. There was also a main effect for grade $\chi^2(2, N = 72) = 15.336, p < .01$ that was qualified by a sex x grade interaction, $\chi^2(2, N = 72) = 8.764, p < .05$. The complete set of frequencies is shown in Table 1 while the interactions are shown in Table 2. All cue categories tended to be more frequently mentioned by females than by males in senior kindergarten and those sex differences declined with age (grade).

Limb movement. The 2 x 3 x 2 x 4 hiloglinear analysis of limb movement revealed that one-way effects accounted for the data , $\chi^2(7, N = 72) = 38.589, p < .01$ and two-way interactions accounted for the data, $\chi^2(17, N = 72) = 14.827, p < .05$. A main effect was also found for grade $\chi^2(2, N = 72) = 14.827, p < .01$ in which the cue categories noted increased with age (SK = 6, 2nd grade = 13 and 4th

grade = 28). A main effect was shown for category, $\chi^2(3, N = 72) = 23.388, p < .01$ that was qualified by a category x limb movement interaction $\chi^2(3, N = 72) = 11.838, p < .01$ and a category x sex interaction, $\chi^2(3, N = 72) = 11.923, p < .01$. The complete set of frequencies is shown in Table 3 , while the interactions are shown in Tables 4 and 5 respectively. With respect to the former interaction, the body cue was identified more for limb movement than when there was no limb movement. With respect to the latter interaction, males, it appears, identified the voice more than did females, whereas females identified the face more than did males.

Vocal pitch. The 2 x 3 x 2 x 4 hiloglinear analysis of vocal pitch, revealed that one-way main effects accounted for the data, $\chi^2(7, N = 72) = 57.587, p < .01$ and two-way interactions accounted for the data, $\chi^2(17, N = 72) = 39.123, p < .01$. A main effect was found for grade $\chi^2(2, N = 72) = 26.233, p < .01$ in which the cue categories noted increased with age (SK = 4, 2nd grade = 6 and 4th grade = 28). A main effect was also found for category, $\chi^2(3, N = 72) = 28.270, p < .01$ that was qualified by a category x pitch interaction $\chi^2(3, N = 72) = 8.996, p < .05$ and a category by sex interaction, $\chi^2(3, N = 72) = 12.294, p < .01$. The complete set of frequencies is shown in Table 6,

while the interactions are shown in Tables 7 and 8 respectively. With respect to the former interaction, the voice cue was identified more for high pitch than for normal pitch. With respect to the latter interaction, males, it appears, identified the voice more than did females, whereas females identified the face more than did males.

Discussion

Anxiety cues

The purpose of this research was to examine whether children of different ages use anxiety cues (gaze, limb movements, and vocal pitch) to detect deception. Generally the children did not use the cues in their judgment of lying. There was tentative evidence that the fourth grade children were beginning to consider these cues. This was shown in that the children were (a) beginning to identify the cues and (b) were providing greater lying judgments to statements accompanied by indirect gaze than to those accompanied by direct gaze, and to those accompanied by limb movement than to those accompanied by no limb movement. The fact that the cues were gaining use by the fourth grade children, indicates the importance of testing older children, perhaps sixth graders, on their use of these same cues.

Children revealed some sensitivity to the four cues in their

explanations of their lying judgments. Specifically, the children were more likely to note the body cue when limb movement was active than nonactive and were more likely to note the voice cue when vocal pitch was high than normal. If children were considering these cues, why weren't they using them in the expected manner?

One possible explanation for these findings is that although children were considering these cues they were not using them uniformly as a basis of inferring lying. For example, some children believed that indirect eye contact was indicative of truthfulness; whereas others may view such indirect gaze as indicating deception. It is essential that future researchers try to find what rules may be guiding children's judgments. It may be revealed that the guidelines which children are using are, in part, individualistic.

Valences

This research also examined whether children of different ages use valence cues (liking, not liking) to detect lying. Younger subjects, senior kindergarteners and second graders, tended to judge negative valenced statements as being more of a lie. There was a tendency for the fourth grade children to demonstrate a reverse pattern: they tended to judge the positive statements as indicating more lying than the negative statements. These findings are related

to previous research by both DePaulo et al (1982) and Rotenberg et al (1989).

DePaulo et al (1982) found that younger subjects, sixth, eighth, and tenth graders, perceived others as being more deceptive when they expressed negative (dislike and pretend-to-dislike) statements than when they expressed positive (like and pretend-to-like) ideas. They also noted that this tendency reversed with age, and the older subjects, tenth graders and college students, perceived the others as being more dishonest when their statements were positive as opposed to when they were negative. The present research is in some way similar to the previous findings in that comparable shifts in valence are found to be developing, however, the pattern in the present study is found with much younger children. The senior kindergarten perceived the negative statements as revealing more deception than the positive statements. The older subjects in this study, the fourth grade children, tended to demonstrate the opposite pattern; they provided greater lying judgments to those who made positive statements than to those who made negative remarks. That DePaulo et al (1982) found such patterns in older children, whereas this study showed the same tendencies in much younger children may be related to the procedures used. An explanations for the age

delay at which time the children use valence to infer lying in the DePaulo et al (1982) study as compared to the present study may relate to the differences in complexity between the two studies. The present study used single communications, whereas DePaulo et al (1982) used more complex and elaborate communications. Perhaps the children's' use of cues varies by the complexity of the communications provided.

The present findings bear a close similarity to those by Rotenberg et al (1989) Those researchers found that senior kindergarten children judged positive facial expressions as indicating the truth and negative facial expressions as indicating lying. In contrast, fourth grade children judged positive facial expressions as indicating lying and negative facial expressions as indicating the truth. It was suggested by these researchers that young children tend to have a "rose-colored" view of honesty, in that they associate that which is positive as being good and honest and that which is negative as being bad and a lie.

Grade and sex findings

A number of sex and grade differences were found in judgments provided by the children. It was found that in statements where gaze was varied, females showed a decrease in lying

judgments. As well, females in senior kindergarten assigned greater lying judgments than did males. A tendency towards a reversal emerged by fourth grade, in that males assigned greater lying judgments than did females.

Sex and grade differences were also found in explanations provided by the children. Senior kindergarten females noted more of the cue categories when the verbal communications were accompanied by gaze than did the males, and the differences between the sexes decreased with age. It appears that younger females are showing a greater sensitivity to the cues. They may have a more advanced use of cues and are considering them all which may be causing them to infer more lying.

Other sex differences were found as well. In children's' explanations of those statements where either limb movement or vocal pitch was varied, males identified the actor's voice significantly more than did the females; whereas females identified the actor's facial expressions more than did the males. At this point, It is unclear why these differences exist.

Researchers have examined such sex differences in adults. Hall (1978) reviewed studies that examined sex differences in judging nonverbal communications. Hall (1978, p.854) reports that

“the female advantage at judging nonverbal cues is stable” across age groups. An explanation of this relates to gender stereotypes, which suggest that both males and females learn from an early age how they “should act”. Females are taught to show their feelings more so than are males. Another explanation, given by Hall, (1978) is that females may be attuned from birth to either be extremely sensitive to nonverbal cues or to have the ability to learn these cues extremely quickly. She believes that evolutionally, this seems viable because a female’s sensitivity to nonverbal communications may help her in detecting threatening situations directed toward her offspring.

This review by Hall (1978) discusses aspects which are similar to the findings of the present research. There was marginal evidence that younger females may be more sensitive to the nonverbal cues and associate these cues with deception. When the statements were varied by gaze, the younger females showed a greater sensitivity than did males to the nonverbal cues. Females identified aspects of the facial expression more while males identified the aspects of the voice more. These findings are consistent across grade levels. Further research on the emergence of sex differences in the use of cues in the detection of deception is needed.

Finally, considering the children's explanations, there were increases in the types of cues children considered in detecting deception. This may reveal that there are increases with age in children's use of various cues to detect deception. Alternatively, the findings may be attributed to an increase with age in children's verbal ability and ability to articulate their thoughts.

Limitations with the study

One limitation of this study arises from the difficulty in generalizing the patterns of children's cue use to naturalistic situations. In an experimental task the children are more attuned to the cues presented to them. In the children's natural environment, however, these same cues may not be detected by them. It is important to examine children's use of cues in detecting deception in a number of more natural settings.

A second limitation concerns the role of chance in the present study. A number of analyses were carried out and the possibility exists that some findings may be due to chance. In future, researchers should examine the reliability of the findings.

Another limitation of the study relates to the anxiety cues which were manipulated in this study. These cues were used in a single fashion, in that only one cue was associated with each of the

verbal statements. This may be of concern in that children may actually be using a configuration of these cues when judging whether or not someone is lying to them. Perhaps future research could examine multiple cue combinations so as to acquire a deeper understanding of children's detection of deception.

References

- Bond, C. F, Jr., Kahler, K. N., & Paolicelli, L. M. (1985). The miscommunication of deception: An adaptive perspective. Journal of Experimental Social Psychology, 21, 331-345.
- Buck, R. (1984). The communication of emotion. New York: Guilford.
- Chandler, M., & Hala, S. (1991). Trust and children's developing theories of mind. In Ken J. Rotenberg (Ed.). Children's interpersonal trust: Sensitivity to lying, deception, and promise violations (pp. 257-292). New York: Springer-Verlag.
- Chandler, M., Fritz, A. S., & Hala, S. (1989). Small-scale deceit: Deception as a member of two- three- and four-year-olds' early theories of mind. Child Development, 60, 1263-1277.
- Depaulo, B. M., Stone, J. I. , Lassiter, G. D. (1985). Deceiving and detecting deceit. In Barry R. Schlenker (Ed.). The self and social life (pp. 323-370). New York: McGraw Hill.
- DePaulo, B. M., Jordan, A., Irvine, A., & Laser, P. S. (1982). Age changes in the detection of deception. Child Development, 53, 701-709.
- Feldman, R. S. & Philippot, P. (1991). Children's deception skills and social competence. In Ken J. Rotenberg (Ed.). Children's interpersonal trust: Sensitivity to lying, deception, and promise violations (pp. 80-99). New York: Springer-Verlag.

Feldman, R. S. & White, J. B. (1980). Detecting deception in children. Journal of Communication, 30, 121-128.

Feldman, R. S. (1976). Nonverbal disclosure of deception and interpersonal effect. Journal of Educational Psychology, 68, 807-816.

Hall, J. A. (1978). Gender effects in decoding nonverbal cues. Psychological Bulletin, 85(4), 845-857.

Harris, P. L., Donnelly, K., Guz, G. R., & Pitt-Watson, R. (1986). Children's understanding of the distinction between real and apparent emotion. Child Development, 57, 895-909.

Lickona, T. (1976). Research on Piaget's theory of moral development. In T. Lickona (Ed.). Moral development and behavior (pp.219-240). New York: Holt, Rinehart & Winston.

Olson, D., Astington, J. W., & Harris, P. L. (1988). Introduction. In Janet W. Astington, Paul L Harris & David R. Olson (Eds.). Developing theories of mind (pp. 1-15). Cambridge: Cambridge University Press.

Peterson, C. C. (1991). What is a lie? Children's use of intentions and consequences in lexical definitions and moral evaluations of lying. In Ken J. Rotenberg (Ed.). Children's interpersonal trust: Sensitivity to lying, deception and promise violations (pp. 5-19). New York:

Spring-Verlag.

Peterson, C. C., Peterson, J., & Seeto, D. (1983). Developmental

changes in ideas about lying. Child Development, 54, 1529-1535.

Piaget, J. (1932). The moral judgment of the child. London: Routledge, &

Kegan Paul.

Pope, W. R., & Forsyth, D. R. (1986). Judgments of deceptive

communications: A multidimensional analysis. Bulletin of the

Psychonomic Society, 24, 435-436.

Rotenberg, K. J. (1991). Children's cue use and strategies for detecting

deception. In K. J. Rotenberg (Ed.). Children's interpersonal trust:

Sensitivity to lying, deception and promise violations (pp. 43-57).

New York: Spring-Verlag.

Rotenberg, K. J., Simourd, L., & Moore, D. (1989). Children's use of

verbal-nonverbal consistency principle to infer truth and lying. Child

Development, 60, 309-322.

Saarni, C. (1979). Children's understanding of display rules for

expressive behavior. Developmental Psychology, 15, 424-429.

Saarni, C. (1988). Children's understanding of the interpersonal

consequences of dissemblance of nonverbal-expressive behavior.

Journal of Nonverbal Behavior, 12, 275-294.

Wimmer, H., Gruber, S., & Perner, J. (1984). Young children's conception

of lying: Lexical realism-moral subjectivism. Journal of Experimental Child Psychology, 37, 1-30.

Zuckerman, M., Koestner, R., & Driver, R. (1981). Beliefs about the cues associated with deception. Journal of Nonverbal Behavior, 6, 105-114.

Figure 1. Lying Judgments as a Function of Valence and Grade.

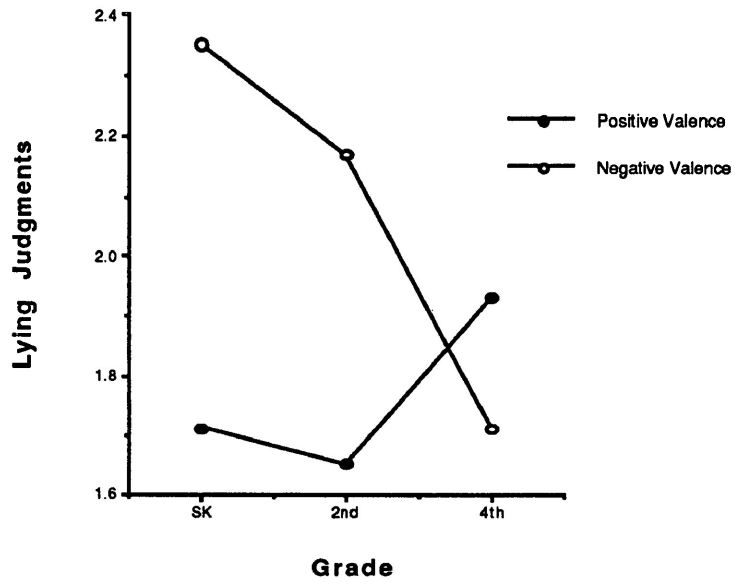


Figure 2. Lying Judgments as a Function of Sex and Grade.

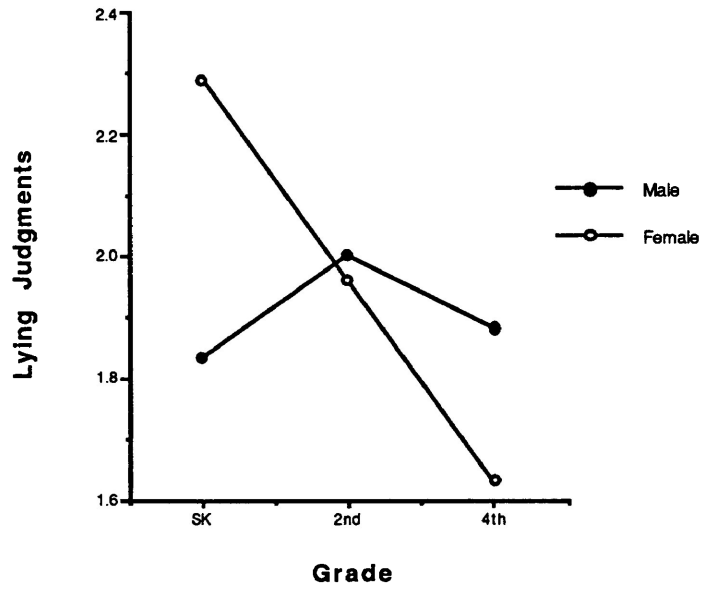


Table 1. Frequencies of cue categories as a function of grade and sex and gaze.

Cue category	Grade					
	Senior Kindergarten		Second		Fourth	
	M	F	M	F	M	F
Direct gaze						
Voice	0	1	1	1	5	2
Face	0	3	2	2	2	5
Eyes	0	0	0	0	0	1
Body	0	1	0	0	0	1
Indirect gaze						
Voice	1	0	1	1	6	2
Face	0	2	1	2	1	4
Eyes	0	0	2	1	0	3
Body	0	0	0	1	1	0
Totals	1	7	7	8	15	18

M, male; F, female

Table 2. Frequencies of cue categories for gaze as a function of grade and sex.

	Grade		
	Senior Kindergarten	Second	Fourth
Male	1	7	15
Female	7	8	18

Table 3. Frequencies of cue categories as a function of grade and sex and limb movement.

Cue category	Grade					
	<u>Senior Kindergarten</u>		<u>Second</u>		<u>Fourth</u>	
	M	F	M	F	M	F
No limb movement						
Voice	1	0	2	2	6	1
Face	0	2	0	2	2	3
Eyes	0	0	1	0	0	1
Body	0	0	0	0	0	0
Limb movement						
Voice	1	0	2	0	3	3
Face	0	2	1	2	0	4
Eyes	0	0	0	0	0	0
Body	0	1	0	1	2	3
Totals	2	4	6	7	13	15

M, male; F, female

Table 4. Frequencies of cue categories as a function of cues and limbs.

	Cue Category			
	Voice	Face	Eyes	Body
No limb movement	12	9	2	0
Limb movement	9	9	0	7

Table 5. Frequencies of cue categories for limbs as a function of cues and sex.

	Cue Category			
	Voice	Face	Eyes	Body
Male	15	3	1	2
Female	6	15	1	5

Table 6. Frequencies of cue categories as a function of grade and sex and pitch.

Cue category	Grade					
	Senior Kindergarten		Second		Fourth	
	M	F	M	F	M	F
Normal pitch						
Voice	0	0	1	0	4	1
Face	0	2	0	0	1	4
Eyes	0	0	0	0	1	0
Body	0	0	0	1	0	2
High pitch						
Voice	0	0	2	2	4	4
Face	0	2	0	0	1	6
Eyes	0	0	0	0	0	0
Body	0	0	0	0	0	0
Totals	0	4	3	3	11	17

M, male; F, female

Table 7. Frequencies of cue categories as a function of cues and pitch.

	Cue Category			
	Voice	Face	Eyes	Body
Normal pitch	6	7	1	3
High pitch	12	9	0	0

Table 8. Frequencies of cue categories of pitch as a function of cues and sex.

	Cue Category			
	Voice	Face	Eyes	Body
Male	11	2	1	0
Female	7	14	0	3

APPENDICES

Appendix A

Dear Parent/Guardian

We, Dr. Ken Rotenberg and Carey Sullivan from the psychology department at Lakehead University, would like to ask if you would permit your child to participate in a study that we are currently conducting. The purpose of the study is to obtain information about the types of cues that children at different ages use to judge whether someone is lying as opposed to telling the truth. In the study, the children will be presented a series of children (called actors) on videotape. Each actor will make a statement such as "I like that movie." The actors will vary the pitch of their voice (normal/high), show different types of gazing (direct/indirect), and show different limb movements (normal/nervous movements). The children will be asked to decide whether the actor was lying or telling the truth. The study has been approved by the Lakehead University Ethics Advisory Committee and Lakehead Public School Board.

The study will take about thirty minutes and will be conducted in class at school on an individual withdrawal basis. It should be emphasized that the present study is concerned with the general way that children of different ages respond and it is not concerned with any particular child. In effect, the responses of each child will be kept completely confidential and the findings will be considered and reported solely in terms of the responses of groups of children.

Please fill out the attached consent form if you are willing to have your child participate in the study. If you have any questions please do not hesitate to call either Dr. Ken Rotenberg at 343-8694, or Carey Sullivan at 623-7892.

Yours sincerely,

Carey Sullivan
M.A. candidate

Ken Rotenberg Ph.D.
Associate Professor

My signature on this form indicates that my child may participate in research by Carey Sullivan and Dr. Ken Rotenberg investigating children's use of cues to determine lying.

I understand the following:

- 1) My child is a volunteer and can withdraw from the research at any time.
- 2) I have received an explanation about the research and it's purpose.
- 3) There is no danger of physical or psychological harm.
- 4) The data provided by my child will be anonymous.
- 5) If I wish, I can obtain a summary of the project following its completion.

_____ (Signature of Parent or Guardian) _____ (Date)

_____ His/her sex: Male Female
(Child's name) Circle One

His/her birthdate: _____

His/her grade: _____

If you would like a summary of the general findings please print your address below:

(number and street) (City)

(Province) (Postal Code)

We are carrying out further research on related topics. Please indicate whether you and your child might be interested in participating by including your phone number below. You will be contacted regarding participation within the next month.

Phone #: _____

Appendix B

Parental Consent for Acting

This is to acknowledge that I give my permission for my child -
_____ - to serve as an actor in the study undertaken by Carey
Sullivan. I realize that this entails: (1) videotaping of my child; and (2) the viewing of
that videotape by other children. Furthermore, I understand that this will be carried out
at mutually agreed upon times after school and during the weekends.

Finally, although I realize that continued participation of my child is important once
begun, I realize that I can withdraw my child from the study at any time if I am
concerned about the effects of his/her participation.

Signed: _____
(Parent or Guardian)

Signed: _____
(Witness)

Appendix C

CODING SHEET

V = How something sounded or how it was said, such as speech rate, clarity of speech, aspects of the voice

F = Facial expression or facial movements, such as smiling, how the face looks

E = Gaze of the eyes or eye movement, such as rolling them, looking away

B = Body, limb or head movements, such as fidgeting, stiffness, hand movements

O = Other

DG

IG

NLM

LM

NP

HP

V

F

E

B

O
