

## Beliefs of Forensic Investigators Regarding Bi- and Uni-directional Behavior Analysis

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Bi-directional behavior analysis is an approach to detecting deceit in interviews in which investigators observe frequencies of interviewees' behaviors during non-threatening questioning, and compare those to frequencies exhibited when critical questions are asked. For example, an investigator would notice that an interviewee maintains eye contact during preliminary questioning but avoids it upon critical questioning. The key assertion of bi-directional behavior analysis is not that *decreases* in eye contact indicate deceit, but rather that the amount of eye contact has *changed*. The reverse scenario, in which eye contact is minimal during preliminary questioning and greater when critical questions are asked, also indicates deceit. Bi-directional behavior analysis does not suggest that the eye contact of deceivers decreases at critical points in interviews, that delays before answering become longer, that interviewees smile less, or that any other verbal or nonverbal behavior *either* increases or decreases. It does assert that eye contact may increase or decrease, delays in answering may be longer or shorter, interviewees may smile more or less, and so on. Many forensic training publications include examples of behaviors to which bi-directional behavior analysis is applied (e.g., Albrecht et al. 2006; Wells 2005). The bi-directional approach to observing behavioral changes is also an important element of The Reid Technique of Interviewing and Interrogation (Jayne and Buckley 1999).

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Uni-directional behavior analysis, on the other hand, recommends that investigators attend to direction-specific changes in verbal or nonverbal behaviors, such as increases in foot tapping, fidgeting, excessive sweating, and pulsation of the carotid artery (Rabon 2004). A common example is the following statement regarding decreased eye contact.

When you concentrate on facial expressions, your primary interest is eye contact. Eye contact primarily communicates the desire to make or avoid communication. People who feel shame normally drop their eyes to avoid returning glances. This reaction not only avoids seeing the disapproval, but also conceals personal shame and confusion (Albrecht et al. 2006, p. 285).

Although bi- and uni-directional behavior analysis draw inconsistent conclusions about how deceivers' behavior changes under questioning, it is not uncommon to find both approaches recommended in the same forensic training publication. For example, Albrecht et al. (2006) also states that deceivers' rate of speech will either speed up or slow down, contrary to the uni-directional approach in the preceding quotation. This inconsistency in such publications (see also Wells 2005) probably reflects a lack of agreement among forensic investigators regarding a significant aspect of judging behavior in interviews. In the eye contact example, investigators subscribing to bi- and uni-directional behavior analysis would draw different conclusions regarding deceit from the observation that eye contact increased when critical questions were asked. Only those applying bi-directional analysis would infer that deceit is more likely. The purpose of this study is to record what forensic investigators<sup>1</sup> believe about bi- versus uni-directional behavior analysis, and whether a majority of them subscribes to either approach. This may encourage discussion in the profession, and further research, regarding the relative merits of the two versions of behavior analysis.

The questionnaire instrument used in this study asked respondents to rate 13 behaviors, all of which have been studied in numerous psychology papers (Zuckerman et al. 1981a), for their ability to indicate deceit among interviewees. In addition to responses that behaviors may increase, decrease, or not change when people attempt to deceive, there was a “change” response option indicating that behaviors may increase or decrease. The latter option is consistent with bi-directional behavior analysis reasoning. Additionally, there were two groups of respondents: forensic investigators with backgrounds in policing (designated POL investigators), and forensic investigators with non-policing backgrounds (designated NP investigators, primarily with accounting backgrounds).

Across all 13 behaviors directional responses, investigators answered that deceivers would exhibit either more or less of a behavior almost 3.5 times more frequently than those who gave change responses. Therefore, this sample suggests that the uni-directional version of behavior analysis is the dominant view among forensic investigators. Policing experience did not affect responses, which were given in the same frequencies by POL and NP investigators.

Section 2 establishes that bi-directional behavior analysis has not been studied in prior research and presents two research questions based on the distinction between bi- and uni-directional analysis. The remaining sections cover the method, results, and conclusions.

## **RESEARCH QUESTIONS**

Survey research, in which people rate the association of verbal and non-verbal behaviors with deception, is extensive (e.g., Akehurst et al. 1996; Forrest et al. 2004; Granhag et al.

2004; Hocking and Leathers 1980; Lakhani and Taylor 2003; Stroemwall and Granhag 2003; and Zuckerman et al. 1981b). For example, in Zuckerman et al. (1981b), subjects rated deception on a nine-point scale ranging from +4 to -4, in which positive (negative) values indicated that the behavior increases (decreases) under deception and zero indicated that the behavior does not change under deception. The difficulty with this kind of scale is that it forces respondents to answer that any changes in behavior occur in strictly one direction. Forensic investigators subscribing to the bi-directional version of behavior analysis could not record their beliefs in such scales because they would be forced to indicate that behavior frequencies would either increase or decrease. It is remarkable that no extant survey research provides a response option consistent with bi-directional behavior analysis.

In this study, in addition to allowing responses indicating that a behavior increases, decreases, or stays the same when a person is attempting to deceive, a fourth option was provided by which respondents could indicate that the behavior may increase or decrease. Examples of such “bi-directional behavior analysis” change responses are that when interviewees are deceptive, they repeat words more or less often than when they are non-deceptive, they speak at a higher or lower pitch, and they make more or less hand to face gestures (see Figure 1 for all change responses). These responses indicate that behavior among deceivers is expected to change when they deceive (another response states that behavior will not change), but in either direction. Comparison to a baseline observation or calibration period of the interview is not stated in the change response to avoid demand effects, but would be assumed by respondents having behavior analysis experience. (See Appendix A, Figure 1).

Since no prior survey research has included change response options, the literature does not provide any basis for hypotheses regarding the frequency of such options among forensic investigators. Consequently, the first test is presented as a research question about the relative influence of bi- and uni-directional behavior analysis on beliefs of investigators.

RQ1: Does a majority of forensic investigators have beliefs about behavior frequencies consistent with the bi-directional version of behavior analysis or the uni-directional version?

Change answers suggest consistency with bi-directional behavior analysis and responses indicating that behaviors will either increase or decrease suggest support for the uni-directional version.

The practice of forensic investigation provides a rare opportunity to study the beliefs of professionals practicing in the same line of investigation, but having different backgrounds. Distinguishing truth from lies is a key skill for police officers, who can be called “professional lie catchers” (Frank and Feeley 2003, 59). Interviewing skills in general are also important to accountants and auditors (CICA 2000; Ramos 2004), but a difference in their skills versus those of former police officers is recognized in the common forensic practice of pairing an investigator with a background in policing with another having an accounting background for interviews.<sup>2</sup> Expertise of law enforcement officials in detecting deceit has been studied in experimental research (e.g., Ekman and O’Sullivan 1991; Garrido et al. 2004; Vrij 2004), but such research shares a deficiency of survey research; no change response options were given to participants attempting to detect deceit by observing verbal and non-verbal behavior. Therefore, extant research does not provide a basis for predicting that POL investigators should be more likely than NP investigators to apply either bi- or uni-directional behavior analysis. Nevertheless,

any differences regarding beliefs in behavior analysis that may arise between these investigator groups would inform practice, and these are given as the second research question.

RQ2: Do former police officers (POL investigators) and investigators without such backgrounds (NP investigators) have the same or different beliefs about behavior frequencies?

If selections of change answers differ between the two groups, then they may differ in adopting bi- versus uni-directional versions of behavior analysis.

## **METHOD**

### **Materials**

Part A of the questionnaire, in which participants indicated their beliefs about behaviors that may indicate deceit, appears in a condensed form in Figure 1. Respondents are asked to assume that an experienced investigator would be conducting an information interview. Four responses are given for each behavior: more of it is observed when an interviewee is being deceptive, less is observed, more or less may be observed depending on circumstances, and the same amount is observed as when interviewees are not being deceptive. The first and second responses are consistent with uni-directional behavior analysis, and the third is consistent with the bi-directional version.<sup>3</sup> Of the 13 behaviors listed in Figure 1, five are verbal or auditory and eight are non-verbal, and all of them were included in a meta-analysis of deceit by Zuckerman et al. (1981a).<sup>4</sup>

Part B of the questionnaire contained a blank page for answering an open-ended question about circumstances that affected their answers in Part A. Part C asked

demographic questions, including age, gender, professional designations held, and experience in law enforcement and forensic investigation.

### **Survey Method**

The questionnaire was mailed to 100 members of the Association of Forensic Investigators of Canada and a second questionnaire was sent one month later. Feedback on the project at a later date was the only incentive offered. Fifty-five responses were received, a response rate of 55 percent. Respondents worked in forensic accounting practices, large and small public accounting firms, government agencies, and insurance companies. Responses of early and late responders were compared for the 13 behavior ratings; no significant differences in the distribution of responses were found.<sup>5</sup>

## **RESULTS**

Eighty-two percent of the investigators were male and all had conducted interviews as part of a forensic or fraud investigation. Table 1, Panel A presents other demographic information regarding the investigators. Their average age was 48, 72 percent of their time was devoted to fraud or forensic work, they reported zero to 33 years of policing experience, and they averaged 14 years of forensic work experience. Table 1, Panels B (POL) and C (NP) present the demographic statistics for investigators with and without policing experience. The data are similar except that the POL sample spent more time in forensic work (mean = 83% vs. 64% for NP) and averaged less years in forensics (12 years vs. 15 years for NP). Of the 32 NP investigators, 21 (64%) had an accounting (CA, CGA, or CMA) or internal auditing designation. Eighty percent of the NP investigators

indicated that they had taken courses that covered interviewing methods or techniques. (See Appendix B, Table 1).

Table 2 presents frequencies of responses regarding beliefs about 13 behaviors. The research questions relate firstly to frequencies in the “more + less” columns, which is the sum of more than and less than frequencies, consistent with the uni-directional approach to behavior analysis. For example, in the case of posture shifts 52 percent of the total sample answered that deceivers shift more often and 15 percent answered less often, therefore 67 percent of the sample answered either more or less, consistent with uni-directional behavior analysis. Secondly, with regard to posture shifts only 22 percent of the total sample chose the “change” approach, indicating their belief that when interviewees attempt to deceive, they may shift more or less than when not attempting to deceive. These answers are consistent with bi-directional behavior analysis. (See Appendix B, Table 2).

For the total sample, the sum of more and less responses is greater than 50 percent for all 13 behaviors except pupil dilation (46 percent). The most frequent individual response is with regard to eye contact, where 89 percent believed that deceivers make less eye contact. Opinions about whether behaviors are more likely to increase or decrease are mixed regarding only three of them: pitch, answer length, and smiling. The sum of change responses ranges from 9 percent (eye contact) to 30 percent (smiling), far short of a majority for all behaviors. “No change” answers ranged from 2 percent (eye contact) to 30 percent (pupils dilate); pupil dilation was the only behavior for which no change was selected by more than 20 percent of respondents.

Table 3 presents frequencies of change answers, and the sum of more and less answers, for all 13 behavior questions. This includes all answers except “no change” responses and totals 626 answers across the whole sample of all investigators. Seventy-seven percent of these responses were that either more or less of a behavior would be observed among deceivers, a clear majority that suggests support among forensic investigators in general for the uni-directional version of behavior analysis, as described in RQ1. A binomial test indicates that the proportions of change, and all answers that were either more or less, are not equal ( $p < .001$ ).<sup>6</sup> (See Appendix B, Table 3).

Table 3 also shows that responses of POL and NP investigators were very similar (chi-square  $p = .545$ ). Approximately three-quarters of both groups answered that deceivers would exhibit either more or less of a behavior, 79 percent of POL investigators and 76 percent of NP investigators. This result suggests that, in answer to RQ2, a majority of both former police investigators and investigators without such backgrounds adopt the uni-directional version of behavior analysis.

### **Answers to the open-ended question**

An open-ended question asked for explanations of answers to the 13 behavior questions in Part A of the questionnaire. Thirty-one investigators wrote explanations containing anecdotes of their experience, limitations of behavior analysis, the need to consider clusters of behaviors, and other considerations. Following are some examples of their comments.

Behaviors were and are a useful tool, however the interviewer must be aware of the “normal” or standard behaviors of the subject prior to arriving at a conclusion.

Briefly talking about a neutral subject (i.e. weather) helps to establish a reference point from which to gauge/identify deceptive behavior.

People who say things like “I swear on my mother’s life” generally are trying to convince the interviewer they are NOT deceptive when typically they are deceptive.

One posture or body language cannot give a definite yes or no answer. You must also remember the experience of the liar. A good liar can deceive lie detector tests. So all verbal evidence should be tested or independently verified if possible.

The first two quotations refer to setting baseline behaviors, but neither uni- nor bi-directional behavior analysis is implied; most were similar to the latter two quotations and referred to other aspects of behavior analysis. Only two answers addressed directional analysis specifically, one stating that there is less eye contact among deceivers (a uni-directional explanation) and one that gave the following bi-directional explanation, also about eye contact.

Generally speaking the nervousness that accompanies lying translates into nervous gestures of hands, body, feet, eyes. However, in many cases I look for the change in behavior – that is by establishing a baseline if possible, then looking for changes. So, for example – in #8, if the individual is normally looking into my eyes then diverts them at some point then I feel they have lied. Conversely, if they have been shy and avoided looking directly at me then suddenly look directly at me to emphasize some point – I may also think they are lying, especially if other signals are present. I have experienced both scenarios. In the latter case they generally then look immediately away.

The open-ended question did not request explanations regarding uni- and bi-directional baselining specifically so that demand effects were avoided, consequently there is little written evidence on this topic. However, this quotation and the other unquoted response regarding eye contact strongly resemble published training recommendations supporting bi- and uni-directional approaches to analyzing eye contact.

## CONCLUSION

Conclusions are subject to the limitations of this study. The questionnaire did not measure strength of belief and variance in forensic experience in the sample may have reduced the power of tests of differences between the POL and NP groups (RQ2), as well as the ability to generalize results to the population of forensic investigators. Finally, the 13 behaviors included in the questionnaire were selected because they had been studied extensively in prior psychology research, including surveys and experiments. They are not the complete repertoire of behaviors that forensic investigators use to judge deceit, nor would all investigators necessarily consider all 13 to be relevant cues.

Nevertheless, the results suggest that a majority of forensic investigators believes that behaviors change in specified directions, either more or less frequent, when interviewees attempt to deceive. The strongest example of this belief was with regard to eye contact, where 89 percent of investigators believed that deceivers make less eye contact. This approach to behavior analysis, termed uni-directional in this paper, was reflected in survey responses over three times more often than the alternative bi-directional approach across all 13 behaviors. Answers consistent with bi-directional behavior analysis, in which behaviors among deceivers are believed to change but the direction of change is not specified, ranged from just 9 to 30 percent of total responses. Years of policing experience did not affect the results; former police officers were as likely as investigators without such experience to indicate beliefs consistent with uni-directional analysis.

The ultimate question is whether the majority of respondents in this sample is correct in conforming to uni-directional behavior analysis. However, all experimental research to date, in which deceiving and non-deceiving interviewees are videotaped and their behavior frequencies are compared, has been limited to uni-directional analysis (e.g., DePaulo et al. 1991; DePaulo et al. 2003; Ekman and O'Sullivan 1991; Frank and Ekman 1997; Garrido et al. 2004; Lee and Welker 2007; Vrij 2004). For instance, bi-directional analysis would require researchers or participants to attend to increases in eye contact in addition to decreases as conventional wisdom dictates, but this has not been done. This survey is preliminary in that it is the first study of any kind to encompass bi-directional behavior analysis, and it may motivate future research into the validity of forensic investigators' beliefs about behavioral indicators of deception. This may be as simple as re-coding video of research participants in prior studies (e.g., Lee and Welker 2007) who were instructed, and sometimes motivated by rewards, to deceive. Instead of coding for either increases or decreases in behaviors, changes regardless of direction would be recorded.

As was noted in the introduction, there are inconsistencies in published training materials regarding uni- versus bi-directional behavior analysis. Some behaviors are said to change in one direction only (increase or decrease) among deceivers, whereas novice investigators are advised to attend to other behavior changes regardless of the direction. Albrecht et al. (2006) and Wells (2005), standard textbooks on fraud examination, illustrate such inconsistencies. Both books state that crossing one's arms over the middle zones of the body increases when interviewees are deceptive, a uni-directional approach. Elsewhere, consistent with bi-directional behavior analysis, both assert that hand motions

may increase or decrease during threatening questions. Such inconsistencies regarding significant behaviors and how they change direction under deceit may confuse students of forensics.

Authors in forensic investigation may wish to clarify inconsistencies between the uni- and bi-directional approaches to behavior analysis. However, this task would not be as simple as pointing out that the majority of forensic investigators have beliefs consistent with the uni-directional approach; this is a preliminary study covering only 13 behaviors. Furthermore, research in social psychology has rarely consistently found unidirectional relationships. Studies have not found that reduced eye contact is an indicator of deceit, for example (Zuckerman et al. 1981a). Given such findings in social psychology, and the evidence that most investigators appear to apply the uni-directional approach to behavior analysis, we recommend that forensic educators and practitioners consider the bi-directional approach more thoroughly. For instance, there may be some interview situations where the bi-directional approach is appropriate, but others in which uni-directional analysis functions better. It may be helpful to question current beliefs, although until empirical evidence is available, we cannot say which version of behavior analysis serves the profession best.

## **Endnotes**

1. In this paper the term “forensic investigator” refers to experts whose primary training is in law enforcement and/or accounting and auditing, depending on the context.
2. This practice of pairing former police officers and accountants for interviews was noted by a forensic investigator who participated at the pilot stage of this study.
3. The wording of the third change response was suggested by an experienced forensic investigator in the pilot study. Comments and suggestions were received from six investigators.
4. All behaviors presented in Figure 1 may increase or decrease, thus have the potential to be bi-directional. Other behaviors can be expected to increase when interviewees attempt to deceive, but it is highly unlikely that they would decrease. An example is adding oaths such as “I swear to God” (Wells 2005). These strictly uni-directional behaviors have not been studied in prior research on deceit and have been omitted from the instrument.
5. Chi-square tests were used.
6. To investigate possible gender effects, the test was run on female respondents. A larger majority of 82 percent gave either more or less responses, consistent with results for the whole sample supporting the uni-directional approach.



**Appendix B**

**TABLE 1  
Demographics**

**Panel A  
All investigators (n = 55)**

	Minimum	Maximum	Mean/Median
Age	24	65	48/49
Percent forensic work	2%	100%	72%/80%
Years in policing	0	33	8/0
Years in forensics	2	31	14/14

**Panel B  
Investigators with policing experience (POL, n = 23)**

	Minimum	Maximum	Mean/Median
Age	33	59	48/50
Percent forensic work	20%	100%	83%/90%
Years in policing	2	33	19/20
Years in forensics	3	31	12/9

**Panel C  
Investigators without policing experience (NP, n = 32)**

	Minimum	Maximum	Mean/Median
Age	24	65	48/48
Percent forensic work	2%	100%	64%/70%
Years in policing	0	0	0/0
Years in forensics	2	31	15/15

**TABLE 2**  
**Percentages of Responses for 13 Behaviors**

**Blink**

	More	Less	More + Less*	Change	No change
Total sample	55	3	58	22	19
Policing	62	0	62	19	19
Non-policing	50	6	56	25	19

**Pupils dilate**

	More	Less	More + Less	Change	No change
Total sample	46	0	46	19	35
Policing	62	0	62	19	19
Non-policing	34	0	34	19	47

**Pitch**

	More	Less	More + Less	Change	No change
Total sample	37	24	61	26	13
Policing	45	23	68	32	0
Non-policing	31	25	56	22	22

**Head movements**

	More	Less	More + Less	Change	No change
Total sample	52	15	67	22	11
Policing	64	9	73	18	9
Non-policing	44	19	63	25	12

**Shift posture**

	More	Less	More + Less	Change	No change
Total sample	69	13	82	15	3
Policing	74	9	83	13	4
Non-policing	66	16	82	16	3

**Answer length**

	More	Less	More + Less	Change	No change
Total sample	44	33	77	20	3
Policing	43	35	78	17	4
Non-policing	44	31	75	22	3

**Smile**

	More	Less	More + Less	Change	No change
Total sample	20	33	53	30	17
Policing	18	45	63	32	5
Non-policing	22	25	47	28	25

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\* The more + less column is the sum of the more and less columns.

**TABLE 2 (continued)**  
**Percentages of Responses for 13 Behaviors**

**Hand to face gestures**

	More	Less	More + Less	Change	No change
Total sample	58	12	70	17	13
Policing	70	13	83	9	9
Non-policing	50	12	62	22	16

**Repeat words**

	More	Less	More + Less	Change	No change
Total sample	69	11	80	11	9
Policing	70	9	79	17	4
Non-policing	69	12	81	6	13

**Eye contact**

	More	Less	More + Less	Change	No change
Total sample	1	88	89	9	2
Policing	0	87	87	9	4
Non-policing	3	88	92	9	0

**Move legs and feet**

	More	Less	More + Less	Change	No change
Total sample	67	0	67	24	9
Policing	74	0	74	22	4
Non-policing	62	0	62	25	13

**Speech rate**

	More	Less	More + Less	Change	No change
Total sample	49	15	64	27	9
Policing	52	13	65	35	0
Non-policing	47	16	63	22	16

**Pause before answer**

	More	Less	More + Less	Change	No change
Total sample	55	20	75	20	6
Policing	56	13	69	22	9
Non-policing	53	25	78	19	3

**TABLE 3**  
**Frequencies (percentages) of Change Answers**  
**Sum of 13 Answers per Respondent over Respondents per Group**

	Change answers	Sum of more and less answers <sup>*</sup>	Total
Total	141 (23)	485 (77)	626 (100)
Policing (n=23)	58 (21)	213 (79)	271 (100)
Non-policing (n=32)	83 (24)	271 (76)	355 (100)

Binomial test of total sample,  $p < .001$

Chi-square test of policing vs. non-policing frequencies,  $p = .545$

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<sup>\*</sup> Column 3 in Table 2.

## References

- Akehurst, L., G. Kohnken, A. Vrij and R. Bull. 1996. Lay persons' and police officers' beliefs regarding deceptive behaviour. *Applied Cognitive Psychology* 10, pp. 461-471.
- Albrecht, S.W., C.C. Albrecht and C.O. Albrecht. 2006. *Fraud Examination* Second ed. Mason, OH: Thomson South-Western.
- CICA. Canadian Institute of Chartered Accountants. 2000. *Audit Enquiry: Seeking More Reliable Evidence from Audit Enquiry* Research Report.
- DePaulo, B., C. LeMay and J. Epstein. 1991. Effects of importance of success and expectations for success on effectiveness of deceiving. *Personality and Social Psychology Bulletin* 17: 14-24.
- DePaulo, B., J. Lindsay, B. Malone, L. Muhlenbruck, K. Charlton and H. Cooper. 2003. Cues to deception. *Psychological Bulletin* (January): 74-118.
- Ekman, P. and M. O'Sullivan. 1991. Who can catch a liar? *American Psychologist* (September): 913-920.
- Forrest, J., R. Feldman and J. Tyler. 2004. When accurate beliefs lead to better lie detection. *Journal of Applied Social Psychology* (April): 764-780.
- Frank, M. and P. Ekman. 1997. The ability to detect deceit generalizes across different types of high-stake lies. *Journal of Personality and Social Psychology* (June): 1429-1439.
- Frank, M. and T. Feeley. 2003. To catch a liar: challenges for research in lie detection training. *Journal of Applied Communication Research* (February): 58-75.
- Garrido, E., J. Masip and C. Herrero. 2004. Police officers' credibility judgments: accuracy and estimated ability. *International Journal of Psychology* (August): 254-275.
- Granhag, P., L. Andersson, L. Stromwall and M. Hartwig. 2004. Imprisoned knowledge: Criminals' beliefs about deception. *Legal and Criminal Psychology* (February): 103-119.
- Hocking, J. and D. Leathers. 1980. Nonverbal indicators of deception: A new theoretical perspective. *Communication Monographs* 47: 119-131.
- Jayne, B. and J. Buckley. 1999. *The Investigator Anthology* Chicago, IL: John E. Reid and Associates.

- Lakhani, M. and R. Taylor. 2003. Beliefs about cues to deception in high- and low-stakes situations. *Psychology, Crime and Law* (December): 357-368.
- Lee, C. and R. Welker. 2007. The effect of audit inquiries on the ability to detect financial misrepresentations. *Behavioral Research in Accounting* 19: 161-178.
- Rabon, D. 2004. Interviewing: Part two. *Fraud Magazine* pp. 22-24, 46-47.
- Ramos, M. 2004. *Fraud Detection in a GAAS Audit* Audit and Accounting Practice Aid Series. New York, NY: AICPA.
- Stroemwall, L. and P. Granhag. 2003. How to detect deception? Arresting the beliefs of police officers, prosecutors and judges. *Psychology, Crime and Law* (March): 19-36.
- Vrij, A. 2004. Why professionals fail to catch liars and how they can improve. *Legal and Criminological Psychology* (September): 159-181.
- Wells, J. 2005. *Principles of Fraud Examination* Hoboken, N.J.: John Wiley & Sons.
- Zuckerman, M., B. DePaulo and R. Rosenthal. 1981a. Verbal and Nonverbal Communication of Deception. *Advances in Experimental Social Psychology* 14: 1-59.
- Zuckerman, M., R. Koestner and R. Driver. 1981b. Beliefs about cues associated with deception. *Journal of Nonverbal Behavior* (Winter): 105-114.

## **Acknowledgements**

The author thanks the Association of Certified Forensic Investigators of Canada, and the ACFI members who participated in this study. Thanks also to David Elzinga, Glenn Feltham, Janet Morrill, workshop participants at the Certified General Accountants of Manitoba Accounting Research Conference and the Centre for Public Interest Accounting, University of Calgary, two anonymous reviewers, and to Shujun Ding for research assistance.

*The opinions of the authors are not necessarily those of Louisiana State University, the E.J. Ourso College of business, the LSU Accounting Department, or the Editor-In-Chief.*