

## Association for Information Systems AIS Electronic Library (AISeL)

---

AMCIS 2009 Doctoral Consortium

Americas Conference on Information Systems  
(AMCIS)

---

2009

# Deception Detection Theory as a Basis for an Automated Investigation of the Behavior Analysis Interview

Kevin Moffitt

*The University of Arizona*, [kmoffitt@cmi.arizona.edu](mailto:kmoffitt@cmi.arizona.edu)

Follow this and additional works at: [http://aisel.aisnet.org/amcis2009\\_dc](http://aisel.aisnet.org/amcis2009_dc)

---

### Recommended Citation

Moffitt, Kevin, "Deception Detection Theory as a Basis for an Automated Investigation of the Behavior Analysis Interview" (2009).  
*AMCIS 2009 Doctoral Consortium*. 21.  
[http://aisel.aisnet.org/amcis2009\\_dc/21](http://aisel.aisnet.org/amcis2009_dc/21)

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2009 Doctoral Consortium by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact [elibrary@aisnet.org](mailto:elibrary@aisnet.org).

# Deception Detection Theory as a Basis for an Automated Investigation of the Behavior Analysis Interview

Kevin Moffitt

The University of Arizona  
kmoffitt@cmi.arizona.edu

## ABSTRACT

Although over 150,000 law enforcement personnel have been trained to use the Behavior Analysis Interview (BAI), the interview technique has been subjected to very little scrutiny in the laboratory setting. Building on theories of deception from communication and psychology literature, I propose to mine key lexical features from the verbal content of responses to the Behavior Analysis Interview. I expect to find that the responses from deceptive interviewees will differ from truthful responses across multiple lexical dimensions. In addition, I expect responses in high-stakes environments to differ from responses in low- or medium-stakes contexts.

## Keywords

Behavior analysis interview, deception detection, text mining

## INTRODUCTION

The Behavior Analysis Interview (BAI) is the only standardized interviewing technique developed specifically to help discriminate between those who are 'likely to be guilty and those who are not' (Horvath, Blair and Buckley 2008). Over 150,000 law enforcement officers around the world have been trained to use the BAI, but there is still very little supporting scientific evidence (Blair and Kooi, 2004). The purpose of my dissertation is to study the BAI through the lens of current deception theory. In addition, I will study the BAI in low, medium and high stakes environments and on a question-by-question basis using text-mining methods and statistical natural language processing. These are novel approaches to studying the BAI that will provide much needed theoretical and experimental evidence for the interviewing tool's capabilities.

## LITERATURE REVIEW

The BAI was developed by John E. Reid and Associates, Inc., as a result of a field study conducted by Frank Horvath in 1973 (Blair and Horvath, unpublished manuscript). According to Blair et al., Frank Horvath studied the pre-test interview portion of the polygraph examination by carefully documenting the verbal and non-verbal behaviors of the interviewees. By comparing the truthful and deceptive interviewee responses to a model developed from practitioner experience, Horvath found that 77% of all the truthful subject's answers were of the "truthful type", while 66% of the deceivers' answers were of the "deceptive type". The results of this study led John Reid and Associates, Inc., to create a systematic interview for determining the guilt or innocence of an interviewee. The BAI is known among polygraph examiners as the "Reid Technique".

Although the BAI has been thoroughly documented for practitioners as an interviewing technique (Inbau, Reid, Buckley and Jayne, 2001), a paucity of related scholarly research has emerged. This has resulted in a failure to solidify the theoretical underpinnings of the technique. Vrij et al. (Vrij, Mann and Fisher, 2006) attempted the first experimental study of the BAI. The results of their study showed that the BAI did differentiate liars from deceivers, but that the results were in line with what deception theory would predict, not the BAI. According to Vrij et al., the predictions of deception theory are completely at odds with what the BAI would predict in terms of deceivers' behaviors. Unfortunately, Vrij only focused on the Impression Management Hypothesis and used it as a surrogate for "deception theory". This paper discusses numerous other deception theories and techniques. Other problems with Vrij's study are discussed later in this paper.

Blair et al. (unpublished manuscript) also endeavored to develop new insights into the theoretical foundation of the BAI. Their study first provided some theory development, largely based on Inbau et al.'s (2001) work, for each of the fifteen standard behavior provoking questions of the BAI. They also categorized the 15 questions into groups: self-presentation  
*Proceedings of the Fifteenth Americas Conference on Information Systems, San Francisco, California August 6<sup>th</sup> – 9<sup>th</sup>, 2009*

questions, information management questions, outcome questions, and developmental questions. Because the theory development on individual-questions was so reliant on the Inbau et al.'s work, the real contributions of this study are the categorizations of the questions and the accompanying experiment which, unlike Vrij et al.'s study, supports the propositions of the BAI.

A third paper (Horvath et al., 2008) describes the purpose of the BAI as a screening tool. The authors emphasize three major topics in the paper: (1) the BAI was designed as a screening tool to distinguish whether or not the interviewee is guilty of the crime in question, (2) the 'Sherlock Holmes Effect' is set forth and presented as the major distinguishing feature between innocent and guilty subjects, and (3) numerous research tips are revealed in an effort to direct and influence future BAI research.

First, Horvath et al. (2008) point out that the BAI, if conducted correctly, will result in a decision of either 'Eliminated from suspicion', or 'Not eliminated from suspicion'. They emphasize that the BAI is not used to expose deceivers, but rather find out if people are withholding information. They also say that the BAI is not limited to the police environment, but can also be used in scenarios such as employers investigating employee theft.

Second, the authors describe a phenomenon called the 'Sherlock Holmes Effect' as a principal discriminator between innocent and guilty subjects. This effect is present when an innocent subject who is familiar with the crime (and meets other preconditions) tries to mentally reason who could have committed the crime. Because of this effect, innocent subjects should respond differently to BAI questions such as, "who could have committed this crime," "how could this crime have been committed," and "what would motivate someone to commit this crime?" The description of the Sherlock Holmes Effect is perhaps the most substantial theoretical contribution to the BAI since the inception of the BAI.

Finally, the authors give detailed accounts of field studies and laboratory studies used to assess the BAI and recommendations for conducting future studies. The authors point out that the major shortcoming of field studies is the difficulty of establishing ground truth. Even confessions are not completely reliable due to the frequency of false confessions. While this frequency is unknown, separate studies have put the rate at somewhere between .001% and 12%. Laboratory studies, on the other hand, have the problem of establishing ecological validity. Horvath et al. point out that Vrij et al.'s (2006) study failed to meet all of the preconditions for the Sherlock Holmes effect to be present and that it was a very low-stakes scenario lacking in ecological validity. Horvath et al. recommend continued laboratory and field research with an emphasis of evaluating the presence of the Sherlock Holmes Effect. In order for this effect to be present, certain preconditions must be met and designed into experiments. They emphasize the importance of realistic designs that will provide results that benefit a real-world environment.

This dissertation project will combine many of the important features of the three papers discussed above. I experiments and one field study. Ground truth is firmly established in the field study by confessions and court-documented evidence. The questions will be analyzed as a whole, within the framework set forth by Blair et al. (unpublished manuscript) and individually. Multiple deception theories and established deception detection techniques with strong theoretical underpinnings will drive the hypotheses. The Sherlock Holmes Effect will be evaluated for each dataset.

## **Deception Theories**

This dissertation project will elevate the role of deception theories and deception detection methodologies with regard to responses to BAI questions. Prominent theories and methods for analyzing deceptive discourse include Content-Based Criteria Analysis (CBCA) (Vrij, 2005), Scientific Content Analysis (SCAN) (Driscoll 1994), Reality Monitoring (RM) (Johnson and Raye, 1981), Information Manipulation Theory (IMT) (McCornack 1992), Interpersonal Deception Theory (IDT) (Buller and Burgoon, 1996), Four Factor Theory (FFT) (Zuckerman, DePaulo, and Rosenthal, 1981), and Leakage Theory (Ekman and Friesen, 1969).

### **CBCA**

Content-Based Criteria Analysis (CBCA) is a method within Statement Validity Analysis, a technique developed to verify the veracity of a child's testimony in sex-crime cases. CBCA, however, has been used successfully in several different contexts. CBCA is based on the hypotheses that a statement based on fantasy will differ in quality and content than a statement based on actual experience. In CBCA trained evaluators judge the presence or absence of 19 criteria. The presence of each criterion suggests that the statement was derived from an actual experience, and is therefore not deceptive. Deceptive statements should lack more criteria than truthful statements. Only some of the CBCA criteria are currently amenable to automatic analysis by computers including quantity of details, and words associated with feelings, *Proceedings of the Fifteenth Americas Conference on Information Systems, San Francisco, California August 6<sup>th</sup> – 9<sup>th</sup>, 2009*

time and space. CBCA hypothesizes that truthful messages will contain more unusual details, more superfluous details, more details overall, and more references to time, space, and feelings than deceptive messages because statements derived from actual memories of an experience should contain more contextual details than deceptive statements.

### SCAN

Scientific Content Analysis (SCAN) is a unique version of CBCA that assumes that both deceivers and truth tellers are trying to convince the receiver of their truthfulness. Another important assumption of SCAN is that the sender carefully selects the details that enter into his/her account. This in turn suggests that each word is important in determining the veracity of a statement.

### RM

Reality Monitoring (RM) is a method that attempts to distinguish between memories based on true experiences from internally generated falsehoods or imagination. In RM, memory is differentiated from imagination by its truthfulness. RM hypothesizes that statements based on true memories and statements based on falsehoods differ in the amount of perceptual details, the amount of contextual information, and the quantity of cognitive operations described in the statements. RM hypothesizes that truthful statements will provide more sound, visual, and tactile details than a false statement as well as more contextual references to time and location. False statements, on the other hand, should mention more cognitive operations than truthful statements. Cognitive operations are processes or acts of the mind such as thinking, admitting, understanding, and hoping that are used by deceivers to facilitate inventing false stories. Thus, an increase in the number of cognitive operations used in a statement should throw into doubt the veridicality of that statement.

### IMT

Information Manipulation Theory bases its propositions on Grice's Conversational Implicature Theory which give four maxims for expectations from conversation. IMT states that deceivers covertly violate these maxims to dupe the receiver of the deception. The first maxim is the maxim of quantity. It relates to the amount of information that is shared in a message. It should neither be too little nor too much. Deceivers violate this maxim by withholding pertinent information while implying that they are sharing all of the information. Withholding information causes the receiver to be misled and come to an erroneous conclusion. The second maxim, the maxim of quality relates to the veridicality of the information shared. People expect to receive information that is 100% true without compromise. Deceivers violate this maxim by inventing falsehoods and bold-faced lies which are meant to mislead the receiver. Thirdly, the maxim of relation is one of structure that dictates that responses should always relate to the preceding discourse. Deceivers violate this maxim by introducing extraneous information into a conversation making it difficult for the receiver to receive correct information about the topic they are investigating. Fourth is the maxim of manner which dictates that conversations should be brief, orderly, clear, and unambiguous. This maxim is violated by removing clarity from a conversation and replacing it with ambiguity.

### IDT

Although Interpersonal Deception Theory is mainly concerned with deceptive interchanges dyadic and dialogic, the authors of IDT give many insights into how deceivers will behave in non-interactive, asynchronous settings in which documents like the MD&A occur. Interpersonal Deception Theory (IDT) merges principles from interpersonal communication and deception to deduce a series of 18 propositions that predict the behaviors of senders and receivers in an interactive context. Two important assumptions of IDT are that deception is goal-oriented and that deceivers want to minimize responsibility for their deceit if the deceit is discovered. Another important assumption of IDT is that deceivers strategically manipulate information to attain their goals. This goal can be accomplished by managing a message's completeness, truthfulness, and/or relevance. IDT notes that deceivers and truth tellers alike try to manage their image, but deceivers trying to hide guilt will more likely engage in image management by trying to falsely portray themselves in a more positive light than is warranted. Truthful interviewees will be more likely to include negative information about themselves if it is warranted. Finally, IDT notes that past research on non-interactive deception shows deceivers reduce specificity, use nonimmediate language, and use inclusive terms. These techniques will add ambiguity to statements.

### FFT

The Four Factor Theory describes the four processes or factors that influence deceivers' behaviors. The first factor is *Attempted Control* which refers to deceivers controlling their behavior in an attempt to conceal their deception. The

second factor is *Arousal* which refers to the autonomic response of the nervous system in the deceiver at the time of the deception. The third factor is *The Affective Approach* which refers to the emotions of guilt, anxiety, and duping delight that deceivers feel at the time of deception. These negative or unintended effects of deception may influence the deceivers to use nonimmediate language to disassociate themselves from the guilt induced by the deception. The final factor is *Cognitive Factors in Deception* which refers to the increased cognitive load deceivers bear when inventing lies.

### Leakage Theory

Leakage refers to unintentional behavioral cues that differentiate deceptive behavior from truthful behavior. These behavioral cues “leak” out because of a deceiver’s inability to completely match behavior he or she would normally exhibit in a non-deceptive situation. Examples of leakage by deceivers in face-to-face communication include an increase in shrugs, an increase in tension and fidgeting, a decrease in body and extremities movement, and a decrease in facial pleasantness (Vrij, Edward, Roberts and Bull, 2000). Leakage also occurs in verbal behavior as deceivers try and mimic an innocent or truthful subject’s responses.

In sum, these theories and methods provide a framework for understanding strategic and non-strategic deceptive behaviors of deceivers. IDT and IMT derive their propositions and hypotheses by focusing on deception as an intentional, strategic act. FFT and Leakage Theory focus on the unintentionally leaked cues during deceptive behavior. These approaches are not mutually independent since strategic behaviors are susceptible to leakage like any other behavior. Indeed, IDT and IMT posit the existence of leaked cues. CBCA, SCAN, and RM are tools for detecting specified leaked verbal cues. All of the theories also posit that deceivers and truth tellers exhibit different verbal behavior. IDT, FFT, and Leakage Theory also address kinesic and vocalic behavioral differences as well as differences in facial expressions.

### Natural Language Processing

Natural Language Processing is a research area that focuses on using computing power to process natural language text. NLP can be used to identify a variety of linguistic cues that act as variables for statistical analyses or machine learning algorithms. Both statistical and data mining techniques have been used to classify and predict deception using linguistic cues for various types of documents (reference). This study will identify the linguistic cues that should discriminate guilty subject’s responses from innocent subject’s responses to BAI questions. The linguistic cues will be selected based on an analysis of the deception theories described above and the types of questions that are asked in the BAI. In a previous study (Humpherys, Moffitt, Burgoon, Felix, and Burns, revise and resubmit), the following linguistic cues were selected to discriminate between truthful and deceptive discourse:

- **Affect:** *Activation Ratio:* number of activation words divided by the total number of words; *Affect Ratio:* Total number of affect words divided by the total number of words; *Imagery:* Number of imagery words divided by the total number of words; *Pleasantness Ratio:* number of pleasantness words.
- **Complexity:** *Average Sentence Length:* Number of words divided by total number of sentences; *Average Word Length:* Number of syllables divided by total number of words; *Pausality:* Number of punctuation marks divided by total number of sentences.
- **Diversity:** *Content Word Diversity:* Percentage of unique content words (number of different content words divided by total number of content words); *Function Word Diversity:* Number of function words divided by total number of sentences; *Lexical Diversity:* Percentage of unique words or terms out of total words.
- **Expressivity:** *Emotiveness:* Ratio of adjective and adverbs to nouns and verbs.
- **Nonimmediacy:** *Group References:* First person plural pronoun count; *Other References:* Count of all other singular or plural pronouns; *Passive Verb Ratio:* Number of passive verbs divided by total number of verbs.
- **Quantity:** *Modifier Quantity:* Total number of modifiers; *Sentence Quantity:* Total number of sentences; *Verb Quantity:* Total number of verbs; *Word Quantity:* Total number of words.
- **Specificity:** *Sensory Ratio:* Number of words referencing five senses, divided by total number of words; *Spatial Close Ratio, Spatial Far Ratio, Temporal Immediate Ratio, and Temporal Nonimmediate Ratio:* Number of words that reference temporal or spatial information divided by total number of words.
- **Uncertainty:** *Modal Verb Ratio:* Number of modal verbs divided by the total number of verbs.

For this dissertation project, these linguistic cues and others will be extracted from BAI discourse and analyzed. Overall, interviewees who are deceptive should exhibit verbal cues is differing quantities, or at different rates than interviewees who are truthful. Also, depending on the question, I expect cues to exhibit varying degrees of discriminatory power in differentiating between truthful and deceptive interviewees. Part of the project will be to determine which cues are more

salient for each question, which questions are more discriminative overall, and if the cues are strengthened or diminished based on the level of stakes of the interview.

## RESEARCH QUESTIONS

RQ1: Can linguistic cues discriminate between innocent and guilty interviewees in the BAI interview?

RQ2: Is the discriminatory power of a linguistic cue dependent on the particular question of the BAI interview?

RQ3: Do certain BAI questions give more linguistic evidence of guilt or innocence than other BAI questions?

RQ4: Is the discriminatory power of linguistic cues affected by the low-, medium-, or high-level stakes of the interview?

## METHODOLOGY

I will extract linguistic cues from transcribed versions of the three datasets. The subjects' data from the text-chatting condition of the mock theft experiments will not need to be transcribed. The cues will be extracted using tools GATE (Cunningham, 2002), as well as custom Python scripts. The data from each cue will be analyzed using independent sample t-tests to determine if there are differences between the means of the cues in deceptive and truthful discourse. Discriminant analysis as well as machine learning algorithms will perform classification of the text using 10-fold cross-validation. I will classify based a restricted model with just the significant linguistic cues (as determined by the t-tests) as well as with an inclusive model which contains all of the cues regardless of significance.

I will also test the importance of linguistic cues on a question-by-question basis. I will also examine the questions to see which ones provide the most discriminatory linguistic cues. I will compare all the results of the linguistic analysis across datasets. I expect the differences between truth tellers and deceivers to be more pronounced as the stakes and realistic nature of the data are increased. In other words, the mock theft experiment should exhibit less of a difference between truth tellers and deceivers while the BAI Field Data should exhibit the largest contrast (experiment descriptions are below).

### Datasets

#### *Mock Theft*

The Mock Theft dataset includes 185 participants. In this experiment, participants were recruited from a multi-sectioned communications class. Half of the subjects were randomly assigned to be 'thieves' and the remainder were assigned to be 'innocent' subjects. Subjects in the 'theft' condition were told to steal a wallet from a classroom. Innocent subjects were only told that a theft occurred on a previous day. Subjects were motivated by a \$10 reward for convincing interviewers that they were innocent of the crime. An addition incentive was a \$50 reward for the most convincing interviewee as judged by the interviewer. Interviewees were subjected to the BAI interview in one of three modalities: face to face (72 subjects), text-chatting (62 subjects), and audio conferencing (51 subjects). This study provided a comparatively low-stakes environment. The reward was generally low and the opportunity for the \$50 bonus was remote.

#### *Mock Crime*

The Mock Crime dataset includes 136 participants who all participated in the BAI interview. In the Mock Crime experiment, participants were subjected to a high-arousal and arguably higher-stakes scenario in which they could earn \$65 for just one hour of participation. In order to earn that money, participants had to successfully complete the experiment and convince an interviewer that they were innocent of the crime.

In the mock crime experiment, approximately half of the subjects were told to steal a ring from an office and convince a polygraph examiner of their innocence (they were not subjected to a polygraph test). The rest of the subjects were told to enter the room where the crime would take place, but were not told to steal the ring. They also had to convince the polygraph examiner, who was blind to subject conditions, that they were innocent. Subjects judged innocent by the examiner received a \$50 reward on top of \$15 an hour.

Subjects were recruited from the general population by newspaper ads. When subjects arrived for the experiment, they found themselves in an empty intake room with bookshelves and couches. A synthesized voice then directed them to another empty room where they received instructions for the experiment and signed a consent form. The absence of study personnel should have heightened the arousal of participants and put them in a more realistic position relative to the mock theft scenario. Subjects in the 'guilty' condition were told to approach an office in a nearby building, ask for a

Mr. Carlson, and then steal a ring when the secretary (a confederate) left the office in search of Mr. Carlson. After the guilty subject stole the ring they proceeded to the interview intake room and were subsequently interviewed about the incident. 'Innocent' subjects also asked for Mr. Carlson and entered the office and were then interviewed, but at no time did they steal a ring.

#### BAI Field Data

The BAI Field Data comes from actual BAI interviews from 177 that occurred before polygraph examinations. The examinations and interviews were of actual criminal suspects that have been subsequently convicted or exonerated from the crime for which they are being interviewed. Ground truth was established with confessions and criminal evidence linking suspects to the crime.

The Mock Theft interview and the Mock Crime interview did not contain all of the BAI questions. Table 1 shows which BAI question types appeared in which studies. Appendix A shows all of the BAI questions.

BAI Question Types				
		Mock Theft	Mock Crime	BAI Field Data
		Low Stakes	Medium Stakes	High Stakes
1	Purpose			X
2	History	X	X	X
3	Knowledge	X	X	X
4	Suspicion	X		X
5	Vouch		X	X
6	Credibility			X
7	Opportunity			X
8	Attitude		X	X
9	Think	X		X
10	Motive		X	X
11	Punishment	X	X	X
12	Second Chance	X	X	X
13	Objection			X
14	Results	X	X	X
15	Tell Loved Ones	X		X
16	Bait	X	X	X

Table 1. BAI items for each dataset

## CONCLUSION

The purpose of the BAI is to help investigators determine who is likely to have committed a crime. The purpose of this dissertation is to test the utility of linguistic cues, as identified by deception theory, in detecting deceptive interviewees who are lying about their involvement in a crime. The potential benefit of this experiment is a tool to aid investigators in solving criminal cases by lending credibility to an investigative tool and by aiding BAI interviewers in determining guilt and innocence. A failure to yield significant results in this study would suggest that the verbal component of the BAI is not useful in determining guilt or innocence and that an auditory or visual channel may be better suited for discovering criminals during the BAI. Further research would be needed to support or dispute these findings.

I am also investigating which questions included in the BAI yield more intensely discriminatory verbal cues. This approach may allow me to identify which questions are the most critical when conducting a verbal analysis. Also, during certain questions a particular linguistic cue may manifest itself as highly discriminatory while during other questions the same cue may be insignificant. Learning which cues are discriminatory for each question may help guide future research into how the BAI can be optimized.

Finally, I am investigating the BAI as it was administered in three scenarios with relatively high, medium, and low stakes. If the results are consistent in each scenario, this will suggest that the BAI is a highly robust instrument, immune to varying levels of stakes. If the results differ in each scenario, this will suggest that BAI studies conducted outside of

the field environment thus far do not maintain ecological validity and that future laboratory experiments should be designed to have higher fidelity to BAI interviews conducted in the field.

## REFERENCES

1. Blair, J.P. and Horvath F. (Unpublished Manuscript) Detection of Deception Accuracy Using the Verbal Component of the Behavior Analysis Interview Model, 1-28.
2. Blair, J.P. and Kooi, B. (2004) The Gap Between Training and Research in the Detection of Deception, *International Journal of Police Science & Management*, 6, 77-83.
3. Buller, D.B. and Burgoon, J. K. (1996) Interpersonal Deception Theory *Communication Theory*, 6, 203-242.
4. Cunningham, H. (2002) GATE, a General Architecture for Text Engineering, *Computers and the Humanities*, 36, 223-254.
5. Driscoll, L.N. (1994) A Validity Assessment of Written Statements from Suspects in Criminal Investigations Using the Scan Technique, *Police Studies: The International Review of Police Development*, 17, 4, 77-88.
6. Ekman, P. and Friesen, W.V. (1969) Nonverbal Leakage and Clues to Deception, *Psychiatry* 32, 88-106.
7. Horvath, F., Blair, J.P. and Buckley, J.P. (2008) The Behavioural Analysis Interview: Clarifying The Practice, Theory And Understanding Of Its Use And Effectiveness, *International Journal of Police Science & Management*, 10, 101-118.
8. Humpherys, S., Moffitt, K., Burgoon, J.K., Felix, W. and Burns, M. (In Review) Identification of Fraudulent Financial Statements Using Linguistic Credibility Analysis, *Decision Support Systems*, 1-33.
9. Inbau, F.E., Reid, J.E., Buckley, J.P. and Jayne, B.P. (2001) *Criminal Interrogation and Confessions*, 4th ed., Jones & Bartlett Publishers, London.
10. Johnson, M. and Raye, C. (1981) Reality Monitoring, *Psychological Review*, 88, 67-85.
11. McCornack, S.A. (1992) Information Manipulation Theory, *Communication Monographs*, 59, 1-16.
12. Vrij, A. (2005) Criteria-Based Content Analysis: A Qualitative Review of the First 37 Studies, *Psychology, Public Policy, and Law*, 11, 3-41.
13. Vrij, A., Edward, K., Roberts, K.P. and Bull, R. (2000) Detecting Deceit via Analysis of Verbal and Nonverbal Behavior, *Journal of Nonverbal Behavior*, 24, 239-263.
14. Vrij, A., Mann, S. and Fisher, R. (2006) An Empirical Test of the Behaviour Analysis Interview, *Law and Human Behavior*, 30, 329-345.
15. Zuckerman, M., DePaulo, B.M. and Rosenthal, R. (1981) "Verbal and Nonverbal Communication of Deception, *Advances In Experimental Social Psychology*. New York, NY: Academic Press.



**APPENDIX A**

BAI Questions (adapted from Inbau et al. 2001)

1. Purpose: Jim, what is your understanding of the purpose for this interview with me here today?
2. History/You: Did you start the fire (Or: If you had anything to do with starting the fire, you should tell me now.
3. Knowledge: Jim, do you know who started the fire?
4. Suspicion: Jim, who do you suspect started the fire? Now let me explain that a suspicion may just be a gut feeling on your part and you may be completely wrong. But I've found that in situations like this almost everyone will have thoughts about other people. Any name you give will not be released back to that person. Who do you suspect may have done this?
5. Vouch: Jim, of the people who work at the warehouse, is there anyone you feel certain did not start the fire, where you could vouch for that person's innocence?
6. Credibility: Jim, do you think that someone did purposefully start this fire?
7. Opportunity: Jim, who would have had the best opportunity to start this fire if they wanted to? I'm not saying that this person did it, but who would have had the best chance to start the fire?
8. Attitude: Jim, how do you feel about being interviewed concerning the fire?
9. Think: Jim, have you ever just thought about doing something to get even with the company?
10. Motive: Jim, why do you think someone did start the fire?
11. Punishment: Jim, what do you think should happen to the person who did start this fire?
12. Second Chance: Jim, under any circumstances do you think the person who started that fire should be given a second chance?
13. Objection: Jim, tell me why you wouldn't do something like this?
14. Results: Jim, once we complete our entire investigation, what do you think the results will be with respect to your involvement in starting this fire?
15. Tell Loved Ones: Who did you tell about your interview with me today?
16. (The Bait Question is not a standard part of the BAI, but exists in all of the datasets)