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Does contextual information improve the detection of deceptive behavioral cues?

Kristen Alicia Slapinski

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Does contextual information improve the detection of deceptive behavioral cues?

by

Kristen A. Slapinski

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Major: Psychology

Program of Study Committee:
Stephanie Madon, Co-major Professor
Max Guyll, Co-major Professor
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The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this thesis. The Graduate College will ensure this thesis is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University
Ames, Iowa
2020

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ABSTRACT

Influential interrogation manuals assert that investigators can detect deception from a suspect’s behaviors with high rates of accuracy when they have access to contextual information about the crime (e.g., case facts, witness statements, forensic evidence). The current study provided the first empirical test of this claim. Undergraduate participants were presented with statements made by either a liar or truth-teller who denied involvement in a real transgression and judged whether they believed that the individual was lying or telling the truth. While making this judgment, participants were either able or unable to observe the individual’s behavior and received or did not receive relevant contextual information about the alleged transgression. Results provided no evidence that the provision of behavioral cues or contextual information affected accuracy of participants’ judgments independently or in combination. Exploratory analyses revealed that behavioral cues biased judgments toward deception, while contextual information biased judgments toward truth. These findings suggest that the evaluation of behavioral cues may put innocent suspects at risk of being misclassified as deceptive, whereas the provision of contextual information may bias judgments toward truth or exacerbate individuals’ pre-existing biases.
CHAPTER 1. GENERAL INTRODUCTION

Proponents of influential interrogation methods claim that suspects leak behavioral cues during questioning (e.g., fidgeting, hesitance, crossed-arms) that can be detected and interpreted by investigators to distinguish truth from deception with high rates of accuracy (Inbau, Reid, Buckley, & Jayne, 2013). Accordingly, the initial phase of an interrogation is often dedicated to ascertaining whether suspects, on the basis of their behavior, are being truthful or deceptive. Suspects deemed deceptive are often subjected to a coercive interrogation. Because coercive interrogations can lead innocent suspects to falsely confess, and because false confessions are a leading cause of wrongful conviction, it is critically important that innocent suspects not be misclassified as deceptive on the basis of their behavior (Kassin, 2014).

However, the deception detection literature has repeatedly shown that people’s ability to detect deception from behavioral cues is little better than chance, leading researchers to conclude that the interpretation of a suspect’s behaviors is of little value for detecting deception (Bond & DePaulo, 2006). Proponents of Reid-style interviewing and interrogation methods have argued that studies showing near chance effects are not valid indicators of deception detection accuracy due to limited ecological validity. For example, proponents of these methods partially attribute the tendency of prior research to find near chance accuracy rates to the absence of relevant contextual information about the event that is typically provided to investigators, and which presumably promotes the accurate assessment of a suspect’s behavioral cues (see Inbau, Reid, Buckley, & Jayne, 2013).

The objective of this research was to provide the first empirical test of the claim that the presence of contextual information improves deception detection accuracy. The current chapter addresses three issues that are directly relevant to this issue. First, it describes different sources
of cues that have the potential to aid in the detection of deception, including those that involve
the interpretation of behavioral cues and others that involve a content analysis of an individual’s
statements. Second, the chapter reviews research relevant to the claim that contextual
information increases deception detection accuracy. Finally, the chapter discusses a possible
psychological mechanism through which contextual information could increase the accuracy of
detecting deception from behavioral cues.

**Background**

In several personal and professional domains—politics, national security, marriage,
business, and police interrogation—the ability to accurately distinguish between truth and
deception is potentially advantageous. Unsurprisingly, deception and its detection have garnered
extensive attention in the psychological literature and generated considerable public interest.
However, the psychological literature indicates that laypeople and police investigators exhibit
deception detection abilities that are generally poor, and that there are no behaviors uniquely
associated with truth or deception (Bond & DePaulo, 2006).

In response to this finding, scholars have proposed that other cues to deception exist
within the content of an individual’s verbal statements that can be detected and interpreted with
higher accuracy than relying on the interpretation of behavioral cues alone. Indeed, there are
multiple sources of information that individuals can rely upon when attempting to detect
deception, including both the individual’s behaviors and the content of their spoken statements.
The following section reviews research relevant to two classes of cues to deception that have
been identified in the literature: behavioral cues and statement cues.
Potential Cues to Deception

The literature has identified two broad classes of cues that have the potential to reveal deception: behavioral cues and statement cues. Behavioral cues include non-verbal and paraverbal behaviors. Statement cues include content cues and correspondence cues. The following sections describe behavioral cues and statement cues in more detail.

Behavioral Cues

In the typical deception detection paradigm, some participants (judges) evaluate the veracity of statements made by other participants (senders) on the basis of non-verbal (e.g., body language) and paraverbal (e.g., voice tone, pitch, hesitancy) behavioral cues. The interpretation of behavioral cues to deception rests on the assumption that deception is accompanied by feelings of fear, guilt, or excitement that manifest themselves in a sender’s non-verbal and paraverbal behaviors (Trovillo, 1939; Ekman, 1985). For instance, according to the theory of emotional leakage (Ekman & Friesen, 1969), behavioral cues to deception can be detected via microexpressions of excitement, fear, or guilt that flash across a sender’s face for milliseconds.

Building upon this assumption, other theories have attempted to identify the conditions under which these behavioral cues are more likely to emerge. For example, some theories hypothesize that behavioral cues to deception are more likely when a liar experiences heightened emotions or cognitive load (Zuckerman, DePaulo, & Rosenthal, 1981), when deception is attempted in high stakes situations (DePaulo, Ansfield, & Bell, 1996), and in response to certain investigator behaviors (Buller & Burgoon, 1996). The interpretation of behavioral cues is recommended in police interrogation manuals (see Inbau, Reid, Buckley, & Jayne, 2013) and laypeople generally believe that behavioral cues to deception exist, such as the belief that liars avoid eye contact (Taylor & Hick, 2007; Vrij, Akehurst, & Knight, 2006).
However, the scientific study of deception detection indicates that deception detection accuracy is only slightly above chance. Most notably, a meta-analysis of 206 deception detection studies found that judges accurately classified lies and truths at a rate of 54%, only 4% better than what would be expected by chance alone (Bond & DePaulo, 2006). There are two related explanations that may account for this finding. First, liars and truth-tellers can experience similar feelings of fear and stress, suggesting that behavioral cues indicative of internal emotions are unreliable indicators of deception (DePaulo, Lindsay, Malone, Muhlenbruck, Charlton, & Cooper, 2003; Ofshe & Leo, 1997). Second, the actual behaviors of liars versus truth-tellers tend to be more similar than different, and the few behavioral cues that do distinguish between them tend to be faint (see DePaulo et al., 2003; Sporer & Schwandt, 2006, 2007).

Consistent with these findings, there is some indication in the empirical literature that the presence of behavioral cues can be detrimental to deception detection accuracy. In particular, there is evidence that judges become less accurate at detecting deception when non-verbal behavioral cues are present than when they are absent (Anderson, DePaulo, Ansfield, Tickle, & Green, 1999; Bond & DePaulo, 2006; Mann, Vrij, & Bull, 2004). For example, when judges assessed audio or videotaped statements of senders either truthfully or deceptively confessing to crime, accuracy rates were lower for those assessing videotaped statements that included both paraverbal and non-verbal behaviors than those assessing audiotaped statements that included only paraverbal behaviors (Kassin, Meissner, & Norwick, 2005). Thus, the addition of non-verbal behaviors decreased accuracy. Similarly, while paraverbal behaviors do not appear to be particularly detrimental, they do not increase deception detection accuracy. For example, judges are no more accurate at identifying deception from audio or audiovisual presentations of a sender’s statements than they are at identifying deception from transcripts of a sender’s
statements (Bond & DePaulo, 2006). The findings that non-verbal behaviors are detrimental to accuracy and paraverbal behaviors are largely unhelpful raises the possibility that the interpretation of behavioral cues may generally be detrimental to deception detection accuracy.

**Statement Cues**

In response to mounting evidence that judges are not able to accurately distinguish between truth and deception through the interpretation of behavioral cues alone, some researchers have suggested that higher accuracy rates might be obtained if judges based their evaluations on statement cues – i.e., cues to deception contained within the verbal content of statements (Blair, Levine, & Shaw, 2010; Köhnken, 1987; Reinhard, Sporer, Scharmach, & Marksteiner, 2011). Importantly, the interpretation of statement cues to deception does not necessitate the observation of behavior. This is because statement cues can be available even when behavioral cues are absent, such as when judges are presented with a transcript of a sender’s statements. As briefly noted above, the literature has distinguished between two types of statement cues: content cues and correspondence cues.

**Content Cues**

Content cues refer to the verbal content of a sender’s statement, such as the amount of detail, consistency, completeness, and vividness the statement conveys (Reinhard, Sporer, Scharmach, & Marksteiner, 2011). Research shows that liars' and truth-tellers' statements differ in terms of content cues. Liars, for instance, make statements that are less detailed, consistent, and plausible than those made by truth-tellers (DePaulo et al., 2003).

There is increasing evidence that relying on the analysis of content cues improves deception detection accuracy (Reinhard, Sporer, Scharmach, & Marksteiner, 2011; Reinhard, Sporer, & Scharmach, 2013), and this has led researchers to develop new techniques to aid in
deception detection. For example, content-based criteria analysis, which was developed specifically for cases of suspected child sexual abuse, assesses truthfulness by analyzing the content cues within a child’s statement, such as the degree to which the statements are characterized by a logical structure and unusual or superfluous details (Steller & Köhnken, 1989). Empirical research has shown that truthful versus deceptive accounts differ on these criteria, thereby supporting the efficacy of using this method to distinguish between truth and deception (Lamb et al., 1997; Vrij, 2005; Vrij, Akehurst, Soukara, & Bull, 2002). Similarly, the verifiability approach trains investigators to ask suspects to provide verifiable details about their alibi. Because deceptive suspects tend to provide fewer verifiable details than truth-tellers, assessing this content cue increases deception detection accuracy (Nahari, Vrij, & Fisher, 2012; Vrij & Nahari, 2019). Overall, the effectiveness of these methods suggest that assessing content cues, such as the number of details reported, can increase deception detection accuracy rates.

**Correspondence Cues**

By contrast, correspondence cues are cues to deception that are derived from an analysis of consistency between the verbal content of a sender’s statements and contextual information about the crime (e.g., evidence, witness statements). Presumably, truthful senders will tend to make statements that correspond to the contextual information, whereas deceptive senders will tend to make statements that do not correspond to the contextual information. For example, if the police identified a suspect’s fingerprints at a crime scene, but the suspect denies ever having been there, then the investigator can infer that the suspect is probably lying. Investigators often rely on correspondence cues to arrive at judgments of deception (Granhag & Strömwall, 1999; Granhag & Strömwall, 2002; Granhag, Strömwall, & Jonsson, 2003), and empirical research has
demonstrated that judges achieve superior accuracy rates when they are able to interpret correspondence cues (Blair, Levine, & Shaw, 2010; Blair, Reimer, & Levine, 2018).

**Contextual Information and Deception Detection**

The provision of crime-related contextual information – for instance, the provision of case facts, witness statements, and/or forensic evidence – has the potential to increase deception detection accuracy through three mechanisms: (1) by increasing judges’ reliance on content cues; (2) by providing judges the opportunity to detect correspondence cues; (3) by facilitating the accurate interpretation of behavioral cues to deception. These mechanisms are described in detail below.

**Increasing Reliance on Content Cues**

There is some evidence that the provision of crime-relevant contextual information can improve the interpretation of content cues to deception. For example, judges who were provided with contextual information reported relying more heavily on content cues to deception, and thereby demonstrated greater deception detection accuracy than judges who were not provided with contextual information (Reinhard, Sporer, Scharmach, & Marksteiner, 2011; Reinhard, Sporer, & Scharmach, 2013). Importantly, this effect occurred even though the contextual information contained no information that could be directly compared to the content of the suspect’s statement. This suggests that the provision of relevant contextual information may increase judges’ perceived familiarity with a situation. In turn, because judges feel more familiar with the situation, they may be more likely to attend to content cues to deception over behavioral cues. The tendency to rely more on diagnostic content cues than behavioral cues may enable judges to better distinguish between liars and truth-tellers.
Providing an Opportunity to Detect Correspondence Cues

By definition, the interpretation of correspondence cues to deception necessitates having knowledge of crime-relevant contextual information. Accordingly, contextual information increases deception detection accuracy by creating the potential for correspondence cues to signal when the verbal content of a sender’s statement fails to correspond to known contextual information (Blair, Levine, & Shaw, 2010; Blair, Reimer, & Levine, 2018; Reinhard, Sporer, Scharmach, & Marksteiner, 2011). For example, in an alleged cheating incident, judges who were provided with contextual information indicating that a set of logic problems were so difficult that no one could get more than two correct without cheating achieved a higher deception detection accuracy rate than those who were not provided with this contextual information (Blair, Levine, & Shaw, 2010). Overall, this suggests that the interpretation of correspondence cues increases the accuracy of deception detection judgments independently of behavioral cues and content cues.

Recognizing the potential utility of correspondence cues, researchers have developed several deception detection techniques that emphasize the importance of attending to correspondence cues. The strategic use of evidence technique, for example, trains judges to use contextual information to elicit correspondence cues to deception, leading to an increase in deception detection accuracy. Specifically, judges are trained to acquire relevant evidence and contextual information pertinent to the suspect and the crime prior to an interview, to ask increasingly specific questions about the withheld evidence during the interview, and only at the end of the interview to reveal the evidence they have. The objective is to keep senders unaware of known evidence in order to elicit more statement-evidence inconsistencies that are likely to be indicative of deception (see Granhag, Strömwall, Willen, & Hartwig, 2012; Hartwig, Granhag,
Strömwall, & Kronkvist, 2006; Hartwig, Granhag, Strömwall, & Vrij, 2005). Judges who use this technique exhibit superior accuracy compared to those who do not use the technique (Hartwig, Granhag, Strömwall, & Kronkvist, 2006).

The effectiveness of using contextual information to detect correspondence cues to deception is also supported by other deception detection methods. For example, investigators using cognitive load approaches are trained to increase the suspect’s attentional demands in order to elicit contradictions between their statements and known contextual information, thereby increasing deception detection accuracy (Vrij, Fisher, Mann, & Leal, 2008). Overall, this suggests that training methods that elicit correspondence cues between the content of a sender’s statement and contextual information can improve deception detection accuracy.

**Facilitating the Accurate Interpretation of Behavioral Cues**

A third mechanism by which contextual information could increase accuracy is through the interpretation of behavioral cues. According to proponents of the Reid Technique of Interviewing and Interrogation—the most commonly used police interrogation manual in the world—providing contextual information to judges increases deception detection accuracy by facilitating the degree to which they accurately interpret suspects’ non-verbal and paraverbal behavioral cues to deception (Inbau, Reid, Buckley, & Jayne, 2013). For example, to address criticisms of their behavior-based deception detection methods, authors of the training manual (Inbau, Reid, Buckley, & Jayne, 2013) argue that the ability for judges to accurately interpret behavioral cues to deception increases when they are provided with contextual information: “When an investigator understands the context in which an interview is taking place (for example, the case facts and background information) accuracy in the assessment of a subject’s behavior symptoms greatly increases.” (p. 103).
Moreover, the authors claim that many deception detection studies have failed to yield high accuracy rates, in part, because: “There was little consideration given to evaluating behaviors in context. For example, identifying whether specific non-verbal behaviors are appropriate given the verbal content of the suspect’s response, identifying the consistency of the suspect’s statement across time and with known evidence, and so on.” (p. 104). Thus, while the authors do note that contextual information may increase accuracy through mechanisms such as content or correspondence cues, they additionally argue that contextual information should orient the investigator’s attention toward specific non-verbal behaviors indicative of deception. In other words, the authors of the training manual do not merely argue that contextual information improves deception detection by orienting the investigator’s attention toward content cues, or by initiating a comparison between contextual information and the content of a suspect’s statement. Instead, they argue that contextual information provides the foundation for the accurate interpretation of behavioral cues to deception.

Presuming this to be true, the training manual specifically instructs police to use case-relevant contextual information when interpreting a suspect’s behavioral cues for deception. In fact, the manual includes a non-verbal lie detection method of questioning, the Behavior Analysis Interview—a non-accusatory interview conducted before an interrogation in which investigators are encouraged to interpret a suspect’s behaviors in order to determine if the suspect is being truthful or deceptive. This evaluation is then used as the basis for deciding whether or not to proceed with an accusatory interrogation.

The behavioral analysis interview involves first collecting background information from the suspect in order to establish a sense of the suspects’ normative or baseline behaviors. Then, the interview proceeds by asking the suspect a series of fifteen behavior-provoking questions.
For example, in an alleged theft case, behavior-provoking questions might include “Do you know who stole the money?” and “Have you ever thought about stealing money?”. According to the manual, these behavior-provoking questions mobilize guilty individuals, thereby increasing physiological arousal and excitement. For example, compared to innocent suspects, guilty suspects undergoing a behavior analysis interview are expected to be less helpful and sincere and to exhibit more behaviors indicative of nervousness, such as by appearing more guarded, having a closed, static, and non-frontal body posture, and displaying less illustrative behaviors with their hands (Inbau, Reid, Buckley, & Jayne, 2013). Because these questions are intended to elicit different behavioral responses from innocent and guilty suspects, proponents of these methods argue that by conducting a behavior analysis interview, investigators are able to reliably detect and interpret behavioral cues indicative of truth or deception in a manner akin to detecting physiological arousal with a polygraph (Horvath & Jayne, 1990).

Despite widespread use of this behavior-based lie detection tool, little research has been conducted that has supported its effectiveness. Initial research conducted by affiliates of the training manual reported that investigators using the behavior analysis interview achieved high deception detection accuracy rates (Blair & McCamey, 2002; Horvath, Jayne, & Buckley, 1994). However, several methodological limitations, including that the ground truth of senders’ statements could not be established, have led scholars to question the validity of the findings (Masip, Herrero, Garrido, & Barba, 2011; Vrij, Mann, & Fisher, 2006). In another study in which ground truth was established by experimentally manipulating the sender’s guilt status, innocent suspects undergoing a behavior analysis interview exhibited more nervous behaviors and were less helpful to investigators than guilty suspects, a finding that is in direct opposition of the claims made by the training manual (Vrij, Mann, & Fisher, 2006). Thus, the results from the
limited empirical research examining the behavior analysis interview have not conclusively established its effectiveness.

In addition to the lack of empirical support, there is no research that supports or refutes the validity of the training manual’s claim that contextual information increases the accuracy of behavioral cue interpretation. Although contextual information can increase the deception detection accuracy rate, it is unclear whether the mechanisms underlying this effect are solely due to the interpretation of statement cues, or also due to the interpretation of behavioral cues. In particular, because no research has simultaneously manipulated the presence or absence of contextual information and the presence or absence of behavioral cues, it is impossible to know whether the increase in deception detection accuracy that is found when contextual information is provided could be partially attributed to an increase in the accurate interpretation of behavioral cues (Blair, Levine, & Shaw, 2010; Blair, Reimer, & Levine, 2018).

Consistent with the training manual’s claims, contextual information might increase deception detection accuracy by facilitating the degree to which people correctly interpret another’s behavioral cues to deception. If this is the case, then the presence of behavioral cues should increase deception detection accuracy above and beyond any effects attributable to contextual information. Alternatively, contextual information might only increase deception detection accuracy by increasing people’s reliance on content and correspondence cues to deception, such as by leading them to compare a suspect’s verbal statements to available contextual information. If this is the case, then accuracy in deception detection judgments may actually be greatest when behavioral cues (that might otherwise mislead or distract) are absent. Distinguishing between these alternative explanations requires research that orthogonally
manipulates both contextual information and behavioral cues to deception, which has not previously been done.

**Contextual Information and Schema Theory**

Although authors of the training manual did not offer a theoretical explanation as to why contextual information might facilitate the accurate interpretation of a suspect’s behavioral cues, schema theory provides a mechanism that could provide support for the training manual’s claim. Specifically, contextual information could activate knowledge structures that guide how individuals encode and interpret incoming information, and in turn affect memory and comprehension (see Bransford & Johnson, 1992; Taylor & Crocker, 1981; Trope, 1986). In this way, schematic information processing may guide attention away from irrelevant perceptual details and toward more relevant information (von Hippel, Jonides, Hilton, & Narayan, 1993). With respect to police interrogation, for example, contextual information about a crime could activate a schematic representation of the criminal event. In turn, this schematic representation may organize and guide an investigator’s attention away from irrelevant behavioral cues, and conversely, toward diagnostic behavioral cues to deception, thereby increasing deception detection accuracy.

Schematic information processing also simplifies cognitive processing and frees up attentional resources to attend to other information (Macrae, Milne, & Bodenhausen, 1994). Accordingly, a schema that is activated by crime-relevant contextual information may reduce the cognitive resources an investigator needs to understand the background of a case via the suspect’s spoken statement, thereby allowing the investigator to allocate more of their cognitive resources to the interpretation of behavioral cues. The availability of these cognitive resources may enable the investigator to allocate more of their information processing resources to
detecting and interpreting a suspect’s subtler behavioral cues to deceit, thereby improving the investigator’s ability to accurately detect deception.
CHAPTER 2. OVERVIEW OF PROPOSED RESEARCH

Hypotheses

This experiment tested several hypotheses relevant to the effects of behavioral cues and contextual information on deception detection accuracy.

Behavioral Cues

I tested competing, directional predictions about the effect of behavioral cues on deception detection.

*Hypothesis 1: Behavioral Cues Increase Accuracy*

One the one hand, theories of emotional leakage (e.g., Ekman & Friesen, 1969) propose that deceptive individuals show behaviors that can be detected by observers. Accordingly, this perspective predicts judges should exhibit greater deception detection accuracy when behavioral cues are present than when they are absent.

*Hypothesis 2: Behavioral Cues Decrease Accuracy*

On the other hand, empirical research has demonstrated that deception detection accuracy is greater when judges are provided with transcribed or audiotaped statements than when they are provided with videotaped statements (e.g., Kassin, Meissner, & Norwick, 2005), perhaps because visual behaviors distract judges from statement cues to deception. This view corresponds to the prediction that judges should exhibit greater deception detection accuracy when behavioral cues are absent than when they are present.

Contextual Information

I made a single, directional hypothesis with respect to the effect of contextual information on deception detection accuracy.
Hypothesis 3: Contextual Information Increases Accuracy

Specifically, contextual information should increase reliance on statement cues and thereby increase deception detection accuracy (e.g., Blair, Levine, & Shaw, 2010; Blair, Reimer, & Levine, 2018). Thus, I predicted that when contextual information is present, judges should exhibit greater deception detection accuracy than when contextual information is absent.

Combined Effects of Behavioral Cues and Contextual Information

This experiment tested competing, directional predictions about the combined effects of behavioral cues and contextual information on deception detection accuracy.

Hypothesis 4: Contextual Information Improves Interpretation of Behavioral Cues

Proponents of the interviewing methods presented in the Reid training manual assert that contextual information should improve the interpretation of behavioral cues to deception, further increasing accuracy (see Inbau, Reid, Buckley, & Jayne, 2013). This perspective corresponds to an interaction, such that the improvement in accuracy created by the presence of behavioral cues is greater when contextual information is present than when contextual information is absent. However, it is not feasible to test for the presence of an interaction effect in this sample with sufficient power. For example, if I were to predict that the absence of contextual information would attenuate the effect of behavioral cues on accuracy by 50%, I would need to collect 14 times the number of participants that I would need to test for a main effect of behavioral cues ($N = 448$), resulting in a total sample size of 6,272 (Giner-Sorolla, 2018).

Therefore, given a non-significant interaction term, I will further test the hypothesis that contextual information improves the interpretation of behavioral cues through a pairwise comparison that will assess whether accuracy rates follow the predicted pattern. Specifically,
this perspective would predict that when contextual information is present, accuracy will be
greater when behavioral cues are present than when they are absent. By contrast, this
perspective does not correspond to any clear prediction about the effect of behavioral cues on
accuracy when contextual information is absent. Therefore, if accuracy follows the predicted
pattern when contextual information is present, I will informally compare the sizes of the
differences in accuracy when behavioral cues are absent versus present to assess whether the
difference is greater when contextual information is present.

**Hypothesis 5: Behavioral Cues Distract from Interpretation of Contextual Information**

As detailed above, empirical evidence suggests that the provision of behavioral cues
worsens deception detection (e.g., Kassin, Meissner, & Norwick, 2005), whereas the provision
of contextual information improves deception detection (e.g., Blair, Levine, & Shaw, 2010).
These results pertaining to their separate effects suggest two specific predictions about how they
could operate in combination to affect deception detection accuracy. Specifically, when
contextual information is provided, one would expect accuracy to be greater. However, the
additional provision of behavioral cues may distract judges from statement cues and decrease
accuracy. This perspective corresponds to an interaction, such that the improvement in accuracy
created by the presence of contextual information is greater when behavioral cues are absent
than when they are present. However, for the reasons described above, it is not feasible to test
for the presence of an interaction in this sample with sufficient power. For this reason, I will use
the same analytic approach described above. Namely, given a non-significant interaction term, I
will further test the hypothesis that behavioral cues distract or mislead judges from accurately
evaluating contextual information through two pairwise comparisons, followed by informal
comparisons of the sizes of differences in accuracy.
In particular, this perspective would predict that when contextual information is present, accuracy will be greater when behavioral cues are absent than when they are present. It should be noted that this prediction is opposite to the prediction implied by proponents of the Reid training manual, which I articulated above. Furthermore, when behavioral cues are absent, one would expect no distraction from the beneficial effect expected by providing contextual information. Therefore, this perspective would also predict that when behavioral cues are absent, accuracy will be greater when contextual information is present than when it is absent. If accuracy follows the predicted pattern, I will informally compare the sizes of the differences in accuracy when contextual information is absent versus present to assess whether the difference is greater when behavioral cues are absent.

**Experiment Overview**

This experiment provided the first test of whether the provision of contextual information increases the accuracy with which judges can interpret behavioral cues to deception. To do so, the experiment manipulated the presence of contextual information and the presence of behavioral cues in order to isolate their unique effects. Participants were presented with statements made by a liar or truth-teller proclaiming innocence in an alleged cheating incident. These statements were either presented in the form of an audiotaped transcript narrated by a text-to-speech program in which only statement cues were present, or in the form of a videotape that communicated both the statement cues as well as any behavioral cues the liar or truth-teller might have leaked. Further, contextual information about the cheating incident was either withheld from or provided to participants.
CHAPTER 3. PRELIMINARY STUDY

I conducted a preliminary study in order to obtain stimulus materials for the present thesis. The stimulus materials include truthful and deceptive statements that were obtained, with permission, from participants who were questioned about an alleged cheating incident of which they were either guilty or innocent.

Method

Participants

A total of 64 undergraduate students recruited through Iowa State University’s participant pool completed the preliminary study in exchange for course credit.

Design

I randomly assigned participants to one of two conditions in a 2 cell (cheating vs. no cheating) between-subjects experimental design.

Materials

Logic problems

Participants completed a packet of five multiple-choice logic problems. Of particular importance were the fourth and fifth problems in the set because participants who were assigned to the cheating condition were encouraged to cheat on only these two problems. The fourth problem required participants to unscramble a set of flashcards to reveal temporally-sequenced drawings that told a story. The fifth problem required participants to identify the contents of a lock box that could only be opened by unscrambling an alphabetical code. The code, once unscrambled, indicated that the combination to the lock box was deciphered by transforming the correct answers to the previous three multiple choice questions into numbers (i.e., 1 = A; 2 = B, 3 = C, and D = 4). The logic problems are presented in Appendix A.
**Answer Key**

A folder holder on the desk where participants completed the logic problems contained an answer key. The answer key listed the correct answers to all five multiple-choice logic problems. For the fourth problem, the answer key showed the multiple-choice response that corresponded to the correct order of the drawings, but did not describe the story-line depicted in the unscrambled drawings. For the fifth problem, the answer key showed the multiple-choice response that corresponded to the correct contents of the lock box in addition to the correct combination to the lock box, but did not indicate that it was based on the answers to the previous logic problems.

**Procedure**

Using a modified version of the cheating paradigm (Russano, Meissner, Narchet, & Kassin, 2005), participants in the preliminary study worked with a partner on the set of five logic problems. The partner, a trained research confederate, encouraged some participants, but not others, to cheat on two logic problems in the set. All participants completed the first three logic problems with the partner as instructed. After the pair answered the third problem, the confederate manipulated the experimental factor. In the cheating condition, the confederate feigned finding the answer key to the logic problems and subsequently encouraged the participant to use the answer key to solve the remaining two logic problems. In the no-cheating condition, the confederate did not feign finding the answer key nor did the confederate encourage the participant to cheat on any of the logic problems.

Given the nature of the logic problems, participants who cheated were unlikely to have specific knowledge about the process required to produce the correct answers. For example, participants who cheated may have struggled to explain the story-line of the temporally-
sequenced pictures or how they generated the alphabetical code that opened the lock box. By contrast, participants who completed the problems honestly would presumably have knowledge of these details.

After the confederate and the participant had completed all five logic problems, the experimenter indicated that there was a problem with their answers at which point the experimenter separated the pair to ostensibly question the confederate about what happened. A few minutes later, the confederate returned to the participant to retrieve her or his backpack and delivered a scripted statement that informed the participant that the experimenter had accused her or him of cheating, but that s/he claimed nothing happened. The confederate then encouraged the participant to do the same and left the room.

Shortly after, the experimenter, who was blind to the participant’s guilt status, re-entered the room and accused the participant of having cheated. Specifically, the experimenter explained that the pair had come to all of the correct answers, but that they had completed the problems too quickly compared to previous study participants, which the experimenter said has never happened before and suggested that the pair had cheated on the problems. The experimenter explained that the professor in charge of the study was informed of the incident and was “angry and annoyed” about the situation. In addition, the experimenter claimed that if the participant had cheated, they may need to report the incident to the university’s Dean of Students Office.

Following the accusation, the experimenter asked the participant five scripted questions under the guise that the experimenter needed to report the information provided by the participant back to the professor. The experimenter allowed the participant to fully respond to each question before proceeding to the next. The experimenter always asked these five questions in this order: (1) “Why don’t you start by telling me everything that happened when you and your
partner completed the logic problems?”, (2) “Well, like I said before, no one has ever answered those problems correctly so quickly, so how did you and your partner do it?”, (3) “I’m really struggling to understand things, and I have your answers here, so I think it might help to talk about some specific questions. So, how did you get your answer to Question 4, the one where you unscrambled the drawings?”, (4) “What about Question 5, how did you open the lockbox?”, and (5) “It would help if you could be more specific and explain exactly how you solved the riddle that gave you the code to the lockbox?”. All participants were audio and visually recorded during this questioning period.

Results

A total of 53 participants provided consent for their audiovisual recordings to be used in the current research. Of these participants, 40 were assigned to the cheating condition. The audiovisual recordings of 34 of these participants were unusable for the following reasons: The participant confessed when questioned by the experimenter ($n = 18$), the participant refused to cheat when encouraged by the confederate ($n = 11$), the audiovisual recording of the participant was unusable due to audio or video malfunctions ($n = 5$). Therefore, I obtained a total of six audiovisual recordings of guilty participants who falsely proclaimed their innocence for use in the current study, including three female and three male participants.

Of the 13 participants who were assigned to the no-cheating condition, four of the audiovisual recordings were unusable due to audio or video malfunctions. Of the remaining audiovisual recordings, I chose six for use in the current experiment by choosing three female and three male participants whose audiovisual recordings were similar in length to the audiovisual recordings of the six guilty participants. For purposes of clarity, these participants will hereafter be referred to as “suspects”.
The interviews I selected for use in the current study ranged in length from 168 seconds (2 minutes and 48 seconds) to 768 seconds (12 minutes and 48 seconds; $M = 438.97$ seconds). For guilty suspects, the interviews ranged in length from 226 seconds (3 minutes and 46 seconds) to 768 seconds (12 minutes and 48 seconds; $M = 376.45$ seconds). For innocent suspects, the interviews ranged in length from 168 seconds (2 minutes and 48 seconds) to 675 seconds (11 minutes and 15 seconds; $M = 500.44$ seconds).
CHAPTER 4. METHODS

After obtaining stimulus materials through the preliminary study, I conducted the experiment which tested the effects of contextual information and behavioral cues on the accuracy of deception detection judgments.

Methods

Power Analysis

Because this study is primarily concerned with testing for the presence of an effect that would be practically meaningful in the justice system, I based the power analysis on a medium sized effect. Cohen describes a medium sized effect as one that should just be detectable by the naked eye of a careful observer (Cohen, 1988, p. 25). For comparison of means of continuous variables across conditions I used Cohen's $d = 0.5$. For comparison of rates of accuracy of the dichotomous judgments across conditions I used Odds Ratio (OR) = 2.47, the value of which was calculated using the conversion provided by Borenstein, Hedges, Higgins, and Rothstein (2009), specifically $\text{OR} = \exp\left[\frac{d\pi}{3^{0.5}}\right]$.

I conducted power analyses for each of the tests specified in the hypotheses, both for the continuous outcome variables and the dichotomous outcome variable using the effect sizes specified above, Type I error rate = 0.05, Type II error rate = 0.20, and assuming equal cell sample sizes. I conducted power analyses pertinent to each of the planned comparisons associated with each of the hypotheses, and discovered that the test of the hypothesis regarding the combined effects of contextual information and behavioral cues required the greatest sample size to achieve the desired level of power. I calculated the required sample size for a 2-tailed logistic regression analysis using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) using an OR = 2.47 and a baseline accuracy rate of 0.60, the latter of which approximates the average
accuracy rate reported by Reinhard, Sporer, Scharmach, & Marksteiner (2011) when contextual information was present. All hypotheses were directional and made a priori, which justifies the use of 1-tailed significance tests. However, the use of 1-tailed tests, even when appropriate, is generally met with disapproval. Therefore, I elected to plan the sample size on the assumption that I will be required to report 2-tailed tests.

Power analysis revealed a requirement of 112 participants per cell for this test. Because I calculated the accuracy rate by combining participants' judgments of both truthful and deceptive suspects, the foregoing cell size corresponds to 56 participants evaluating a truthful suspect and 56 evaluating a deceptive suspect. Therefore, the required total sample size for the entire study equaled 448. In order to account for potential participants who would be excluded from the analyses, I estimated that a total sample size of 496, or 62 participants per cell, would be necessary so that up to 10% of the original participating sample could be excluded from analyses without reducing the analyzed sample below the 56 per cell required to maintain the desired level of power.

Participants

A total of 520 undergraduate students recruited through Iowa State University’s participant pool completed the experiment in exchange for course credit. I removed the data provided by 50 participants for the following reasons: Participants were non-native English speakers (n = 41), a computer or procedural error compromised the session (n = 5), participants had taken part in the pilot study that created the stimulus materials (n = 4). Accordingly, the final sample (N = 470) included 286 women (61%), 183 men (49%), and 1 individual who did not report her or his biological sex. There were 390 White or European Americans, 21 Hispanic or
Latinx Americans, 18 Multi-ethnic Americans, 17 African Americans, 10 Asian Americans, and 14 individuals who did not report their ethnicity.

Design

I randomly assigned participants to one of eight conditions in a 2 (Ground truth: deceptive denial vs. truthful denial) × 2 (Behavioral cues: present vs. absent) × 2 (Contextual information: present vs. absent) between-subjects experimental design.

Materials

Suspect Statements

I selected twelve statements made by suspects from the preliminary study to use in the current experiment. Half of these suspects deceptively denied involvement in the cheating incident (deceptive denials) and half of these suspects truthfully denied involvement in the cheating incident (truthful denials). I created both an audiovisual recording and an audiotaped transcript of each suspects’ statements.

Audiovisual recordings. The audiovisual recordings depicted the suspect’s statements as they responded to the experimenter’s questions. The audiovisual recording showed the suspect facing the camera and depicted their movements from the waist and above.

Audiotaped transcripts. I created audiotaped transcripts of each suspect’s statements as they responded to the experimenter’s questions by using Amazon Polly’s text-to-speech service. In the audiotaped transcripts, I removed the suspect’s paraverbal behavioral cues except in those cases in which their removal altered the content of the suspect's statement. In particular, I removed filled pauses (e.g., "um", "uh", "er"), unfilled pauses, and repetitions from the transcript. Conversely, I retained false starts – a paraverbal cue in which the suspect begins a sentence, but fails to complete it (e.g., “They weren’t mathematical and they weren’t – It didn’t
take me that long”) – in the transcript because removing them could alter the content of the statement (Reinhard, Sporer, Scharmach, & Marksteiner, 2011).

**Contextual Information**

Contextual information can vary with respect to the extent that it creates diagnostic correspondence cues to deception when compared to the content of the suspect’s statements. Specifically, contextual information may be designed to be so specific that it clearly contradicts the statements made by deceptive suspects. For example, in one study, the contextual information indicated that a set of logic problems were so difficult that no one could get more than two answers correct without cheating, and in the content of their statements, suspects were asked to report the number of correct answers that they received. Thus, the contextual information created clear correspondence cues that were diagnostic of truth or deception, thereby reducing the difficulty of the deception detection task (see Blair, Levine, & Shaw, 2010).

Conversely, contextual information may be designed to be so general that it does not contain any information that could be directly compared to the content of the suspect’s statement. For example, in one study, the contextual information provided was a map of a city in which suspects claimed to have taken their driver’s test, but the content of suspects’ statements did not contain any information that could be directly compared to the contextual information provided. Thus, this contextual information did not create correspondence cues that were diagnostic of truth or deception (see Reinhard, Sporer, Scharmach, & Marksteiner, 2011).

I sought to create contextual information that would be specific enough to create the potential for diagnostic correspondence cues to deception to be present in the suspect’s statement, without reducing the difficulty of the deception detection task to a decision-rule in which suspects’ statements either clearly corresponded to, or clearly contradicted, known
contextual information. By doing so, I sought to avoid ceiling effects in which the provision of contextual information would increase accuracy so greatly that it would preclude the detection of any increase in deception detection associated with the provision of behavioral cues when contextual information is provided. Therefore, I created contextual information which included general background information regarding the five logic problems and specific information about the steps that were necessary for suspects to unscramble the drawings and discover the code for the lockbox. This contextual information was specific enough to provide the potential for correspondence cues to deception to be detected within the content of the suspect’s spoken statements, such that guilty participants might contradict the necessary steps to arrive at their answers to the last two problems, as they would not know the correct sequence of events necessary to solve the problems and determine the correct answers. However, because deceptive suspects only cheated on two of the five logic problems, any correspondence cues diagnostic of deception would be embedded in an otherwise truthful account. Thus, the contextual information in the current study more closely paralleled the task of real-world investigators, as suspects undergoing a police interrogation often conceal their deception through embedded lies, thereby providing only a small amount of information that might contradict known contextual information (Hartwig, Granhag, & Strömwall, 2007; Porter & Yuille, 1995; Vrij, Granhag, & Porter, 2010). Instructions including contextual information are presented in Appendix B.

Demographic Questionnaire

Participants reported their age, sex, and ethnicity. The demographic questionnaire is presented in Appendix C.
**Individual Difference Measures**

Participants completed questions assessing six individual difference measures for exploratory purposes, including self-reported ACT scores, SAT scores, need for cognition (Cacioppo & Petty, 1982), beliefs in procedural and distributive justice (Lucas, Zhdanova, & Alexander, 2011), and the hostility subscale of the aggression questionnaire (Buss & Perry, 1992). These measures are presented in Appendix D.

**Measures**

**Dichotomous Veracity Judgment**

Participants categorized the suspect's veracity as either “The individual was telling the truth, and was actually innocent of cheating”, coded as 0, or “The individual was lying, and was actually guilty of cheating”, coded as 1. A dichotomous measure of accuracy was created from this measure by coding inaccurate judgments as 0 and accurate judgments as 1.

**Confidence**

Participants made a continuous judgment of confidence in their decision on a 0 to 100 percent sliding scale in response to the statement “How confident are you in the judgment you just made about the individual whose statement you are considering?”.

**Continuous Veracity Judgment**

Participants made a continuous judgment of the likelihood the suspect was telling the truth or lying on a 1 (The individual was definitely telling the truth) to 10 (The individual was definitely lying) scale in response to the statement “Please indicate the response that best represents your opinion about the individual whose statement you are considering”. A continuous measure of accuracy was created from this measure by reverse-scoring responses made by participants who viewed a deceptive denial. By doing so, a response of 10 would
indicate a highly accurate response whereas a response of 1 would indicate a highly inaccurate response when judging both liars and truth-tellers.

**Explanation for Veracity Judgment**

Participants provided an open-ended explanation about the factors that they perceived as having influenced their veracity judgment by responding to the question “What factors contributed to your decision about the individual whose statement you are considering?”.

**Reliance on Non-Verbal Behavioral Cues vs. Verbal Content**

In response the prompt, “In considering the person’s statement, I tended to pay more attention to…” (Reinhard et al., 2011), participants reported their use of non-verbal behavioral cues versus verbal content on a 1 (non-verbal behavior) to 10 (verbal content) scale.

**Participant Motivations**

Participants answered two questions regarding their motivation to be accurate: (1) “How motivated were you to be accurate in trying to determine whether the individual was lying or telling the truth?” (2) “How seriously did you take your decision to determine whether the individual was lying or telling the truth?”. For both questions, participants responded on a five-point scale with endpoints 1 (not at all) and 5 (very).

**Investigation-Relevant Judgments**

Participants answered two investigation-relevant questions: (1) “If you had been the person investigating this incident, how likely would you be to report this cheating incident to your professor?” (2) “If the individual really did cheat, how harshly do you think that they should be punished?”. For both questions, participants responded on a five-point scale with endpoints 1 (not at all) and 5 (very).
Veracity Judgment with Inconclusive Option

Participants also categorized the suspect's veracity into the categories of lying, telling the truth, and inconclusive. Participants made this categorization by selecting one of these three options in response to the question “In this experiment we asked you to decide if a person was telling the truth or lying, but those were the only two options you had. However, when detectives observe suspects in real life, they actually have three options: they believe the person was telling the truth, they believe the person was lying, or their decision is inconclusive because they don’t have a strong belief either way. If you had these three options, which one would you choose?”.

Lie-telling Ability

Participants answered five questions assessing their self-reported lie-telling ability (e.g., “When I tell a lie, I am very good at making people believe me”). Appendix E presents all five questions.

Procedure

The University’s Institutional Review Board approved all procedures (see Appendix F). Participants completed the experiment in individual sessions at a University laboratory. After obtaining informed consent, the experimenter explained to participants that the study examines how individuals’ personal characteristics affect their ability to detect deception. The experimenter then informed participants that, upon conclusion of the session, they would be told whether their judgments were accurate or inaccurate. In addition, the experimenter informed participants that they would receive a $5 Amazon gift card if they were accurate in their judgment. In addition, I conducted a raffle in which a number of participants who had been inaccurate were randomly selected to receive a $5 gift card. However, the experimenter did not disclose this fact until the end of the session to increase participants’ motivation to be accurate.
Next, the experimenter instructed participants in the deception detection task. In the contextual information absent conditions, the experimenter provided participants with written instructions to evaluate the suspect’s statements to decide whether she or he was telling the truth or lying. In the contextual information present conditions, the experimenter provided participants with written instructions that also included contextual information regarding the alleged cheating incident as described above.

Next, participants evaluated the statements obtained from a suspect from the preliminary study, either a truthful denial or a deceptive denial, on a computer monitor via Qualtrics. Participants evaluated the statements made by either a single deceptive or a single truthful suspect to prevent contextual information from being revealed through viewing successive interviews of different suspects. Participants evaluated either an audiovisual recording of the suspect’s statements (behavioral cues present) or an audiotaped transcript (behavioral cues absent). This audiotaped transcript was accompanied by one photo of the suspect that was randomly selected from four possible still-frame photos taken from the audiovisual recording.

Immediately after the presentation of the statements, participants made the forced-choice veracity judgment, after which they completed the confidence measure, continuous veracity judgment, an explanation of their decision, their reliance on non-verbal behavior versus verbal content, motivations, investigation-relevant judgments, the accuracy measure with a forced-choice option, all individual difference measures, and demographic questions. The experimenter then fully debriefed all participants. At this point, the experimenter distributed $5 gift cards to participants who rendered correct judgments. The experimenter entered participants who rendered incorrect judgments into a raffle to receive a $5 gift card that was scheduled to occur after data collection was complete.
CHAPTER 5: RESULTS

The Effects of Behavioral Cues and Contextual Information on Accuracy

To test my hypotheses, I examined the effects of the behavioral cues and contextual information manipulations on accuracy of the dichotomous and continuous judgments. Because no a priori predictions were made about the effects of ground truth, it was not included as a factor in these analyses. Descriptive statistics with proportions of accurate judgments for the dichotomous judgment, and mean accuracy rates for the continuous judgment, are presented in Table 1 for each condition. For accuracy of the dichotomous judgment, planned comparison of proportions using logistic regression was used. For accuracy of the continuous judgment, univariate analysis of variance (ANOVA) was used.

Accuracy of the Dichotomous Judgment

Results of a logistic regression analysis in which the accuracy of the dichotomous judgment was regressed on the behavioral cues and contextual information experimental factors as well as their interaction are presented in Table 2.

Hypotheses 1 and 2. I made competing predictions that about the effect of behavioral cues on accuracy. Specifically, if deceptive individuals leak behavioral cues to deception, the provision of behavioral cues should increase accuracy, resulting in a main effect (Hypothesis 1; Ekman & Friesen, 1969). Conversely, if behavioral cues are invalid and detrimental to accuracy, the provision of behavioral cues should decrease accuracy, resulting in a main effect (Hypothesis 2; Kassin, Meissner, & Norwick, 2005). Results from the logistic regression analysis did not support either directional hypothesis. Accuracy did not significantly differ between participants who were able to observe behavioral cues (59.7%) and participants who were not able to observe behavioral cues (58.6%; β = 0.04, Wald \( \chi^2(1) = 0.05, p = .829, OR = 1.04 \),
Thus, the provision of behavioral cues did not significantly influence accuracy.

**Hypothesis 3.** I predicted that contextual information would increase accuracy, resulting in a significant main effect. Results from the logistic regression analysis did not support this hypothesis. Accuracy of participants who were provided with contextual information (61.0%) was not significantly different from participants who were not provided with contextual information (57.3%; \( \beta = -0.15, \text{ Wald } \chi^2(1) = 0.67, p = .413, \text{ OR } = 0.86, 95\% \text{ CI } [0.59 – 1.23] \)). Thus, the provision of contextual information did not significantly influence accuracy.

**Hypotheses 4 and 5.** I also made two separate, competing predictions about the combined effects of the behavioral cues and contextual information factors on accuracy. Specifically, I predicted that if the provision of contextual information improved the interpretation of behavioral cues, the improvement in accuracy created by the presence of behavioral cues should be greater when contextual information is present than when contextual information is absent (Hypothesis 4). Conversely, I predicted that if the provision of behavioral cues distracted or misled participants from the interpretation of contextual information, the improvement in accuracy created by the presence of contextual information should be greater when behavioral cues are absent than when they are present (Hypothesis 5). If either one of these competing predictions were supported, I would expect a significant interaction between the behavioral cues and contextual information experimental factors, but the logistic regression yielded no evidence of this interaction (\( \beta = 0.09, \text{ Wald } \chi^2(1) = 0.05, p = .821, \text{ OR } = 1.09, 95\% \text{ CI } [0.52 – 2.27] \)).

However, because the absence of a significant interaction may be attributable to insufficient power, I additionally conducted planned comparisons of proportions of accurate
judgments in each condition to examine whether accuracy followed the patterns predicted by either of these competing hypotheses. First, I examined whether the provision of behavioral cues influenced accuracy in conditions in which contextual information was present. The planned comparison revealed that when contextual information was present, the accuracy of participants who were able to observe behavioral cues (58.3%) was not significantly different from participants who were not able to observe behavioral cues (56.3%; \( \beta = -0.08, \text{Wald } \chi^2(1) = 0.10, p = .751, \text{OR} = 0.92, 95\% \text{ CI } [0.55 – 1.54]; \text{see Figure 1} \)). Thus, there is no evidence that the provision of behavioral cues increased accuracy when contextual information was provided, in contrast to the prediction made by proponents of the Reid training manual. Because the provision of behavioral cues did not increase accuracy when contextual information was provided, there was no reason to informally compare the sizes of the differences in accuracy when behavioral cues were absent versus present to assess whether the difference was greater when contextual information was present. Therefore, I found no support for the hypothesis that contextual information improved the interpretation of behavioral cues (Hypothesis 4). Moreover, I found no evidence that behavioral cues decreased accuracy when contextual information was provided, in contrast to the prediction that behavioral cues would distract or mislead from evaluating contextual information (Hypothesis 5).

Second, I examined whether contextual information increased accuracy when behavioral cues were absent, as would be additionally expected if behavioral cues were a distraction from accurately evaluating contextual information. This planned comparison revealed that when behavioral cues were absent, the accuracy of participants who were provided with contextual information (56.3%) was not significantly different from participants who were not provided with contextual information (61.1%; \( \beta = -0.20, \text{Wald } \chi^2(1) = 0.54, p = .462, \text{OR} = 0.82, \).
95% CI [0.49 – 1.39]). Thus, the results provided no evidence that behavioral cues decreased accuracy when contextual information was provided, or that contextual information improved accuracy when behavioral cues were absent. Therefore, I found no support for the hypothesis that behavioral cues distracted or misled participants from accurately evaluating contextual information (Hypothesis 5).

**Accuracy of the Continuous Judgment**

Results from an ANOVA including behavioral cues and contextual information as factors predicting accuracy of the continuous judgment are presented in Table 3.

**Hypotheses 1 and 2.** I tested the competing predictions that the provision of behavioral cues would either increase accuracy (Hypothesis 1) or decrease accuracy (Hypothesis 2). Results from the ANOVA did not support either directional hypothesis. Accuracy of participants who were able to observe behavioral cues ($M=5.82, SD=2.30$) was not significantly different from participants who were not able to observe behavioral cues ($M=5.88, SD=2.23$; $F(1, 466)=0.09, p=.771, \eta^2_p=.000, 95\% CI [.000 – .008]$). Thus, similar to results of the dichotomous judgment, the provision of behavioral cues did not significantly influence accuracy.

**Hypothesis 3.** Next, I tested the prediction that the provision of contextual information would increase accuracy. Accuracy of participants who were provided with contextual information ($M=5.72, SD=2.33$) was not significantly different from participants who were not provided with contextual information ($M=5.98, SD=2.19$; $F(1, 466)=1.57, p=.210, \eta^2_p=.003, 95\% CI [.000 – .022]$). Thus, similar to results of the dichotomous judgment, the provision of contextual information did not significantly influence accuracy.

**Hypotheses 4 and 5.** Finally, I tested the two competing predictions about the combined effects of the behavioral cues and contextual information factors on accuracy. Specifically, if the
provision of contextual information improved the interpretation of behavioral cues, the improvement in accuracy created by the presence of behavioral cues should be greater when contextual information is present than when contextual information is absent (Hypothesis 4). Conversely, if the provision of behavioral cues distracted or misled participants from the interpretation of contextual information, the improvement in accuracy created by the presence of contextual information should be greater when behavioral cues are absent than when they are present (Hypothesis 5). If either one of these competing predictions were supported, I would expect a significant interaction between the behavioral cues and contextual information experimental factors.

There was no evidence of a significant interaction between the behavioral cues and contextual information factors \((F(1, 466) = 0.14, p = .706, \eta_p^2 = .000, 95\% \text{ CI } [.000 – .011])\). However, because the absence of a significant interaction may be attributable to insufficient power, I additionally conducted planned comparisons of mean accuracy in each condition. First, I examined whether the provision of behavioral cues influenced accuracy in conditions in which contextual information was present. The planned comparison revealed that when contextual information was present, accuracy of participants who were able to observe behavioral cues \((M = 5.65, SD = 2.29)\) was not significantly different from participants who were not able to observe behavioral cues \((M = 5.79, SD = 2.39; F(1, 466) = 0.23, p = .634, \eta_p^2 = .000, 95\% \text{ CI } [.000 – .012])\). Because the provision of behavioral cues did not significantly influence accuracy when contextual information was provided, there was no reason to informally compare the sizes of the differences in accuracy when behavioral cues were absent versus present to assess whether the difference was greater when contextual information was present. Therefore, similar to the results of the dichotomous judgment, I found no support for the hypothesis that
contextual information improved the interpretation of behavioral cues (Hypothesis 4). Moreover, I found no evidence that behavioral cues decreased accuracy when contextual information was provided, in contrast to the prediction that behavioral cues would distract or mislead from evaluating contextual information (Hypothesis 5).

I also examined whether contextual information increased accuracy when behavioral cues were absent, as would be expected if behavioral cues were a distraction from accurately evaluating contextual information. The planned comparison revealed that when behavioral cues were absent, accuracy of participants who were provided with contextual information ($M = 5.97$, $SD = 2.07$) was not significantly different from participants who were not provided with contextual information ($M = 5.79$, $SD = 2.39$; $F(1, 466) = 0.38$, $p = .538$, $\eta^2_p = .001$, 95% CI [.000 – .014]). Thus, similar to the results of the dichotomous judgment, I found no evidence in support of the hypothesis that behavioral cues distracted participants from accurately evaluating contextual information (Hypothesis 5).

**The Effects of Ground Truth, Behavioral Cues, and Contextual Information on Accuracy**

The results of the analyses above did not support my hypotheses. However, I collapsed across the ground truth factor in these analyses. Thus, it is of interest to examine how the ground truth factor may have influenced accuracy independently and in combination with the behavioral cues and contextual information factors. To do so, I conducted exploratory analyses on the accuracy of the dichotomous and continuous judgment using analytic models that included ground truth, behavioral cues, and contextual information as factors.

**Accuracy of the Dichotomous Judgment**

Results from a logistic regression analysis including ground truth, behavioral cues, and contextual information as experimental factors predicting accuracy of the dichotomous judgment
are presented in Table 4. There were no significant main effects of ground truth, behavioral cues, or contextual information. Specifically, accuracy of participants who judged a truthful denial (60.8%; \( \beta = -0.14 \), Wald \( \chi^2(1) = 0.51 \), \( p = .747 \), OR = 0.87, 95% CI [0.60 – 1.27]). Accuracy of participants who were able to observe behavioral cues (59.7%) was not significantly different from participants who were not able to observe behavioral cues (58.6%; \( \beta = 0.03 \), Wald \( \chi^2(1) = 0.02 \), \( p = .875 \), OR = 1.03, 95% CI [0.71 – 1.51]). Finally, accuracy of participants who were provided with contextual information (61.0%) was not significantly different from participants who were not provided with contextual information (57.3%; \( \beta = -0.15 \), Wald \( \chi^2(1) = 0.60 \), \( p = .440 \), OR = 0.86, 95% CI [0.59 – 1.26]).

The logistic regression analysis revealed a significant interaction between the ground truth and behavioral cues factors (\( \beta = 0.81 \), Wald \( \chi^2(1) = 4.43 \), \( p = .035 \), OR = 2.26, 95% CI [1.06 – 4.82]). Follow-up simple main effects analyses examining the effect of behavioral cues when judging a truthful versus deceptive denial indicated that when judging a truthful denial, accuracy of participants who were able to observe behavioral cues (56.6%) was not significantly different from participants who were not able to observe behavioral cues (65.2%; \( \beta = -0.38 \), Wald \( \chi^2(1) = 1.92 \), \( p = .166 \), OR = 0.69, 95% CI [0.40 – 1.17]). Conversely, when judging a deceptive denial, accuracy of participants who were able to observe behavioral cues (62.9%) was not significantly different from participants who were not able to observe behavioral cues (52.1%; \( \beta = -0.44 \), Wald \( \chi^2(1) = 2.54 \), \( p = .111 \), OR = 1.55, 95% CI [0.90 – 2.65]; see Figure 2).

In addition, simple main effects analyses examined the effect of ground truth when behavioral cues were absent versus present. When behavioral cues were absent, participants who
judged a deceptive denial were significantly less accurate in their dichotomous judgment (52.1%) than participants who judged a truthful denial (65.2%; $\beta = -0.55$, Wald $\chi^2(1) = 3.83$, $p = .050$, OR = 0.58, 95% CI [0.34 – 1.00]). Conversely, when behavioral cues were present, accuracy did not significantly differ between participants who judged a truthful denial (56.6%) and participants who judged a deceptive denial (62.9%; $\beta = 0.27$, Wald $\chi^2(1) = 1.01$, $p = .316$, OR = 1.31, 95% CI [0.77 – 2.21]).

Thus, these analyses revealed that the effect of behavioral cues on accuracy depended on the ground truth of the suspect’s statements. Specifically, although the simple main effect of behavioral cues was not significant when judging a truthful denial or when judging a deceptive denial, the significant interaction effect in combination with an inspection of the pattern of means in each condition suggests that when judging a truthful denial, accuracy was higher when behavioral cues were absent than when they were present, whereas when judging a deceptive denial, accuracy was higher when behavioral cues were present than when they were absent.

The logistic regression analysis also yielded a significant interaction between the ground truth and contextual information factors ($\beta = -1.58$, Wald $\chi^2(1) = 16.79$, $p < .001$, OR = 0.21, 95% CI [0.10 – 0.44]). Follow-up simple main effects analyses examining the effect of contextual information when judging a truthful versus deceptive denial indicated that when judging a truthful denial, participants who were provided with contextual information were significantly more accurate (67.4%) than participants who were not provided with contextual information (52.8%; $\beta = 0.64$, Wald $\chi^2(1) = 5.59$, $p = .018$, OR = 1.90, 95% CI [1.12 – 3.24]). Conversely, when judging a deceptive denial, participants who were provided with contextual information were significantly less accurate (45.5%) than participants who were not provided
with contextual information (68.3%; $\beta = -0.94$, Wald $\chi^2(1) = 11.74$, $p = .001$, OR = 0.39, 95% CI [0.23 – 0.67]; see Figure 3).

In addition, simple main effects analyses examining the effect of ground truth when contextual information was absent versus present indicated that when contextual information was absent, participants who judged a deceptive denial were significantly more accurate (68.3%) than participants who judged a truthful denial (52.8%; $\beta = 0.65$, Wald $\chi^2(1) = 5.71$, $p = .017$, OR = 1.92, 95% CI [1.13 – 3.29]). When contextual information was present, participants who judged a truthful denial were significantly more accurate (67.4%) than participants who judged a deceptive denial (45.5%; $\beta = -0.931$, Wald $\chi^2(1) = 11.60$, $p = .001$, OR = 0.39, 95% CI [0.23 – 0.67]). This pattern indicates that when judging a truthful denial, accuracy was higher when contextual information was present than when it was absent, whereas when judging a deceptive denial, accuracy was higher when contextual information was absent than when it was present.

Results further indicated that the behavioral cues and contextual information factors did not interact ($\beta = 0.07$, Wald $\chi^2(1) = 0.03$, $p = .862$, OR = 1.07, 95% CI [0.50 – 2.28]). Moreover, there was no evidence of a significant three-way interaction between the ground truth, behavioral cues, and contextual information factors ($\beta = 1.03$, Wald $\chi^2(1) = 1.77$, $p = .183$, OR = 2.80, 95% CI [0.62 – 12.74]).

**Accuracy of the Continuous Judgment**

Results from an ANOVA including ground truth, behavioral cues, and contextual information as factors predicting accuracy of the continuous judgment are presented in Table 5. There was a significant main effect of the ground truth experimental factor ($F(1, 462) = 14.01$, $p < .001$, $\eta^2_p = .029$, 95% CI [.007 – .066]). Specifically, participants who judged a truthful
denial were significantly more accurate ($M = 6.22$, $SD = 2.28$) in their continuous judgment than participants who judged a deceptive denial ($M = 5.47$, $SD = 2.20$). There were no significant main effects of the behavioral cues experimental factor ($F(1, 462) = 0.15$, $p = .702$, $\eta^2_p = .000$, 95% CI [.000 – .011]), or the contextual information experimental factor ($F(1, 462) = 2.37$, $p = .124$, $\eta^2_p = .005$, 95% CI [.000 – .026]).

Results further indicated that the ground truth and behavioral cues factors did not interact ($F(1, 462) = 2.56$, $p = .110$, $\eta^2_p = .006$, 95% CI [.000 – .027]). However, the ANOVA did yield a significant interaction between the ground truth and contextual information factors ($F(1, 462) = 13.30$, $p < .001$, $\eta^2_p = .028$, 95% CI [.006 – .064]). Follow-up simple main effects analyses examining the effect of contextual information when judging a truthful versus deceptive denial indicated that when judging a truthful denial, accuracy of participants who were provided with contextual information ($M = 6.42$, $SD = 0.19$) was not significantly different from participants who were not provided with contextual information ($M = 5.99$, $SD = 0.21$; $F(1, 462) = 2.23$, $p = .136$, $\eta^2_p = .005$, 95% CI [.000 – .025]). Conversely, when judging a deceptive denial, participants who were provided with contextual information were significantly less accurate ($M = 4.91$, $SD = 0.21$) than participants who were not provided with contextual information ($M = 5.97$, $SD = 0.20$; $F(1, 462) = 13.37$, $p < .001$, $\eta^2_p = .028$, 95% CI [.006 – .064]).

In addition, simple main effects analyses examining the effect of ground truth when contextual information was absent versus present indicated that when contextual information was absent, participants who judged a deceptive denial were no more accurate ($M = 5.97$, $SD = 0.20$) than participants who judged a truthful denial ($M = 5.99$, $SD = 0.21$; $F(1, 462) = 0.01$, $p = .950$, $\eta^2_p = .000$, 95% CI [.000 – .001]). However, when contextual information was present, participants who judged a truthful denial were significantly more accurate ($M = 6.42$, $SD = 0.19$)
than participants who judged a deceptive denial ($M = 4.91, SD = 0.21; F(1, 462) = 27.73, p < .001, \eta^2_p = .057, 95\% \text{ CI [.023} \text{– .102]}$). Thus, similar to the results of the forced-choice judgment, this pattern indicates that when judging a truthful denial, accuracy was higher when contextual information was present than when it was present, whereas when judging a deceptive denial, accuracy was higher when contextual information was absent than when it was present.

The behavioral cues and contextual information factors did not interact ($F(1, 462) = 0.16, p = .685, \eta^2_p = .000, 95\% \text{ CI [.000} \text{– .011]}$). Moreover, there was no evidence of a significant three-way interaction between the ground truth, behavioral cues, and contextual information factors ($F(1, 462) = 0.34, p = .561, \eta^2_p = .001, 95\% \text{ CI [.000} \text{– .014]}$).

**Frequency of Truth or Deception Judgments**

The interaction and pattern of means found between the ground truth and behavioral cues factors in the analyses described above indicated that participants who judged a truthful denial were less accurate when behavioral cues were present than when they were absent, whereas participants who judged a deceptive denial were more accurate when behavioral cues were present than when they were absent. This suggests that the provision of behavioral cues may have increased the number of suspects who were judged to be deceptive. Similarly, the interaction found between the ground truth and contextual information factors in the analyses above indicated that participants who judged a truthful denial were more accurate when contextual information was present than when it was absent, whereas participants who judged a deceptive denial were less accurate when contextual information was present than when it was absent. This suggests that the provision of contextual information may have increased the number of suspects who were judged to be truthful.
One factor that complicates the interpretation of the results from the analyses reported above is the use of accuracy as the dependent variable. Participants made judgments about their perception of the veracity of the suspect’s statements: that is, whether they perceived the suspect to be telling the truth or lying. The ground truth factor was used to create a measure of accuracy from these judgments by coding judgments that did not match the ground truth of the statement as inaccurate and judgments that did match the ground truth of the statement as accurate. Thus, the measure of accuracy is dependent on the level of the ground truth factor.

By changing the dependent variable to the participant’s judgment of truth or deception, the connection between the ground truth factor and the dependent variable is removed. When judgments of truth or deception are used as the dependent variable, the ability of the ground truth factor to predict judgments of truth or deception captures participants’ ability to discriminate between truthful and deceptive statements, and thereby represents overall accuracy. Conversely, the ability of the behavioral cues or contextual information factors to predict judgments of truth or deception captures perceptual biases toward truth or deception that are distinct from accuracy. Interactions of the ground truth factor with the behavioral cues or contextual information factors additionally capture how the behavioral cues or contextual information factors influence participants’ ability to discriminate between truthful and deceptive statements. Thus, examining participants’ judgments of truth or deception uncouples the accuracy of participants’ judgments from their perception of the suspect’s truthfulness or deception. In other words, using participants’ judgment of truth or deception as the outcome variable provides the potential to show judgment biases toward truth or deception that are distinct from accuracy.

Therefore, to further examine the possibility that behavioral cues increased judgments of deception while contextual information increased judgments of truthfulness, I conducted
analyses on participants’ dichotomous and continuous judgments of truth or deception using analytic models that included ground truth, behavioral cues, and contextual information as factors. For the dichotomous judgment, a judgment of truth was coded as 0, and a judgment of deception was coded as 1. For the continuous judgment, a judgment that the suspect was definitely telling the truth corresponded to a response of 1, and a judgment that the suspect was definitely lying corresponded to a response of 10.

**Dichotomous Judgment of Truth or Deception**

Proportions of dichotomous judgments of deception by condition are presented in Figure 4. Results from the logistic regression, presented in Table 6, revealed main effects of ground truth, behavioral cues, and contextual information on judgments of deception. Specifically, there was a main effect of ground truth such that participants who judged a deceptive denial were significantly more likely to judge the suspect to be deceptive (57.5%) than participants who judged a truthful denial (39.2%; \( \beta = 0.73 \), Wald \( \chi^2(1) = 14.26, p < .001, OR = 2.08, 95\% CI [1.42 – 3.03]; \) see Figure 5). This suggests that participants were able to discriminate between truthful and deceptive denials.

There was also a main effect of behavioral cues such that participants who were able to observe behavioral cues were significantly more likely to judge the suspect to be deceptive (52.9%) than participants who were not able to observe behavioral cues (43.5%; \( \beta = 0.41 \), Wald \( \chi^2(1) = 4.43, p = .035, OR = 1.50, 95\% CI [1.03 – 2.19]; \) see Figure 6). This suggests that the provision of behavioral cues shifted participants’ perceptions of the suspect’s statements toward judgments of deception.

Finally, there was a main effect of contextual information such that participants who were provided with contextual information were significantly less likely to judge the suspect to be
deceptive (38.5%) than participants who were not provided with contextual information (58.4%; \( \beta = -0.79, \text{Wald } \chi^2(1) = 16.79, p < .001, \text{ OR} = 0.45, 95\% \text{ CI } [0.31 – 0.66]; \text{ see Figure 7}). This suggests that the provision of contextual information shifted participants’ perceptions of the suspect’s statement toward judgments of truthfulness. There were no significant two- or three-way interactions (\( p’s > .182 \)), suggesting that participants’ ability to discriminate between truthful and deceptive statements was not significantly influenced by the provision of behavioral cues or contextual information. In sum, these results provide evidence that participants were able to distinguish between truth-tellers and liars with some level of accuracy independently of whether behavioral cues or contextual information were provided. Moreover, these results provide evidence that the provision of behavioral cues created a perceptual bias toward deception, whereas the provision of contextual information created a perceptual bias toward truthfulness.

**Continuous Judgment of Truth or Deception**

Results from the ANOVA, presented in Table 7, also revealed main effects of ground truth and contextual information, but not behavioral cues, on judgments of truth or deception. Specifically, there was a main effect of ground truth such that participants who judged a deceptive denial judged the suspect as significantly more likely to be deceptive (\( M = 5.47, SD = 2.20 \)) than participants who judged a truthful denial (\( M = 4.78, SD = 2.28 \);
\[ F(1, 462) = 10.18, p = .002, \eta^2_p = .022, 95\% \text{ CI } [.003 – .054] \]). There was no significant difference between participants who were able to observe behavioral cues (\( M = 5.29, SD = 2.31 \)) and participants who were not able to observe behavioral cues (\( M = 4.95, SD = 2.20 \);
\[ F(1, 462) = 2.56, p = .110, \eta^2_p = .006, 95\% \text{ CI } [.000 – .027] \]). Finally, there was a main effect of contextual information such that participants who were provided with contextual information
judged the suspect as significantly less likely to be deceptive \((M = 4.74, SD = 2.21)\) than participants who were not provided with contextual information \((M = 5.52, SD = 2.24; F(1, 462) = 13.30, p < .001, \eta^2_p = .028, 95\% CI [.006 – .064])\). There were no significant two- or three-way interactions \((p’s > .123)\). These results provide further evidence that participants had some ability to discriminate between truthful and deceptive statements. Moreover, these results provide further evidence that contextual information increased judgments of truthfulness. However, in contrast to results from the dichotomous judgment, these results provide no evidence that the provision of behavioral cues significantly increased judgments of deception.

**Effect of Including an Inconclusive Option**

Next, I examined the effect of including an “Inconclusive” option on participants’ judgments of deception. When given the option, 201 participants \((42.8\%)\) indicated that their judgment was inconclusive. Of the remaining participants, 129 \((27.4\%)\) indicated that they believed that the individual was telling the truth, and 139 \((29.6\%)\) indicated that they believed that the individual was lying. A logistic regression indicated that accuracy of the dichotomous judgment did not significantly differ between participants who chose to label their judgment as inconclusive when given the option \((56.2\%)\) and participants who were certain in their choice \((61.6\%; \beta = .22, \text{Wald } \chi^2(1) = 1.36, p = .244, \text{OR} = 1.25, 95\% \text{ CI } [0.86 – 1.81])\). Thus, providing participants with an option to indicate that their judgment was inconclusive did not significantly increase accuracy among the group of individuals who did not select the inconclusive option.

**Use of Non-verbal Behavioral Cues vs. Verbal Information**

I sought to test a relationship that was observed by Reinhard, Sporer, Scharmach, & Marksteiner (2011) wherein the provision of contextual information correlated with participants’ perceptions that they relied more on verbal content in making their judgment, which in turn
predicted greater accuracy. The provision of contextual information did not significantly affect participants’ self-reported use of verbal content when making judgments of truth or deception ($F(1, 466) = 6.01, p = .352, \eta^2_p = .002, 95\% CI [.000 – .040]$). In addition, self-reported use of verbal content did not significantly predict accuracy of the dichotomous judgment ($\beta = .06$, Wald $\chi^2(1) = 2.73, p = .099, OR = 1.06, 95\% CI [0.99 – 1.14]$). Thus, these results neither provided evidence that provision of contextual information increased reliance on verbal content, nor that reliance on verbal content predicted accuracy.

**Relationship Between Individual Difference Measures, Accuracy, and Judgments of Deception**

Finally, I was interested in exploring the relationship between individual difference measures, accuracy, and judgments of deception. For example, it is possible that individuals higher in scholastic abilities or need for cognition may be more attentive toward statement cues, thereby increasing accuracy. Individuals high in procedural and distributive justice may be more likely to believe that a suspect being questioned is likely to be guilty, leading to higher judgments of deception. Individuals high in hostility may be more suspicious, leading to higher judgments of deception. Individuals high in lie-telling ability may be more aware of diagnostic cues to deception, thereby increasing accuracy.

Therefore, for exploratory purposes, I investigated the relationship between individual difference measures, including self-reported ACT scores, SAT scores, need for cognition (Cacioppo & Petty, 1982), procedural and distributive justice (Lucas, Zhdanova, & Alexander, 2011), hostility (Buss & Perry, 1992), and self-reported lie-telling ability, accuracy, and judgments of truth or deception. Correlations among the individual difference measures and accuracy are presented in Table 8. None of the individual difference measures were significantly
correlated with accuracy of the dichotomous or continuous judgments. There was a small but significant negative correlation between ACT scores and continuous judgments of deception, indicating that participants who reported higher ACT scores tended to judge suspects to be less deceptive. However, none of the other individual difference measures were significantly related to judgments of truth or deception.
CHAPTER 6: GENERAL DISCUSSION

The purpose of the current experiment was to examine the effects of behavioral cues and contextual information on accuracy of deception detection judgments. In particular, I examined how behavioral cues and contextual information independently influenced accuracy. In addition, I examined how the provision of behavioral cues and contextual information in combination influenced accuracy.

Hypotheses 1 and 2: Behavioral Cues Increase or Decrease Accuracy

First, the provision of behavioral cues did not significantly influence accuracy. Thus, I found no support for the prediction that behavioral cues would increase accuracy, as suggested by theories of emotional leakage, which assert that subtle cues to deception are leaked through suspects’ behaviors that enable judges to detect deception with greater accuracy (Hypothesis 1; Ekman & Friesen, 1969). One possible reason that this experiment failed to find that behavioral cues increased accuracy is that any diagnostic behavioral cues that suspects displayed were weak, and therefore not detected by judges. Indeed, the actual behaviors of liars versus truth-tellers tend to be more similar than different, and the few behavioral cues that do distinguish between them tend to be faint (see DePaulo et al., 2003; Sporer & Schwandt, 2006, 2007). Therefore, any behavioral cues to deception that suspects may have displayed may have been too faint for judges to detect.

Conversely, I also found no support for the competing prediction that behavioral cues would decrease accuracy, as suggested by empirical research showing that the provision of non-verbal behaviors decreases accuracy (Hypothesis 2; Kassin, Meissner, & Norwick, 2005). One possible reason that the results may have failed to find a detrimental effect of behavioral cues on accuracy is that the current experiment manipulated the presence or absence of both non-verbal
and paraverbal behavioral cues, rather than separately manipulating the presence of non-verbal and paraverbal behavioral cues. If non-verbal behavioral cues are non-diagnostic and decrease accuracy, but paraverbal behavioral cues are somewhat diagnostic and increase accuracy, their joint provision may have led to the absence of an effect of behavioral cues on accuracy.

For example, in one empirical study, judges were significantly more accurate when judging audiotaped statements that included only paraverbal behavioral cues than videotaped statements that included both non-verbal and paraverbal behavioral cues (Kassin, Meissner, & Norwick, 2005). Thus, the addition of non-verbal behavioral cues decreased accuracy, suggesting that non-verbal behavioral cues are invalid. However, paraverbal behavioral cues may be somewhat diagnostic. For example, deceptive statements do tend to differ from truthful statements by some paraverbal cues, such as speech rate, filled pauses (e.g., “um”), and incomplete words (DePaulo, Rosenthal, Rosenkrantz, & Green, 1982; Reinhard, Sporer, Scharmach, & Marksteiner, 2011). Thus, if paraverbal behavioral cues provided some diagnostic information that could increase accuracy, but non-verbal behavioral cues provided only invalid information that could decrease accuracy, their provision in combination may have led to the absence of an overall effect of behavioral cues on accuracy.

**Hypothesis 3: Contextual Information Increases Accuracy**

Second, the provision of contextual information did not increase accuracy, in contrast to empirical research (Hypothesis 3; Blair, Levine, & Shaw, 2010; Blair, Reimer, & Levine, 2018; Reinhard, Sporer, Scharmach, & Marksteiner, 2010). One possible reason that this experiment failed to find an effect of contextual information is that the correspondence cues—cues to deception created by assessing the degree of consistency between the suspect’s statement and known contextual information—may have been non-diagnostic of the suspect’s truthfulness or
deceit. Prior research which has manipulated the presence of contextual information has often used contextual information that creates clear correspondence cues that are diagnostic of deception in the content of the suspect’s statement (Blair, Levine, & Shaw, 2010; Blair Reimer, & Levine, 2018). For example, in one study, the contextual information provided to judges included information that a set of logic problems that suspects were instructed to solve were so difficult that it was unlikely that a suspect could answer more than two problems correctly without cheating. In the content of the statement, suspects were asked explicitly to report the number of correct answers that they received, thereby creating clear correspondence cues that were diagnostic of truth or deception (see Blair, Levine, & Shaw, 2010).

By contrast, judges in the current experiment were provided with contextual information about the general situation surrounding the cheating incident and specific information on the correct sequence of events necessary to solve all five logic problems. However, deceptive suspects only cheated on two of the five logic problems about which they were questioned. Thus, any correspondence cues to deception regarding those two logic problems would be embedded in an otherwise truthful account in which the suspect’s statements were largely consistent with the contextual information. Creating a situation in which the suspect’s lies were embedded in an otherwise truthful account increases ecological validity, as suspects undergoing a police interrogation often conceal their deception through embedded lies, thereby providing only a small amount of information that might contradict known contextual information (Hartwig, Granhag, & Strömwall, 2007; Porter & Yuille, 1995; Vrij, Granhag, & Porter, 2010). For this reason, the difficulty of detecting these embedded, subtle correspondence cues to deception may have dampened the effect of contextual information on accuracy compared to prior research.
Another possible reason that this experiment failed to find an effect of contextual information may be that judges were not able to question suspects or use the provided contextual information strategically to elicit correspondence cues to deception. Deception detection methods that emphasize the use of contextual information, such as the strategic use of evidence technique, train judges to strategically question the suspect about circumstances surrounding known contextual information in order to elicit correspondence cues to deception that are high in diagnosticity (Granhag, Strömwall, Willen, & Hartwig, 2013; Hartwig, Granhag, Strömwall, & Kronkvist, 2006; Hartwig, Granhag, Strömwall, & Vrij, 2005). Therefore, it is possible contextual information may need to be used strategically in order to elicit clear correspondence cues, and thereby increase accuracy.

In sum, it is possible that the failure of the current research to find an effect of contextual information on accuracy may be the result of the absence of diagnostic correspondence cues to deception. However, contextual information can vary with respect to the extent to which it provides the potential for correspondence cues to be detected. Prior research has shown that the provision of contextual information—even contextual information that provides no information that can be directly compared to the suspect’s statement—can increase accuracy through another mechanism: by increasing reliance on content cues to deception (Reinhard, Sporer, Scharmach, & Marksteiner, 2011). In particular, providing judges with contextual information that increases judges’ perceived familiarity with the situation has been shown to increase judges’ reliance on content cues to deception, such as the detailedness, consistency, and completeness of a statement, and thereby increase accuracy.

However, in addition to the failure to find a significant effect of contextual information on accuracy, the results of the current experiment also failed to find an effect of contextual
information on judges’ self-reported use of content cues, and judges’ self-reported use of content cues was not related to accuracy. One possible reason that the results failed to find this effect is that the contextual information provided in the current research was too specific. In prior work in which this effect was demonstrated, judges were provided with general contextual information that could not be directly compared to the content of the suspect’s statements, such as a road map of the city in which a potentially deceptive suspect claimed that they took their driver’s test (Reinhard, Sporer, Scharmach, & Marksteiner, 2011). Because the provision of very general contextual information does not provide the opportunity to directly compare the content of the suspect’s statement to known contextual information, judges may instead focus their evaluation on content cues. However, in the current experiment, the contextual information was much more specific, and enabled judges to directly compare the content of the suspect’s statements to the known contextual information about each logic problem. Thus, judges who were provided with contextual information may have focused their evaluation more specifically on potential correspondence cues, rather than focusing more generally on content cues.

Another possible reason that the results failed to find this effect is that all judges in this research were provided with a small amount of general contextual information about the situation. Specifically, all judges in the current experiment read instructions that indicated that they would be evaluating statements made by a student who was accused of cheating on a laboratory task during a psychology experiment, and who denied cheating when questioned by an experimenter. It is possible that providing all judges with this general contextual information was sufficient to increase their perceived familiarity with the situation, and in turn, increase their reliance on content cues to deception. Thus, the contextual information manipulation may have had no opportunity to additionally increase judges’ perceived familiarity with the situation or
their use of content cues. Examining whether this effect would occur with only general contextual information would require using a control group in which no contextual information is provided in order to assess whether only a small amount of general contextual information is required to sufficiently increase perceived familiarity, and thereby reliance on content cues.

**Hypotheses 4 and 5: The Combined Effects of Behavioral Cues and Contextual Information**

The results provided no evidence that contextual information improved the interpretation of behavioral cues to deception, as articulated in Hypothesis 4. When contextual information was provided, judges were no more accurate in their judgments when behavioral cues were present than when they were absent. Thus, contrary to the claims of proponents of the Reid training manual, the results of the current experiment suggest that the interpretation of behavioral cues to deception does not improve accuracy, even when contextual information is provided (Inbau, Reid, Buckley, & Jayne, 2013). The lack of a significant increase in accuracy due to the provision of behavioral cues when contextual information was provided likewise fails to support the predictions of schema theory, which suggests that contextual information may improve the interpretation of behavioral cues to deception either by guiding judges toward relevant perceptual details, or by freeing up judges’ attentional resources (Macrae, Milne, & Bodenhausen, 1994; von Hippel, Jonides, Hilton, & Narayan, 1993). However, this effect would only be observed if behavioral cues to deception are diagnostic and have the potential to increase accuracy. Thus, the failure to find an effect of behavioral cues on accuracy even when contextual information was provided suggests that behavioral cues are not valid indicators of deception, or are too faint for judges to detect. This finding is consistent with a substantial body of literature that shows that
judges are generally poor at detecting deception through the interpretation of behavioral cues alone (Bond & DePaulo, 2006).

Finally, the results provided no evidence that behavioral cues distracted or misled judges from evaluating contextual information, as articulated in Hypothesis 5. When contextual information was provided, judges were no less accurate when behavioral cues were present than when they were absent. Moreover, when behavioral cues were absent, judges were no more accurate when contextual information was provided than when it was withheld. However, because the current experiment failed to find a beneficial effect of contextual information independently, there was little opportunity for behavioral cues to distract or mislead from the contextual information. Thus, it is possible that in the context of a deception detection scenario in which the contextual information provides clear correspondence cues that are diagnostic of deception, the provision of behavioral cues could have a distracting or misleading effect.

**The Effects of Ground Truth on Accuracy**

To test the hypotheses regarding the effects of behavioral cues and contextual information on accuracy, I collapsed across the ground truth factor in my analyses. However, I was additionally interested in examining how the ground truth factor may have influenced accuracy, both independently and in combination with the behavioral cues and contextual information factors. Therefore, I conducted exploratory analyses examining the effects of ground truth, behavioral cues, and contextual information on accuracy. In these analyses, I found no main effects of ground truth, behavioral cues, or contextual information. However, the analyses did reveal a significant interaction between the ground truth and behavioral cues factors, and between the ground truth and contextual information factors. These two-way interactions are discussed in more detail below.
**Ground Truth and Behavioral Cues**

These analyses revealed that the effect of behavioral cues on accuracy depended on the ground truth of the suspect’s statements. Specifically, although the simple main effects of behavioral cues were not significant when judging a truthful denial or when judging a deceptive denial, the significant interaction effect in combination with an inspection of the pattern of means indicated that the effect of behavioral cues operated differently depending on whether judges evaluated a truthful denial or a deceptive denial. In particular, when judging a deceptive denial, accuracy was higher when behavioral cues were present (62.9%) than when behavioral cues were absent (52.1%), whereas when judging a truthful denial, accuracy was lower when behavioral cues were present (56.6%) than when behavioral cues were absent (65.2%). This pattern suggested that behavioral cues may have increased the number of suspects who were judged to be deceptive, as an increase in the number of suspects judged to be deceptive would correspond to greater accuracy in judgments of deceptive denials and less accuracy in judgments of truthful denials. In other words, this pattern suggested that behavioral cues may have created a perceptual bias toward deception, thereby increasing the number of suspects who were judged to be deceptive.

**Ground Truth and Contextual Information**

The opposite pattern emerged regarding the effect of contextual information on accuracy depending on the ground truth of the statement. In particular, when judging a truthful denial, accuracy was higher when contextual information was present (67.4%) than when contextual information was absent (52.8%), whereas when judging a deceptive denial, accuracy was lower when contextual information was present (45.5%) than when contextual information was absent (68.3%). In contrast to the seeming effect of behavioral cues to increase judgments of deception,
this pattern suggested that the provision of contextual information may have created a perceptual bias toward truthfulness, thereby increasing the number of suspects who were judged to be truthful.

**The Effects of Ground Truth, Behavioral Cues, and Contextual Information on Judgments of Truth or Deception**

One factor that complicates interpretation of the interactions above is that the accuracy of participants’ judgments is tied to the ground truth factor. The measure of accuracy was created by coding participants’ judgments of truth or deception as accurate if their judgment matched the ground truth of the suspect’s statements and inaccurate if their judgment did not match the ground truth of the suspect’s statements. For this reason, shifts in the number of suspects judged to be truthful or deceptive due to a perceptual bias would correspond to an increase in accuracy at one level of ground truth, but a decrease in accuracy at the other level of ground truth. To remove this connection between the ground truth factor and the dependent variable, I also tested the influence of the ground truth, behavioral cue, and contextual information factors on participants’ judgments of the suspect’s truth or deception.

**Deceptive Statements Increased Judgments of Deception**

First, I examined the effect of the ground truth factor on judgments of deception. The ability of the ground truth factor to predict judgments of truth or deception represents judges’ ability to discriminate between truthful and deceptive statements, and thereby represents overall accuracy. Accordingly, the analyses of judgments of truth or deception revealed a main effect of ground truth, such that judges were significantly more likely to judge deceptive statements to be deceptive than truthful statements. This finding indicates that judges were able to accurately discriminate between truthful and deceptive statements.
This result indicates that judges had some ability to accurately discriminate between truthful and deceptive statements independently of the provision of behavioral cues or contextual information. Thus, judges’ ability to discriminate between truthful and deceptive statements does not appear to be the result of the evaluation of either behavioral cues or correspondence cues created by the contextual information. This suggests that judges in this experiment had to have been attending to other cues to deception, which resulted in their ability to discriminate between truthful and deceptive statements. It is possible that judges were able to rely on content cues, such as the number of details, consistency, and completeness of the statement. Content cues tend to distinguish between liars and truth-tellers (DePaulo et al., 2003). Moreover, content cues would be available to judges regardless of the provision of behavioral cues or contextual information. Thus, it is possible that relying on content cues to deception may have increased judges’ accuracy at discriminating between truthful and deceptive statements.

To examine this possibility, I informally assessed differences in content cues between the statements made by the six truthful and six deceptive suspects that I chose for use in the current experiment. To assess the detailedness of the statement, I examined both the length of the videotaped statements and the number of words contained within suspects’ responses. The videotapes of truthful denials ranged in length from 168 seconds (2 minutes and 48 seconds) to 675 seconds (11 minutes and 15 seconds; \( M = 500.44 \) seconds), whereas the videotapes of deceptive denials ranged in length from 226 seconds (3 minutes and 46 seconds) to 768 seconds (12 minutes and 48 seconds; \( M = 376.45 \) seconds). Similarly, truthful denials ranged in length from 189 words to 1827 words (\( M = 1036.12 \)), whereas deceptive denials ranged in length from 367 words to 1852 words (\( M = 732.06 \)). Thus, judging by mean statement length and word count, truthful denials appear to be more detailed than deceptive denials. Next, to assess
consistency, I informally coded suspects’ statements for the number of clear inconsistencies in the content of their statements. Only one truthful denial contained a clear inconsistency ($M = 0.17$), whereas four of the six deceptive denials contained at least one clear inconsistency ($M = 0.83$). Finally, to assess completeness, I informally coded suspects’ statements for the number of times that the suspect’s response to the experimenter’s question was clearly incomplete. Truthful denials contained between zero and three incomplete responses ($M = 2.01$), whereas deceptive denials contained between one and four incomplete responses ($M = 2.49$). Thus, my informal evaluation of the suspects’ statements seems to provide preliminary support for the idea that truthful and deceptive denials differed in terms of content cues to deception. However, it should be noted that this is an extremely informal evaluation, which merits only speculation about differences in content between truthful and deceptive denials. An adequate assessment of whether the truthful and deceptive statements differed in terms of content cues would require a formal study in which multiple participants who are blind to the ground truth of suspects’ statements rate the statements in terms of their detailedness, completeness, and consistency.

**Behavioral Cues Increased Judgments of Deception**

Next, I examined the effect of the behavioral cues factor on judgments of deception. The ability of the behavioral cues factor to predict judgments of deception would represent a perceptual bias toward either truth or deception. Accordingly, the analyses of judgments of deception revealed a main effect of behavioral cues, such that judges who were able to observe behavioral cues were significantly more likely to judge a suspect to be deceptive than judges who were not able to observe behavioral cues. One reason that the provision of behavioral cues may have created this perceptual bias is that individuals tend to have incorrect beliefs about the
behaviors of deceptive individuals. In particular, prior literature has shown that many of the behaviors that individuals associate with deception, such as gaze aversion, increased head movements, and increased arm movements, are not indicative of deception (Akehurst, Köhnken, Vrij, & Bull, 1996; DePaulo, Stone, & Lassiter 1985). Moreover, many of the behaviors that individuals associate with deception are indicators of nervousness, which could be exhibited by both deceptive and truthful suspects in a high-stakes situation (Köhnken, 1989; Kraut & Poe, 1980). Thus, due to the high-stakes nature of the situation surrounding suspects’ statements in the current experiment, it is possible that judges who were able to observe behavioral cues mistook cues to nervousness or anxiety as cues to deception.

**Contextual Information Decreased Judgments of Deception**

Finally, I examined the effect of the contextual information factor on judgments of truth or deception. Similar to behavioral cues, the ability of the contextual information factor to predict judgments of deception would represent a perceptual bias. Accordingly, these analyses revealed a main effect of contextual information, such that judges who were provided with contextual information were significantly less likely to judge the suspect to be deceptive than judges who were not provided with contextual information. Thus, in contrast to the perceptual bias toward deception created by behavioral cues, the provision of contextual information created a perceptual bias toward truth.

One potential reason that this finding may have been obtained is that the provision of contextual information enabled judges to perceive a high amount of consistency between the content of the suspect’s statement and contextual information, even when judging a deceptive denial. As previously discussed, suspects who deceptively denied cheating had only cheated on two of the five logic problems about which they were questioned. For this reason, the statements
of deceptive suspects were likely to be consistent with the majority of the contextual information provided about the logic problems. For this reason, it is possible that the provision of contextual information enabled judges to notice a high amount of consistency between the content of the suspect’s statements and the contextual information, and thereby created a perceptual bias toward truthfulness.

In addition, if the perceptual bias toward truthfulness created by contextual information is the result of an ability to notice consistencies between the content of the suspect’s statements and the contextual information, it is possible that this effect was bolstered in the current experiment through a confirmation bias. In particular, judges may have used cues from the contextual information to support their pre-existing beliefs about the suspect’s truth status. Prior deception detection research has shown that undergraduate judges tend to show a truth bias: a belief that individuals are more likely to be telling the truth than they are to be lying (Levine, Park, McCormack, 2009). If judges in the current experiment were biased toward truth, they may have used the contextual information to confirm their pre-existing belief in the suspect’s truthfulness. For example, judges who were provided with contextual information may have focused their evaluation of the suspect’s statement on identifying content-context consistencies indicative of truthfulness, rather than identifying content-context inconsistencies indicative of deception.

To assess whether the data provided any evidence of a truth bias among judges, I examined the intercept term from the analysis in which ground truth, behavioral cues, and contextual information were regressed onto participants’ judgments of truth or deception. A judgment of truth was coded as 0, and a judgment of deception was coded as 1. The intercept term ($\beta = -0.07$, Wald $\chi^2(1) = 0.51$, $p = .474$, OR = 0.93) provided no evidence for a significant truth bias. The probability of judging a suspect to be deceptive was 48%, which is close to what
would be expected from chance (50%). Therefore, I found no evidence that judges were biased toward judgments of truth or deception.

While judges in the current experiment did not appear to be biased toward truth or deception, it is possible that contextual information may have a different effect on judgments when being used by an individual with a pre-existing bias. In particular, in contrast to undergraduate students, police investigators tend to show a lie bias: a belief that suspects who are being questioned are more likely to be lying than telling the truth (Meissner & Kassin, 2002). Because of this, when contextual information is used in a police interview, investigators may focus their evaluation of the suspect’s statement on identifying content-context inconsistencies indicative of deception, rather than content-context consistencies indicative of truthfulness. It is a question for future research to explore whether contextual information would have a different effect on judgments depending on judges’ pre-existing beliefs.

**Interactions Between Experimental Factors on Judgments of Truth or Deception**

Finally, I examined the interactions between the ground truth, behavioral cues, and contextual information factors on judgments of truth or deception. A significant interaction between ground truth and either the behavioral cues or contextual information factors would represent an effect on accuracy in discriminating between truthful and deceptive statements based on the provision of behavioral cues or contextual information. There was no significant interaction between the ground truth and behavioral cues factors, nor between the ground truth and contextual information factors, in predicting judgments of truth or deception. This suggests that, consistent with analyses of the effect of behavioral cues and contextual information on accuracy, neither behavioral cues nor contextual information increased judges’ ability to discriminate between truthful or deceptive statements. Moreover, there was no three-way
interaction between the ground truth, behavioral cues, and contextual information factors, suggesting that the combination of behavioral cues and contextual information did not moderate accuracy.

**Individual Difference Measures**

In addition to examining the effects of the experimental factors on judgments, I was also interested in examining the relationship between individual difference measures, accuracy, and perceptual bias. While there is little evidence of individual differences in accuracy of deception detection judgments, there is evidence of individual differences in perceptual biases toward truth or deception (Bond & DePaulo, 2008; Levine & McCormack, 1991). For this reason, I wanted to explore whether individual differences in scholastic ability as assessed through ACT and SAT scores, need for cognition (Cacioppo & Petty, 1982), procedural and distributive justice (Lucas, Zhdanova, & Alexander, 2011), hostility (Buss & Perry, 1992), or self-reported lie-telling ability were related to accuracy of judgments or perceptual bias toward truth or deception. For example, individuals higher in scholastic ability or need for cognition, who may be more likely to rely on statement cues, may be more accurate in their judgments. Individuals high in procedural and distributive justice, who may be more likely to believe that a suspect being questioned is more likely to have cheated, may have a perceptual bias toward deception. Similarly, hostile individuals, who may be more suspicious, may have a perceptual bias toward deception. Individuals high in self-reported lie-telling ability may have knowledge of which cues to deception are diagnostic, and therefore may be more accurate in their judgments.

To examine these possibilities, I conducted exploratory analyses examining the correlations between the individual difference measures, accuracy, and judgments of truth or deception. None of the individual difference measures were significantly related to accuracy.
Thus, I failed to find evidence that these individual differences contribute to deception detection accuracy. Moreover, with the exception of a small but significant negative correlation between ACT scores and continuous judgments of deception, none of the individual difference measures were significantly related to judgments of deception. It is possible that individuals higher in scholastic ability, as assessed through ACT scores, are more likely to rely on the content of the suspect’s statement, or are generally more trusting of other individuals, thereby increasing judgments of truth. However, future research is needed to replicate this exploratory finding and explore the mechanism by which higher ACT scores relate to perceptual bias.

Overall, the results failed to provide evidence that most of the individual differences measures assessed were related to accuracy or perceptual bias. However, given that judges in the current experiment only evaluated one truthful or deceptive statement, the measures of accuracy and the judgments of truth or deception may not adequately capture individual differences between judges. If judges were able to evaluate multiple statements made by several suspects, average accuracy and judgments of truth or deception across statements may be a better indicator of their personal deception detection accuracy or perceptual bias, leading to a more accurate assessment of their relationship to these individual difference measures.

Limitations

The results of the present research should be interpreted in light of several limitations. First, judges in the current research were university undergraduates with no training or experience in deception detection. For this reason, it is unlikely that judges in the current research were aware of which cues to deception might be diagnostic and may not have been likely to attend to correspondence cues within the content of the suspect’s statement. A question for future research is whether these findings would generalize in the context of trained police
investigators’ deception detection judgments. It is possible that trained police investigators may be more likely to attend to correspondence cues to deception, and thereby exhibit higher accuracy than what was observed in the current research. However, the use of an undergraduate student sample was necessary as an initial step toward creating an experiment high in internal validity to test the effects of behavioral cues and contextual information on accuracy.

Similarly, the truthful and deceptive statements used in this research also came from university undergraduates who were accused of cheating on a laboratory experiment. While the students believed that the situation was real and that an admission of cheating would result in real-world consequences, the stakes of successfully concealing deception would presumably be much higher in the context of a police interview in which the suspect could face legal consequences. Thus, it is possible that behavioral or statement cues to deception may be more apparent in suspects who undergo a real police interview. However, I chose to use a paradigm that involves accusing undergraduate students of cheating in order to increase internal validity. By doing so, I created materials in which the ground truth of the suspects’ statements was certain, the questions asked were held constant, and the circumstances surrounding the deceptive statements were the same for all suspects, thereby avoiding any confounds between our experimental manipulations and the content of the suspects’ interviews. Thus, I chose to use stimulus materials involving the accusation of undergraduate students in order to create materials in which the stakes of the situation were maximized to the extent possible while simultaneously seeking to maximize internal validity.

In addition, I used a relatively small pool of stimulus materials, including six deceptive suspects and six truthful suspects. For this reason, it is possible that the results may have been influenced by individual characteristics of a small number of suspects. However, I examined the
accuracy of judgments for each suspect and found that there was substantial variance in accuracy, ranging from 47.6% to 75.6%. Moreover, to examine whether the results were influenced by characteristics of suspects whose accuracy rates were high, I conducted the primary analyses with data from the two suspects with the highest accuracy rates excluded (including a male suspect who made a deceptive denial, 73%, and a male suspect who made a truthful denial, 75.6%). The results of these analyses indicated that removing these suspects did not meaningfully change the results. Specifically, there were no main effects or interactions between behavioral cues or contextual information on accuracy. In addition, the ground truth factor interacted with the behavioral cues factor, as well as with the contextual information factor, to predict accuracy. Finally, there were main effects of ground truth, behavioral cues, and contextual information on judgments of deception. Thus, the results of the current experiment do not seem to be the product of the characteristics of a small number of individual suspects.

Finally, it should be noted that the deception detection task that judges completed in this experiment is substantially different than the task of real-world police investigators. Judges in this study viewed a suspect’s statements in response to questioning by an experimenter who used a standardized, five-question script. This standardized script was likely to be substantially different than the questioning that would take place in a real-world police interview, in which investigators would be free to question the suspect for a greater amount of time and use the contextual information strategically to ask questions designed to elicit correspondence cues. It is more likely that contextual information would have a beneficial effect on accuracy in a situation in which judges are free to question the suspects strategically, and for a longer period of time, in order to elicit diagnostic correspondence cues. However, the use of standardized questioning was necessary to control for the content of the interview and enhance internal validity. Thus, although
using this short, standardized interview script may have created an interview setting that was less similar to a real police interview, a standardized script was necessary to rule out alternative explanations for any effects of contextual information on our dependent measures, such as by asking different questions that elicit different content or correspondence cues to deception. Moreover, the use of a relatively short period of questioning was necessary to minimize stress and ensure the welfare of the undergraduate student suspects.

Implications

The findings of the current experiment have important implications regarding the efficacy of using behavioral cues to detect deception generally, and in combination with contextual information. Contrary to claims made by proponents of the Reid training manual, the present experiment provided no evidence that the provision of behavioral cues increased deception detection accuracy, regardless of whether or not contextual information was provided. This result contributes to the substantial body of literature which has heretofore suggested that behavioral cues are invalid indicators of deception, and that individuals are poor at detecting deception through behavioral cues alone (Bond & DePaulo, 2006; Vrij, Granhag, & Porter, 2010).

Even more, while the provision of behavioral cues did not significantly influence accuracy, their provision did create a perceptual bias toward deception. In particular, judges were more likely to judge the suspect to be deceptive when behavioral cues were present than when they were absent. This result further suggests that not only is the evaluation of behavioral cues invalid when attempting to detect deception, it also has the potential to bias judges toward mistakenly judging the suspect to be deceptive. Therefore, the evaluation of behavioral cues may be particularly dangerous in the context of questioning an innocent suspect. If an innocent suspect is misclassified as deceptive on the basis of their behaviors, then they are more likely to
be subjected to a lengthy and coercive interrogation (Davis & Leo, 2006; Kassin, Goldstein, & Savitsky, 2003; Leo & Drizin, 2010). Subjecting an innocent suspect to a coercive interrogation thereby increases the likelihood of a false confession, and subsequently, wrongful conviction (Kassin, 2014; Narchet, Meissner, & Russano, 2010). Thus, the bias toward deception created by the evaluation of behavioral cues could lead investigators to an initial judgment error that creates a chain of events that result in wrongful conviction.

In addition to the findings regarding the effects of behavioral cues on accuracy and perceptual biases, these findings suggest that contextual information may not always operate to increase deception detection accuracy, as found in prior research (Blair, Levine, & Shaw, 2010; Blair, Reimer, & Levine, 2018; Reinhard, Sporer, Scharmach, & Marksteiner, 2011). In fact, the provision of contextual information may create a perceptual bias, such that judges who are provided with contextual information may be biased toward perceiving suspects to be truthful. Alternatively, the provision of contextual information may exacerbate existing biases and operate to confirm the judge’s pre-existing beliefs about the suspect’s truthfulness or deception.

If contextual information exacerbates judges’ pre-existing beliefs, it is possible that the biasing effect of contextual information may operate differently in the context of a police interview in which the investigator is free to reveal or withhold the content of the contextual information to the suspect through questioning. For example, investigators frequently confront suspects with relevant evidence surrounding the crime early in the interview, an accusatory interrogation tactic recommended in the Reid training manual (Inbau, Reid, Buckley, & Jayne, 2013; Leo, 1996). This early disclosure of contextual information may put innocent suspects at risk of falsely confessing through contamination – a process by which investigators provide suspects with confidential information about the crime throughout questioning that bolsters the
believability of a false confession (Appleby, Hasel, & Kassin, 2013; Garrett, 2010). For this reason, if an investigator who is biased toward deception discloses confidential contextual information to an innocent suspect, it may provide confirmatory, but false, evidence in support of their pre-existing belief in the suspect’s deception if they falsely confess.

By contrast, investigators who use information-gathering approaches that emphasize using contextual information strategically—by withholding contextual information at the outset of an interview, asking questions designed to elicit correspondence cues to deception, and only disclosing contextual information late in the interview—may be less susceptible to contaminating the statements made by innocent suspects, thereby increasing the diagnosticity of both confession evidence and correspondence cues to deception (Granhag, Strömwall, Willen, & Hartwig, 2013; Hartwig, Granhag, Strömwall, & Kronkvist, 2006; Meissner, Redlich, Bhatt, & Brandon, 2012). Thus, the biasing effect of contextual information on judgments may be exacerbated when confidential contextual information is disclosed early in an interview, but eliminated when contextual information is used in a strategic manner.

**Conclusion**

This experiment manipulated ground truth, behavioral cues, and contextual information to examine their effects on deception detection judgments. Results provided no evidence that behavioral cues increased accuracy, regardless of whether contextual information was provided or withheld. Moreover, contextual information did not significantly influence accuracy, in contrast to prior empirical research (Blair, Levine, & Shaw, 2010; Blair, Reimer, & Levine, 2018).

However, while the provision of behavioral cues did not independently influence accuracy of deception detection judgments, the provision of behavioral cues did create a
perceptual bias toward judging suspects to be deceptive. This finding provides further evidence that behavioral cues are invalid indicators of deception and suggests that their evaluation may be particularly dangerous for innocent suspects who may be misclassified as deceptive. Moreover, while contextual information did not independently influence accuracy of deception detection judgments, the provision of contextual information did create a perceptual bias toward judging suspects to be truthful. This suggests that contextual information could bias judgments toward truth, or potentially exacerbate pre-existing biases regarding the suspect’s truthfulness or deception. However, because judges in the current research were undergraduate students, these perceptual biases may be most likely to occur in the context of deception detection situations in which judges are untrained individuals engaging in the informal questioning of friends, partners, or employers. It is less clear whether this effect would also occur among trained investigators conducting a police interrogation. Therefore, it is important to explore these processes among real-world investigators.

Finally, although neither the provision of behavioral cues nor contextual information influenced accuracy, judges were able to discriminate between truthful and deceptive statements with some accuracy. This suggests that judges attended to content cues to deception to distinguish between truthful and deceptive suspects that were independent of the suspect’s behaviors or correspondence cues created by contextual information. This finding suggests that judges should be trained to evaluate content cues to deception, such as the number of details, consistency, and completeness of a statement. Moreover, this finding further supports the efficacy of deception detection methods that involve an analysis of the content of a suspect’s statement, such as content-based criteria analysis (Steller & Köhnken, 1989) or the verifiability approach (Nahari, Vrij, & Fisher, 2012).
Overall, the results of the current experiment caution against the evaluation of behavioral
cues to deception. Further, the results provide evidence that the influence of contextual
information on accuracy may exacerbate individuals’ pre-existing biases. Finally, the results
suggest that certain cues to deception may be contained within the content of a suspect’s
statement that can be used to distinguish between truthful and deceptive suspects independently
of the provision of behavioral cues or contextual information.
REFERENCES


TABLES

Table 1

Accuracy of Judgments Across Ground Truth, Behavioral Cues, and Contextual Information

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Contextual Information Absent</th>
<th>Contextual Information Present</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Truthful</td>
<td>Deceptive</td>
</tr>
<tr>
<td>Behavioral Cues Absent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dichotomous^a</td>
<td>54.7%</td>
<td>66.7%</td>
</tr>
<tr>
<td>Continuous^b</td>
<td>6.09 (2.06)</td>
<td>5.87 (2.09)</td>
</tr>
<tr>
<td>Behavioral Cues Present</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dichotomous^a</td>
<td>50.0%</td>
<td>69.8%</td>
</tr>
<tr>
<td>Continuous^b</td>
<td>5.89 (2.42)</td>
<td>6.08 (2.17)</td>
</tr>
<tr>
<td>Overall Accuracy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dichotomous^a</td>
<td>59.1%</td>
<td></td>
</tr>
<tr>
<td>Continuous^b</td>
<td>5.85 (2.27)</td>
<td></td>
</tr>
</tbody>
</table>

Note. N = 470.

^a Values represent proportions of accurate judgments.

^b Values represent mean accuracy. Standard deviations are presented in parentheses. Values ranged from a score of 1, which corresponded to a very inaccurate judgment, to a score of 10, which corresponded to a very accurate judgment.
Table 2

*Results of Logistic Regression Including Behavioral Cues and Contextual Information Predicting Accuracy of Dichotomous Judgment*

<table>
<thead>
<tr>
<th></th>
<th>β</th>
<th>Wald χ²</th>
<th>p</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Cues</td>
<td>0.04</td>
<td>0.05</td>
<td>.829</td>
<td>1.04^a</td>
<td>[0.72 – 1.50]</td>
</tr>
<tr>
<td>Contextual Information</td>
<td>-0.15</td>
<td>0.67</td>
<td>.413</td>
<td>0.86^a</td>
<td>[0.59 – 1.23]</td>
</tr>
<tr>
<td>Behavioral Cues x Contextual Information</td>
<td>0.09</td>
<td>0.05</td>
<td>.821</td>
<td>1.09^b</td>
<td>[0.52 – 2.27]</td>
</tr>
</tbody>
</table>

*Note. df = 1, N = 470 for all tests. OR = odds ratio; CI = confidence interval. Manipulations were effect-coded (behavioral cues absent = -.5, behavioral cues present = +.5; contextual information absent = -.5, contextual information present = +.5).*

^a*OR = Exp(β), representing difference between factor levels.*

^b*OR = Exp(β), representing ratio of ORs of the constituent simple main effects.*
Table 3

Results of an ANOVA Including Behavioral Cues and Contextual Information Predicting Accuracy of Continuous Judgment

<table>
<thead>
<tr>
<th></th>
<th>F(1, 466)</th>
<th>p</th>
<th>η^2</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Cues</td>
<td>0.09</td>
<td>.771</td>
<td>.000</td>
<td>[.000 – .008]</td>
</tr>
<tr>
<td>Contextual Information</td>
<td>1.57</td>
<td>.210</td>
<td>.003</td>
<td>[.000 – .022]</td>
</tr>
<tr>
<td>Behavioral Cues x Contextual Information</td>
<td>0.14</td>
<td>.706</td>
<td>.000</td>
<td>[.000 – .011]</td>
</tr>
</tbody>
</table>

Note. CI = confidence interval. Manipulations were effect-coded (behavioral cues absent = -.5, behavioral cues present = +.5; contextual information absent = -.5, contextual information present = +.5).
Table 4

Results of Logistic Regression Including Ground Truth, Behavioral Cues, Contextual Information Predicting Accuracy of Dichotomous Judgment

<table>
<thead>
<tr>
<th></th>
<th>β</th>
<th>Wald χ²</th>
<th>p</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Truth</td>
<td>-0.14</td>
<td>0.51</td>
<td>.474</td>
<td>0.87a</td>
<td>[0.60 – 1.27]</td>
</tr>
<tr>
<td>Behavioral Cues</td>
<td>0.03</td>
<td>0.02</td>
<td>.875</td>
<td>1.03a</td>
<td>[0.71 – 1.51]</td>
</tr>
<tr>
<td>Contextual Information</td>
<td>-0.15</td>
<td>0.60</td>
<td>.440</td>
<td>0.86a</td>
<td>[0.59 – 1.26]</td>
</tr>
<tr>
<td>Ground Truth × Behavioral Cues</td>
<td>0.81</td>
<td>4.43</td>
<td>.035</td>
<td>2.26b</td>
<td>[1.06 – 4.82]</td>
</tr>
<tr>
<td>Ground Truth × Contextual Info</td>
<td>-1.58</td>
<td>16.79</td>
<td>&lt; .001</td>
<td>0.21b</td>
<td>[0.10 – 0.44]</td>
</tr>
<tr>
<td>Behavioral Cues × Contextual Info</td>
<td>0.07</td>
<td>0.03</td>
<td>.862</td>
<td>1.07b</td>
<td>[0.50 – 2.28]</td>
</tr>
<tr>
<td>Ground Truth × Behavioral Cues × Contextual Information</td>
<td>1.03</td>
<td>1.77</td>
<td>.183</td>
<td>2.80b</td>
<td>[0.62 – 12.74]</td>
</tr>
</tbody>
</table>

Note. df = 1, N = 470 for all tests. OR = odds ratio; CI = confidence interval. Manipulations were effect-coded (behavioral cues absent = -.5, behavioral cues present = +.5; contextual information absent = -.5, contextual information present = +.5; truthful denial = -.5, deceptive denial = +.5).

aOR = Exp(β), representing difference between factor levels.
bOR = Exp(β), representing ratio of ORs of the constituent simple main effects.
### Table 5

**Results of an ANOVA Including Ground Truth, Behavioral Cues, and Contextual Information**

*Predicting Accuracy of Continuous Judgment*

<table>
<thead>
<tr>
<th></th>
<th>$F(1, 462)$</th>
<th>$p$</th>
<th>$\eta^2_p$</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Truth</td>
<td>14.01</td>
<td>&lt; .001</td>
<td>.029</td>
<td>[.007 – .066]</td>
</tr>
<tr>
<td>Behavioral Cues</td>
<td>0.15</td>
<td>.702</td>
<td>.000</td>
<td>[.000 – .011]</td>
</tr>
<tr>
<td>Contextual Information</td>
<td>2.37</td>
<td>.124</td>
<td>.005</td>
<td>[.000 – .026]</td>
</tr>
<tr>
<td>Ground Truth × Behavioral Cues</td>
<td>2.56</td>
<td>.110</td>
<td>.006</td>
<td>[.000 – .027]</td>
</tr>
<tr>
<td>Ground Truth × Contextual Information</td>
<td>13.30</td>
<td>&lt; .001</td>
<td>.028</td>
<td>[.006 – .064]</td>
</tr>
<tr>
<td>Behavioral Cues × Contextual Information</td>
<td>0.16</td>
<td>.685</td>
<td>.000</td>
<td>[.000 – .011]</td>
</tr>
<tr>
<td>Ground Truth × Behavioral Cues × Contextual Information</td>
<td>0.34</td>
<td>.561</td>
<td>.001</td>
<td>[.000 – .014]</td>
</tr>
</tbody>
</table>

*Note.* CI = confidence interval. Manipulations were effect-coded (truthful denial = -.5, deceptive denial = +.5; behavioral cues absent = -.5, behavioral cues present = +.5; contextual information absent = -.5, contextual information present = +.5).
Table 6

*Results of Logistic Regression Including Ground Truth, Behavioral Cues, and Contextual Information Predicting Dichotomous Judgments of Truth or Deception*

<table>
<thead>
<tr>
<th></th>
<th>β</th>
<th>Wald χ²</th>
<th>p</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Truth</td>
<td>0.73</td>
<td>14.26</td>
<td>&lt; .001</td>
<td>2.08</td>
<td>[1.42 – 3.03]</td>
</tr>
<tr>
<td>Behavioral Cues</td>
<td>0.41</td>
<td>4.43</td>
<td>.035</td>
<td>1.50</td>
<td>[1.03 – 2.19]</td>
</tr>
<tr>
<td>Contextual Information</td>
<td>-0.79</td>
<td>16.79</td>
<td>&lt; .001</td>
<td>0.45</td>
<td>[0.31 – 0.66]</td>
</tr>
<tr>
<td>Ground Truth × Behavioral Cues</td>
<td>0.06</td>
<td>0.03</td>
<td>.875</td>
<td>1.06</td>
<td>[0.50 – 2.27]</td>
</tr>
<tr>
<td>Ground Truth × Contextual Information</td>
<td>-0.30</td>
<td>0.60</td>
<td>.440</td>
<td>0.74</td>
<td>[0.35 – 1.58]</td>
</tr>
<tr>
<td>Behavioral Cues × Contextual Information</td>
<td>0.52</td>
<td>1.77</td>
<td>.183</td>
<td>1.67</td>
<td>[0.78 – 3.57]</td>
</tr>
<tr>
<td>Ground Truth × Behavioral Cues × Contextual Information</td>
<td>0.13</td>
<td>0.03</td>
<td>.862</td>
<td>1.14</td>
<td>[0.25 – 5.20]</td>
</tr>
</tbody>
</table>

*Note. df = 1, N = 470 for all tests. OR = odds ratio; CI = confidence interval. Manipulations were effect-coded (truthful denial = -.5, deceptive denial = +.5; behavioral cues absent = -.5, behavioral cues present = +.5; contextual information absent = -.5, contextual information present = +.5).*

Superscript notes:

- OR = Exp(β), representing difference between factor levels.
- OR = Exp(β), representing ratio of ORs of the constituent simple main effects.
Table 7
Results of an ANOVA Including Ground Truth, Behavioral Cues, and Contextual Information

Predicting Continuous Judgments of Truth or Deception

<table>
<thead>
<tr>
<th></th>
<th>$F(1, 462)$</th>
<th>$p$</th>
<th>$\eta^2$</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Truth</td>
<td>10.18</td>
<td>.002</td>
<td>.022</td>
<td>[.003 – .054]</td>
</tr>
<tr>
<td>Behavioral Cues</td>
<td>2.56</td>
<td>.110</td>
<td>.006</td>
<td>[.000 – .027]</td>
</tr>
<tr>
<td>Contextual Information</td>
<td>13.30</td>
<td>&lt; .001</td>
<td>.028</td>
<td>[.006 – .064]</td>
</tr>
<tr>
<td>Ground Truth × Behavioral Cues</td>
<td>0.15</td>
<td>.702</td>
<td>.000</td>
<td>[.000 – .011]</td>
</tr>
<tr>
<td>Ground Truth × Contextual Information</td>
<td>2.37</td>
<td>.124</td>
<td>.005</td>
<td>[.000 – .026]</td>
</tr>
<tr>
<td>Behavioral Cues × Contextual Information</td>
<td>0.34</td>
<td>.561</td>
<td>.001</td>
<td>[.000 – .014]</td>
</tr>
<tr>
<td>Ground Truth × Behavioral Cues × Contextual Information</td>
<td>0.16</td>
<td>.685</td>
<td>.000</td>
<td>[.000 – .011]</td>
</tr>
</tbody>
</table>

Note. CI = confidence interval. Manipulations were effect-coded (truthful denial = -.5, deceptive denial = +.5; behavioral cues absent = -.5, behavioral cues present = +.5; contextual information absent = -.5, contextual information present = +.5).
Table 8
Correlations and Descriptive Statistics for Individual Difference Measures, Accuracy, and Judgments of Deception

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Scores</td>
<td>–</td>
<td>.331*</td>
<td>.355**</td>
<td>-.082</td>
<td>-.118*</td>
<td>-.090</td>
<td>.105*</td>
<td>-.053</td>
<td>-.060</td>
<td>-.057</td>
<td>-.118*</td>
</tr>
<tr>
<td>2. SAT Scores</td>
<td>–</td>
<td>-.084</td>
<td>-.026</td>
<td>-.108</td>
<td>-.129</td>
<td>-.047</td>
<td>-.053</td>
<td>.058</td>
<td>.013</td>
<td>-.166</td>
<td></td>
</tr>
<tr>
<td>3. Need for Cognition</td>
<td>–</td>
<td>-.031</td>
<td>-.031</td>
<td>-.068</td>
<td>.048</td>
<td>-.018</td>
<td>-.046</td>
<td>-.037</td>
<td>-.054</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Procedural Justice</td>
<td>–</td>
<td>.530**</td>
<td>-.291**</td>
<td>-.048</td>
<td>.009</td>
<td>.042</td>
<td>.033</td>
<td>.009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Distributive Justice</td>
<td>–</td>
<td>-.148**</td>
<td>-.067</td>
<td>-.024</td>
<td>.004</td>
<td>.002</td>
<td>-.011</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Hostility</td>
<td>–</td>
<td>.107*</td>
<td>.007</td>
<td>.028</td>
<td>.036</td>
<td>.064</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Lie-Telling Ability</td>
<td>–</td>
<td>-.030</td>
<td>-.007</td>
<td>-.056</td>
<td>-.037</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Dichotomous Accuracy</td>
<td>–</td>
<td>.840**</td>
<td>-.002</td>
<td>-.033</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Continuous Accuracy</td>
<td>–</td>
<td>-.058</td>
<td>-.069</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Dichotomous Judgment of Deception</td>
<td>–</td>
<td>.850**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Continuous Judgment of Deception</td>
<td>–</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

M  
24.68  1181.67  58.27  40.20  36.84  20.74  15.74  0.59  5.85  0.48  5.12  
SD  
3.85  230.42  11.19  8.00  7.79  6.11  3.07  0.49  2.27  0.50  2.26

Note. N = 430 for ACT scores, N = 69 for SAT scores, N = 470 for all other tests. ACT = American College Test; SAT = Scholastic Aptitude Test.
* p < .05. ** p < .01.
FIGURES

Figure 1

Accuracy of Dichotomous Judgments by Behavioral Cues, Contextual Information Conditions

![Bar graph showing accuracy percentages for different conditions.]

- **Contextual Information Absent**
  - Behavioral Cues Absent: 61.1%
  - Behavioral Cues Present: 61.0%

- **Contextual Information Present**
  - Behavioral Cues Absent: 56.3%
  - Behavioral Cues Present: 58.3%
Figure 2

Accuracy of Dichotomous Judgments by Ground Truth, Behavioral Cues Conditions

![Bar chart showing accuracy of dichotomous judgments by ground truth and behavioral cues conditions.](chart)

- Truthful Denial:
  - Behavioral Cues Absent: 65.2%
  - Behavioral Cues Present: 56.6%

- Deceptive Denial:
  - Behavioral Cues Absent: 52.1%
  - Behavioral Cues Present: 62.9%

□ Behavioral Cues Absent  ■ Behavioral Cues Present
Figure 3

Accuracy of Dichotomous Judgments by Ground Truth, Contextual Information Conditions

![Bar chart showing accuracy of truthful and deceptive denial judgments with and without contextual information.]

- **Truthful Denial**
  - Contextual Information Absent: 52.8%
  - Contextual Information Present: 67.4%

- **Deceptive Denial**
  - Contextual Information Absent: 68.3%
  - Contextual Information Present: 45.5%
Figure 4

Proportions of Dichotomous Judgments of Deception by Ground Truth, Behavioral Cues, and Contextual Information Conditions
Figure 5

Proportions of Dichotomous Judgments of Deception by Ground Truth Conditions ($p < .001$)
Figure 6

Proportions of Dichotomous Judgments of Deception by Behavioral Cues Conditions (p = .035)
Figure 7

Proportions of Dichotomous Judgments of Deception by Contextual Information Conditions

\(p < .001\)
APPENDIX A: LOGIC PROBLEMS USED IN PRELIMINARY STUDY

1. Seven students—K, L, M, N, O, P, and R—give presentations, one at a time and in order. The following conditions apply:

   - N presents before L.
   - M presents after O.
   - P presents after L but before M.
   - R presents before K but after N.
   - K presents after P.

Which of the following could represent the order in which students give presentations?

   b. L, N, R, O, P, K, M
   d. O, N, L, M, P, R, K

**Answer:**

2. These pictures tell a story, but the order is all mixed up. Put them in the right order so that they tell a story. What is the order of the numbers printed on the back?

   a. 136524
   b. 564123
   c. 412356
   d. 532641

**Answer:**

3. Janet, Barbara, and Elaine are a housewife, lawyer, and physicist, although not necessarily in that order. Janet lives next door to the housewife. Barbara is the physicist’s best friend. Elaine once wanted to be a lawyer but decided against it. Janet has seen Barbara within the last two days, but has not seen the physicist.

Janet, Barbara and Elaine are, in that order, the

   a. Housewife, physicist, lawyer
   b. Physicist, lawyer, housewife
   c. Physicist, housewife, lawyer
   d. Lawyer, housewife, physicist

**Answer:**
4. These pictures tell a story, but the order is all mixed up. Put them in the right order so that they tell a story. What is the order of the numbers printed on the back?

   a. 421365  
   b. 635421  
   c. 541623  
   d. 324165

   Answer: __________________

5. Open the padlock on the lockbox in front of you by solving the riddle printed below. What is inside of the lockbox?

   a. Chalk  
   b. Toy car  
   c. Key  
   d. Toy animal

   Answer: __________________

   To unlock the lockbox…

   Step 1 - Solve this code:

   WJOSANO PK MQAOPEKJO 1 – 4 EJ KNZAN

   (Hint: E = I)

   Step 2 - Use this key to open the padlock:

   A = 1, B = 2, C = 3, D = 4.
APPENDIX B: INSTRUCTIONS AND CONTEXTUAL INFORMATION

Context Absent Conditions:
For this study, you will be presented with statements made by a student who was accused of cheating on a laboratory task during a psychology experiment. As you will see, the student denied cheating when questioned about the incident by the experimenter. Your job is to decide whether this student is telling the truth (that is, the student is truly innocent and did not cheat) or lying (that is, the student is truly guilty and actually did cheat).

Context Present Conditions:
For this study, you will be presented with statements made by a student who was accused of cheating on a laboratory task during a psychology experiment. As you will see, the student denied cheating when questioned about the incident by the experimenter. Your job is to decide whether this student is telling the truth (that is, the student is truly innocent and did not cheat) or lying (that is, the student is truly guilty and actually did cheat).

Although it was just part of the experiment to accuse every student, all students – including the one you will be evaluating – believed that the situation was real, that the experimenter really thought they cheated, and that they might really be in trouble.

The following describes the laboratory task that the student had to do.

- The laboratory task consisted of five logic problems that the student completed with a partner.
- For each logic problem, the student and partner jointly selected a multiple choice answer, either A, B, C, or D. There was only one correct answer for each logic problem.
- For Logic Problems 1 & 3, the student and partner had to solve word problems. To get the correct answer, they had to use a process of elimination.
- For Logic Problems 2 & 4, the student and partner were given a set of pictures in random order. To get the correct answer, they had to rearrange the pictures into a particular order so that the pictures told a logical story.
- For Logic Problem 5, the student and partner had to unlock a box and report what they found inside, which was a toy car. To unlock the box, they needed the combination (3243), which was given to them in the form of a “secret code” that they had to figure out.
APPENDIX C: DEMOGRAPHIC QUESTIONNAIRE

Please answer the following questions about yourself.

1. Age (in years): ______

2. What is your biological sex?

   □ Female       □ Male       □ Prefer not to answer

3. How would you describe yourself?

   □ American Indian or Alaska Native
   □ Asian
   □ Black or African-American
   □ Hispanic, Latino, or Spanish origin
   □ Native Hawaiian or Other Pacific Islander
   □ White
   □ Other (please specify) ____________________
   □ Prefer not to answer

4. Is English your native language?

   □ Yes       □ No

5. If you answered No, what is your native language?

   Native Language: ____________________________
APPENDIX D: INDIVIDUAL DIFFERENCE MEASURES

Did you take the ACT?
   Yes
   No

Please indicate the highest ACT composite score you ever received (estimate if necessary).
   __________

Did you take the SAT?
   Yes
   No

Please indicate the highest SAT composite score you ever received (estimate if necessary).
   __________

**Need for Cognition**

For each of the statements below, please indicate whether or not the statement is characteristic of you or of what you believe.

<table>
<thead>
<tr>
<th></th>
<th>1 Extremely Uncharacteristic of Me</th>
<th>2 Somewhat Uncharacteristic of Me</th>
<th>3 Uncertain</th>
<th>4 Somewhat Characteristic of Me</th>
<th>5 Extremely Characteristic of Me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I prefer complex to simple problems.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>I like to have the responsibility of handling a situation that requires a lot of thinking.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Thinking is not my idea of fun.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>I try to anticipate and avoid situations where there is a likely chance I will have to think in depth about something.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>I find satisfaction in deliberating hard and for long hours.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. I only think as hard as I have to.
8. I prefer to think about small daily projects to long term ones.
9. I like tasks that require little thought once I’ve learned them.
10. The idea of relying on thought to make my way to the top appeals to me.
11. I really enjoy a task that involves coming up with new solutions to problems.
12. Learning new ways to think doesn’t excite me very much.
13. I prefer my life to be filled with puzzles I must solve.
14. The notion of thinking abstractly is appealing to me.
15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.
16. I feel relief rather than satisfaction after completing a task that requires a lot of mental effort.
17. It’s enough for me that something gets the job done; I don’t care how or why it works.
18. I usually end up deliberating about issues even when they do not affect me personally.

**Belief in a Just World Scale**

In this first set of questions we are interested in your perceptions of fairness with respect to OTHERS. Please mark your level of agreement using the 7-point scale shown below.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Slightly Disagree</th>
<th>Neutral</th>
<th>Slightly Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

__ 1. I feel that people generally earn the rewards and punishments that they get in this world.
__ 2. People usually receive the outcomes that they deserve.
__ 3. People generally deserve the things that they are accorded.
__ 4. I feel that people usually receive the outcomes that they are due.
__ 5. People usually use fair procedures in dealing with others.
__ 6. I feel that people generally use methods that are fair in their evaluations of others.
__ 7. Regardless of the specific outcomes they receive, people are subject to fair procedures.
__ 8. People are generally subject to processes that are fair.
In this next set of questions, we are interested in your perceptions of fairness with respect to YOURSELF. Please mark your level of agreement using the 7-point scale shown below.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Slightly Disagree</th>
<th>Neutral</th>
<th>Slightly Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

1. I feel that I generally earn the rewards and punishments that I get in this world.
2. I usually receive the outcomes that I deserve.
3. I generally deserve the things that I am accorded.
4. I feel that I usually receive the outcomes that I am due.
5. People usually use fair procedures in dealing with me.
6. I feel that people generally use methods that are fair in their evaluations of me.
7. Regardless of the specific outcomes I receive, I am subject to fair procedures.
8. I am generally subjected to processes that are fair.

**Hostility Subscale of the Buss-Perry Aggression Scale**

Please rate each of the following items in terms of how characteristic they are of you.

1. I am sometimes eaten up with jealousy.

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<tr>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely uncharacteristic of me</td>
<td></td>
<td></td>
<td></td>
<td>Extremely characteristic of me</td>
</tr>
</tbody>
</table>

2. At times I feel like I have gotten a raw deal out of life.

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<th>5</th>
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<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
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</tbody>
</table>

3. Other people always seem to get the breaks.

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<th>5</th>
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<tbody>
<tr>
<td>Extremely uncharacteristic of me</td>
<td></td>
<td></td>
<td></td>
<td>Extremely characteristic of me</td>
</tr>
</tbody>
</table>
4. I wonder why sometimes I feel so bitter about things.

   1  2  3  4  5
   Extremely uncharacteristic of me

5. I know that “friends” talk about me behind my back.

   1  2  3  4  5
   Extremely uncharacteristic of me

6. I am suspicious of overly friendly strangers.

   1  2  3  4  5
   Extremely uncharacteristic of me

7. I sometimes feel that people are laughing at me behind my back.

   1  2  3  4  5
   Extremely uncharacteristic of me

8. When people are especially nice, I wonder what they want.

   1  2  3  4  5
   Extremely uncharacteristic of me
APPENDIX E: MEASURES OF PARTICIPANT LIE-TELLING ABILITY

How much do you agree with each of the following statements about yourself?

1. When I tell a lie, I am very good at making people believe me.

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<th>5</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Disagree strongly</td>
<td>Disagree somewhat</td>
<td>Neither agree nor disagree</td>
<td>Agree somewhat</td>
<td>Agree strongly</td>
</tr>
</tbody>
</table>

2. I am a terrible liar.

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</tr>
</tbody>
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3. Other people can always tell if I am lying.

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4. I can make other people believe me.

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5. When necessary, I find it easy to lie to others.

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APPENDIX F: INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
2420 Lincoln Way, Suite 202

Date: 02/13/2020
To: Kristen Slapinski
Max Guyl
From: Office for Responsible Research
Title: The Effects of Knowledge of Case Evidence on Deception Detection Accuracy
IRB ID: 18-377
Submission Type: Modification
Review Type: Expedited
Approval Date: 02/13/2020
Approval Expiration Date: N/A

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

• **Use only the approved study materials** in your research, including the **recruitment materials and informed consent documents** that have the IRB approval stamp.

• **Retain signed informed consent documents** for 3 years after the close of the study, when documented consent is required.

• **Obtain IRB approval prior to implementing any changes** to the study or study materials.

• **Promptly inform the IRB of any addition of or change in federal funding for this study.** Approval of the protocol referenced above applies only to funding sources that are specifically identified in the corresponding IRB application.

• **Inform the IRB if the Principal Investigator and/or Supervising Investigator end their role or involvement with the project** with sufficient time to allow an alternate PI/Supervising Investigator to assume oversight responsibility. Projects must have an **eligible PI** to remain open.
• Immediately inform the IRB of (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.

• IRB approval means that you have met the requirements of federal regulations and ISU policies governing human subjects research. Approval from other entities may also be needed. For example, access to data from private records (e.g., student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. IRB approval in no way implies or guarantees that permission from these other entities will be granted.

• Your research study may be subject to post-approval monitoring by Iowa State University’s Office for Responsible Research. In some cases, it may also be subject to formal audit or inspection by federal agencies and study sponsors.

• Upon completion of the project, transfer of IRB oversight to another IRB, or departure of the PI and/or Supervising Investigator, please initiate a Project Closure to officially close the project. For information on instances when a study may be closed, please refer to the IRB Study Closure Policy.

If your study requires continuing review, indicated by a specific Approval Expiration Date above, you should:

• Stop all human subjects research activity if IRB approval lapses, unless continuation is necessary to prevent harm to research participants. Human subjects research activity can resume once IRB approval is re-established.

• Submit an application for Continuing Review at least three to four weeks prior to the Approval Expiration Date as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

Please don’t hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.