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Deception Detection in Dyads

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DECEPTION DETECTION IN DYADS

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Master's Program in Clinical Psychology

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Dedication

I would like to dedicate this to my wonderful family: Mom, Dad, G-Money, and the Treat Creature. I could not have done it without you!

DECEPTION DETECTION IN DYADS

By

LORAE MARQUEZ, B.A.

THESIS

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Abstract

The aim of the present study was to determine whether it is possible to detect deception during the interview of a dyad by observing the nonverbal "partner monitoring" behavior of one dyad partner while the other partner is telling a lie. This study also aimed to assess whether individual differences in the Big Five personality traits, Absorption, and Imaginative Suggestibility are correlated with partner monitoring when one's partner is telling a lie. Undergraduate psychology students (N=94) were grouped in dyads and asked to play a game that involved one member of the dyad lying and the other member telling the truth. It was predicted that "partner monitoring" behaviors such as glancing at one's partner would more frequently be exhibited (a) by the non-lying member of a dyad when his or her partner was telling a lie than (b) by the lying member of a dyad when his or her partner was telling the truth. Participants' responses were videotaped and later coded to determine whether partners were more likely to exhibit partner monitoring behavior when their partner was lying than when their partner was telling the truth. Findings did not indicate that there were any significant differences in partner monitoring behavior between the non-lying member of a dyad (i.e. the Truth Teller) when his or her partner was telling a lie and the lying member of a dyad (i.e. the Liar) when his or her partner was telling the truth. Findings also indicated that there were significant relationships between partner-monitoring behavior while playing the role of the truth teller and two of the individual difference variables: imaginative suggestibility and level of interest in office work.

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Introduction

Everyone lies. It is not what one would consider an uncommon event and research indicates that individuals lie about twice a day on average (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996). Deception may take place across various forms of communication, and has been estimated to occur in 14% of emails, 27% of face-to-face interactions and 37% of phone calls (Hancock, 2007). Yet, despite the ubiquitous nature of deception in daily life, human beings are not adept at correctly identifying when another individual is lying.

Numerous studies indicate that under typical conditions the probability of one person successfully detecting deception by another person is only slightly better than chance (e.g. Hartwig, Granhag, Stromwall, & Vrij, 2004; Porter & ten Brinke, 2010; Vrij, 2008). This rate of deception detection accuracy is observed even among individuals such as detectives who must frequently try to detect deception as part of their professional responsibilities.

Although deception is omnipresent in most social interactions, it can have especially important consequences within the field of criminal justice. Deception detection is thus important within forensic settings as well as some clinical contexts (e.g. Vrij, 2008; Porter & Brinke, 2010; Rogers, Salekin, Sewell, Goldstein, & Leonard, 1998). Within the field of law enforcement, officials are required to discriminate between true and false statements frequently, if not daily. It is possible that a suspect may falsely deny involvement in a crime, or that a witness or alleged victim may deliberately make false accusations against someone.

As well, deception detection is relevant to investigators in intelligence settings who seek to prevent criminal acts such as terrorism from occurring. In contrast to forensic investigation interviews, intelligence interviews are primarily concerned with gathering information rather than obtaining a confession (Borum, 2006; Brandon, 2011). This information is primarily

regarding activities that will take place in the future and intelligence investigators seek to successfully discriminate between true and false accounts.

Several different methods have been developed for detecting deception in forensic and other settings. Some of these methods rely on psychophysiological cues of deception, such as the polygraph, while others rely on behavioral or nonverbal cues. The following sections will discuss leading theories concerning deception detection and describe the methods that have been developed for this task.

For purposes of scholarly completeness, this thesis will review topics in the field of deception and deception detection. However, not all of this information is directly relevant to the present study. Readers who wish to focus on topics directly relevant to this thesis may want to skip ahead to the section entitled “Prospective Study” on page 21.

Theories of Deception Detection

The following section will briefly discuss influential conceptual frameworks that have provided the foundation for research on deception detection.

Ekman & Friesen

Ekman and Friesen’s (1969) work is generally considered to be one of the earliest and most influential conceptualizations of deception to be explored by researchers. Ekman and Friesen identified what they referred to as “leakage cues,” which are nonverbal behaviors that betray the desired impression that an individual is attempting to portray to another.

Ekman and Friesen theorized that, in comparison to the body, the face is more likely to betray when someone is lying and thus provide more opportunity for detecting deception. The face generally has a larger expressive capacity than the hands, legs or feet; as a result, a liar is more likely to inhibit and try to control facial expressions that may be discrepant with

misinformation or false impressions that the liar is attempting to give. This inhibition of facial expression, whether it is deliberate or unconscious, results in what Ekman and Friesen refer to as a micro affect, a type of leakage cue. Micro affects are "brief muscular movements in the face that can ordinarily be detected only when videotape is shown in slow motion." (Ekman & Friesen, 1969, p. 93),

Beginning in the 1970s and 1980s, Ekman focused on the role of emotions in deception. He identified two categories of deception cues: thinking cues and feeling cues (Ekman, 1985, 1992). Ekman hypothesized that by understanding the emotional component of deception one may be able to predict those behaviors that are indicative of a lie being told. As well, different emotions were predicted to have different deception cues.

Regarding thinking cues, Ekman hypothesized that it is possible for discrepancies to arise as a result of either over-thinking or being under-prepared. For example, a deceiver who over-thinks may tell lies in a manner that appears rehearsed and unnatural. Conversely, an under-prepared deceiver may tell lies in an awkward manner with slowed speech and delayed responses.

Buller & Burgoon

Buller and Burgoon (1996) developed a theory of interpersonal deception within the discipline of communications. According to their theory, when an individual is intentionally deceiving another, two internal processes are simultaneously taking place. The deceptive individual is "attempting to convey their deceptive message, and at the same time...continually monitoring the target of their deception for signs of suspiciousness and then adapting their behavior accordingly" (p. 20).

However, Buller and Burgoon (1996) maintained that no one profile of behavior is indicative of deception. Rather, the behaviors associated with deception may vary, depending on mediating factors such as the deceiver's goals, motivations, relationship with the target of their deception, and the target's degree of suspiciousness. By taking into account the type and strength of such mediating factors, Buller and Burgoon hypothesized that it may be possible to detect behaviors that occur as a result.

Buller and Burgoon (1996) identified three types of motivation that may increase the likelihood of deceptive behaviors being expressed: instrumental motives, identity motives, and relational motives. Instrumental motives are those that are driven by self-interest, identity motives are those that are intended to protect a liar's image, and relational motives are those that are intended to avoid relationship problems. Buller and Burgoon predicted that instrumental motives would produce higher levels of detection apprehension, resulting in the expression of arousal cues, which are unintentional or nonstrategic behaviors that may betray the deceiver's hidden intentions.

Zuckerman

Zuckerman's research on deception detection (Zuckerman, DePaulo, & Rosenthal, 1981) is based upon the idea that nonverbal behavior is not entirely under conscious control, and therefore may provide involuntary cues when a person is lying. However, Zuckerman maintains that some nonverbal behaviors are more controllable than others and therefore, there is no one set of behaviors that will consistently be indicative of deception. Given this assumption, Zuckerman's research focused on the underlying thoughts, feelings and psychological processes involved in deception, rather than the observable behavior associated with the act of lying.

Zuckerman identified four factors associated with deception: arousal, feelings while lying, cognitive aspects, and attempted control of verbal and nonverbal behaviors (Zuckerman et al., 1981). Liars may experience higher levels of arousal than those telling the truth, resulting in pupil dilation, increased blinking, more frequent speech disturbances, and higher pitch. Feelings while lying are a factor because if a liar is experiencing guilt or fear, behavior associated with these emotions (such as fidgeting, evasive and indirect communication, less eye contact) is more likely to be present.

Zuckerman also identified cognitive aspects as a factor. He hypothesized that lying is a more cognitively challenging task than truth telling and so will result in the following behaviors: longer response latencies, more speech hesitations, and greater pupil dilation. Lastly, attempted control of verbal and nonverbal behaviors is a predicted factor because in attempting to control one's behavior, one may inadvertently display cues that will betray the impression one desires to conceal resulting in behavior such as decreased spontaneity.

DePaulo

The foundation for DePaulo's (1992) conceptualization of deception detection is self-presentation theory. Self-presentation is by definition the act of behaving "in ways that convey certain roles and personal qualities to others" (Pontari & Schlenker, 2000, p. 1092). We attempt to create these desired impressions on others by our expression of nonverbal behavior. Nonverbal behavior is not entirely unregulated and in social interactions it serves as a means to present ourselves in a certain way.

DePaulo applied self-presentation theory as a conceptualization of lying in everyday life (DePaulo, 1992). When telling the truth, a person desires to present himself or herself as honest and trustworthy and give the impression of telling the truth. However, when lying, a person

desires to give the same impression. What will always set the deceiver apart from the truth teller is their motive, which is to purposefully deceive. DePaulo refers to this as the deception discrepancy and that from this discrepancy, cues of deception can be predicted (DePaulo, et al., 2003). However, DePaulo rejects the view that lying is a cognitively and emotionally challenging task. Instead, she maintains that, with practice, an individual can become so competent in the act of deception that there are little to no “behavioral residues.” Therefore verbal and nonverbal cues of deception may only be recognizable in the inexperienced liar.

DePaulo’s self-presentational perspective identifies five categories of cues to deception: latency, less compelling tales, less pleasant, increased tension, and fewer ordinary imperfections in their story (DePaulo, Wetzel, Sternglanz, & Walker Wilson, 2003). This perspective also predicts that factors such as motivation, lie content, and amount of time devoted to preparing a lie can moderate the strength of the cues.

Deception Detection Using Nonverbal Cues

Research on deception detection has typically focused on one of the following two distinct approaches: deception detection based on physiological responses or deception detection based on observable nonverbal behavior. The idea that non-verbal behavioral may betray information about the speaker is reasonable. For example, research has shown that nonverbal behavior can reveal characteristics such as gender, sexual orientation, status, dominance, and romantic involvement (Ambady, Bernieri, & Richeson, 2000; Ambady & Rosenthal, 1992; DePaulo & Friedman, 1998; DePaulo, 1992). It is plausible, therefore, that nonverbal behavior can also betray information that a deceptive person is trying to keep secret.

Perhaps for this reason, nonverbal behavior is often treated as an important source of information in criminal investigations. For example, a Florida man by the name of Tom Sawyer

became the prime suspect of a case involving sexual assault and murder. After being interrogated for 16 hours and being threatened, he provided a confession. However, Mr. Sawyer only became the prime suspect in this particular case after his face became flushed during the initial interview (Meissner & Kassin, 2002).

Because everyday experience shows that individuals are frequently unaware of their nonverbal behavior, it seems highly plausible that when people tell lies, their nonverbal behaviors may betray the untruthful impressions they are attempting to convey (Hale & Stiff, 1990; Maxwell, Cook, & Burr, 1985; Stiff, Hale, Garlick, & Rogan, 1990; Vrij, Dragt, & Koppelaar, 1992; DePaulo & Rosenthal, 1979). Despite the surface plausibility of this idea, however, research indicates that both laypersons and law enforcement experts have difficulty detecting a liar merely by observing his or her non-verbal behaviors.

Accuracy of Deception Detection Based on Nonverbal Behaviors: Research on Laypersons

A review by Kraut (1980) of deception detection studies found that the average layperson can discriminate a lie from a truth with an average accuracy rate of only 54.27% (ranges equals 45%-60%), where 50% would be chance accuracy. In an examination of 34 studies looking at nonverbal cues of deception, Vrij (2008b) found that the accuracy with which an individual can correctly identify the truth is generally higher than the accuracy of identifying a lie. The average truth accuracy rate of these 34 studies was 63.41% while the average lie accuracy rate was 48.15%.

However, higher levels of truth accuracy may be due to a truth bias, which is a persistent and biased tendency to misperceive deceitful messages as truthful (Kohnken, 1989; Levine, Park, & McCornack, 1999; Zuckerman, DePaulo, & Rosenthal, 1981). In a meta-analysis done by DePaulo and Bond (2006), findings showed that participants judged 56% of messages as honest.

As well, people may avoid exhibiting suspicion of others because it is not a behavior that is encouraged socially (Toris & DePaulo, 1984).

Accuracy of Deception Detection Based on Nonverbal Behaviors: Research on Professional Lie Catchers

Both professional lie catchers and laypersons believe that the professionals are better at discriminating between truths and lies (Garrido, Masip, & Herrero, 2004). In contrast to this widely accepted belief, Vrij (2008b) examined 24 studies and found that accuracy rates for professional lie catchers ranged from 40% to 73%, with an average rate similar to that of a layperson (55.91%).

Findings from several studies have found that police officers are little if any better than laypeople at discriminating between truths and lies (DePaulo & Pfeifer, 1986; Ekman & O'Sullivan, 1991; Garrido & Massip, 2001; Garrido et al., 2004; Masip, Garrido, & Herrero, 2003; Meissner & Kassin, 2002; Vrij & Graham, 1997). In fact, in a study by Kassin, Meissner, and Norwick, (2005), laypersons actually outperformed police officers. However, an exception to the general pattern was reported by Ekman et al., (1991, 1999), who found that members of both the CIA and the Secret Service outperformed laypersons with accuracy rates of 73% and 64%, respectively.

Interestingly, the truth bias observed in laypersons does not occur in professional lie catchers (Garrido et al., 2004; Masip, Alonso, et al., 2005; Masip et al., 2003; Meissner & Kassin, 2002; Kassin, Meissner, & Norwick, 2005). Rather, the opposite tendency, what is referred to as "lie bias," has been found. Research indicates that law enforcement professionals have a persistent and biased tendency to misperceive truthful messages as deceitful. The

strength of this lie bias is positively correlated with the length of time that a law enforcement officer has served on the force (Masip, Alonso et al., 2005; Meissner & Kassin, 2002).

Contextual Factors That Influence Accuracy of Deception Detection

Contextual factors appear to affect an individual's ability to detect deception, although research on this topic is limited. A study by Bond & DePaulo (2006) revealed that being able to hear the narrative of another person (the "sender") increased participants' ability to tell whether that narrative was true or false. Participants who could only see the sender were less accurate at detecting deception than were participants who could only hear the sender. Participants who could both see and hear the sender performed at the same level of accuracy as those who could only hear.

The same study also found that motivation can affect the ability to detect deception. Specifically, Bond and DePaulo (2006) found that participants who were given increased motivation to detect lies were more accurate at discriminating false accounts from truthful accounts than were participants who were not given increased motivation.

Individual Differences in Deception Detection

There are several individual difference factors that may affect a person's ability to detect deception using nonverbal cues. Studies have shown that females are better than males at detecting deception in friends or romantic partners, whereas males are better than females at detecting deception in strangers (Bella M. DePaulo et al., 2003; Porter, McCabe, Woodworth, & Peace, 2007)

Individuals who are introverted, good actors or high in self-awareness have been found to be good lie detectors (Johnson et al., 2004; Malcolm & Keenan, 2003). However, studies have

shown that individuals with high social anxiety make poor lie detectors (Vrij & Baxter, 1999; Vrij, Harden et al., 2001).

Although being a lie catcher by profession does not necessarily improve an individual's ability to detect deception, there are factors that separate good lie detectors from poor lie detectors. Mann, Vrij, and Bull (2004) found that good lie detectors are more knowledgeable about empirically supported deception cues than poor lie detectors. Good lie detectors pay attention to both speech and behavior cues, whereas poor lie detectors pay attention to behavior cues but tend to neglect speech cues (Ekman & O'Sullivan, 1991).

Lastly, there are factors present that can increase an individual's likelihood of being perceived as deceitful. People high in public self-consciousness, introverts, and socially anxious people are more likely to be perceived as being dishonest, regardless of whether or not they are telling the truth (Schlenker & Leary, 1982). However, people who are "socially tactful" are more likely to be perceived as honest (DePaulo & Friedman, 1998; Riggio, 1986). Studies have also shown that Caucasians are more likely to perceive non-Caucasians as being dishonest (Vrij & Winkel, 1991; Vrij, Winkel, & Koppelaar, 1991; Winkel & Vrij, 1990).

Methods of Lie Detection

Methods of lie detection not only depend on observing nonverbal behaviors but also utilize various lie detection tools that depend on physiological measurements. The following sections will further discuss these tools, their theoretical basis/rationale, and their strengths and limitations.

Methods of Lie Detection: Non-Verbal and Behavioral

Behavioral Analysis Interview. The Behavior Analysis Interview (BAI) is a deception detection tool that is intended to assess behavioral cues of deception. In contrast to other tools of

deception detection, which will be discussed later within this section, the BAI does not require any equipment or the transcription of physiological response output. It was first developed by John E. Reid and Associates and consists of questions designed to elicit a behavioral response from a suspect. The suspect is first asked to describe what he or she was doing within a specific time frame. This question is then followed by sixteen standardized questions that can be altered slightly given the type of crime (Inbau, Reid, Buckley, and Jayne, 2001).

The BAI operates upon the underlying assumption that liars experience more discomfort than truth tellers in an investigative interview. As a result of this discomfort, liars, in comparison to truth tellers, are more likely to display certain behaviors such as crossing legs, shifting in their chair, answering quickly, providing less sincere answers, showing lack of concern about being a suspect, and appearing to expect to be exonerated (Inbau et al., 2001; Horvath, Jayne, & Buckley, 1994).

However, findings within the literature do not support this assumption. DePaulo and colleagues (2003) found that both liars *and* truth tellers experience discomfort during investigative interviews as a result of the fear of not being found to be truthful. As well, previous studies have found that liars are *not* more likely than truth tellers to engage in behaviors such as crossing legs, shifting in their chairs, or looking away.

A field study conducted by Horvath, Jayne, & Buckley (1994) examining 60-videotaped BAIs found that evaluators were able to correctly identify 78% of truthful suspects and 66% of deceptive suspects. However, a study done by Kassin & Fong (1999) in which participants were trained to look for the behaviors listed above as cues of deceit found that these trained observers were less accurate than those participants who were untrained. Other studies have revealed similar findings (Mann et al., 2004; Vrij, 2005; Vrij, Mann, & Fisher, 2006).

Reality Monitoring. Reality monitoring analyses were first introduced as a means of deception detection in the 1990s. Scientists conducting research within the field of deception detection have often used it; however, the same cannot be said of individuals considered to be professional lie detectors (Masip, Sporer, Garrido, & Herrero, 2005; Sporer, 2004). Reality monitoring has garnered support from within the scientific community due to its strong underlying theoretical foundation. It refers to the cognitive processes that are involved in discriminating imagined events from events that an individual has actually experienced (Johnson & Raye, 1981).

Johnson and Raye (1981) theorized that memories of real experiences are retrieved through perceptual processes. As a result, such memories are more likely to contain sensory information, contextual information and affective information. In contrast, memories of imagined events are more likely to result in cognitive operations such as thoughts and reasoning.

As a means of testing this theory, Johnson and colleagues (1988) developed the Memory Characteristic Questionnaire (MCQ). It consists of 39 items and measures the accuracy of an individual's memory for a particular event. Within the context of deception detection, it is of particular use when attempting to determine the veracity of an individual's reported actions or whereabouts.

Despite its strong theoretical foundation, reality monitoring has some limitations. Its use is not recommended with young children or in situations where the event in question took place long before the examination (Vrij, 2008). As well, reality-monitoring criteria are poorly defined and the MCQ remains un-standardized. However, studies have determined the reality monitoring approach can distinguish between truths and lies at above-chance levels (Vrij, 2008) Thus, with

further development, reality monitoring could possibly become a viable means of detecting deception.

Methods of Lie Detection: Physiological

The rationale for using tools that measure physiological responses indicative of deceptive behavior is typically based on one or both of two different conceptual approaches: concern and orienting reflex (Raskin & Honts, 2002).

The concern approach is based on the idea that liars produce increased physiological responses due to stress experienced as a result of the fear of being caught lying. Tools that were developed under a concern-based approach include various polygraph techniques, voice stress analysis, and thermal imaging. The orienting reflex approach is based on the idea that an individual will experience an involuntary response as result of encountering a personally significant stimulus (e.g. an individual noticing when his/her name is mentioned) (Pavlov, 1927; Sokolov, 1963). Tools that were developed under the orienting reflex approach are the Guilty Knowledge polygraph technique and analysis of the P300 brain wave. The following sections will further discuss these tools, their theoretical basis/rationale, and their strengths and limitations.

Concern Approach. The polygraph is a widely used tool in the field of deception detection that is based on the concern approach. A polygraph is an electric instrument that measures an individual's electrodermal activity, blood pressure, and respiration. While the polygraph itself cannot determine whether or not an individual is lying, the physiological responses measured by the instrument can be analyzed for signs of stress that may indicate deception. The rationale behind use of the polygraph is based on the concept of fight-or-flight:

when an individual is faced with a threat (e.g., being caught in a lie about one's criminal behavior), he or she will produce a physiological reaction in response (Thompson, 2000).

The application of the polygraph in criminal investigations is based on the idea that psychological processes such as fear of detection will produce physiological changes that can then be measured by the polygraph (Podlesny & Raskin, 1977; Raskin, 1979). Physiological reactions thought to be associated with lying are increased palmar conductance, increased blood pressure, decreased respiratory activity, and peripheral circulation (Stern, Breen, Watanabe, & Perry, 1981). Since the polygraph first began being used in criminal investigations, several variations of the test have been developed and will be discussed within the following paragraphs.

The Relevant-Irrelevant Test (RIT) was the first polygraph test to gain popularity in criminal investigations (Vrij, 2008). It consists of two types of questions: crime relevant questions and crime irrelevant questions. Crime relevant questions are related to the crime under investigation, whereas crime irrelevant questions are not. An example of a crime-relevant question would be “Did you break into a beige Honda yesterday morning?” On the other hand, an example of a crime-irrelevant question would be “Is it Wednesday today?”

A larger physiological response to crime-relevant questions versus crime-irrelevant questions is considered to be indicative of lying (Raskin & Honts, 2002). However, critics have argued that the rationale behind RIT is too simplistic and does not account for intrapersonal differences (Podlesny & Raskin, 1977). An individual may respond differently to different questions depending on the type of question being asked. When asked a crime-relevant question, it is possible that an individual may begin to experience anxiety, despite being innocent. This anxious response may produce a large physiological response and thus cause the innocent

individual to be accused of a crime that he or she did not commit. For this reason, the RIT has fallen out of use in criminal investigations (Iacono, 2000).

The central problem of the RIT is that it lacks a means of controlling for the emotional impact that crime-related questions can have on innocent examinees. The Comparison Question Test (CQT) (also referred to as the Control Question Test) was developed to address this problem and has replaced the RIT as the most commonly used polygraph test in criminal investigations (Vrij, 2008). Three types of yes-or-no questions are asked during the CQT: neutral questions, relevant questions and probable lie questions. Neutral questions are general in nature (e.g. Do you live in the United States?) and serve only as fillers. The physiological reactions to these questions are inconsequential to the outcome of the test (Vrij, 2008). Relevant questions in the CQT are highly similar to the crime-relevant questions in an RIT and pertain directly to the crime under investigation (e.g. Did you take the phone?). Lastly, probable lie questions are deliberately vague in nature and cover long periods of time in the examinee's history, (e.g. Prior to 1989, did you ever do something dishonest or illegal?). They are designed to encourage the examinee to make a dishonest response, that is, a "probable lie," and experience emotional discomfort for doing so. In this way, probable lie questions are intended to serve as an experimental control for relevant questions, because both types of questions supposedly evoke negative emotions.

Although the CQT makes an attempt to provide experimental control, its use remains controversial amongst scholars (Iacono, 2000). It is argued that use of the CQT is not based on a solid theoretical foundation, which may be due in part to the polygraph profession operating primarily outside of the scientific environment (Vrij, 2008)

The Direct Lie Test (DLT) was developed in response to criticism of the CQT. Unlike the CQT, the DLT is standardized (Raskin & Honts, 2002; Raskin, Honts, Kircher, 1997; Horowitz, Kircher, Honts, & Raskin, 1997). What are referred to as “probable lie questions” in the CQT are referred to in the DLT as “directed lie questions.” Directed lie questions can be used in any interview, regardless of the situation or crime. For example, the examiner may ask the examinee: “In the first 27 years of your life, have you ever told even one lie?” The examinee will then be instructed to answer ‘no’ to this and any other directed lie questions while thinking about particular situations in which they did tell a lie or break a rule (Raskin & Honts, 2002). The purpose of these questions is to provide an established baseline physiological response indicative of that individual telling a lie.

Although the DLT represents an attempt to standardize the polygraph test within criminal investigations, it still does not address other criticisms that have surfaced as the polygraph test has come into use (e.g. weak theoretical foundation, lack of incorporation of psychological knowledge, lack of standardization in scoring the charts, vulnerability and illegality of using deceptive procedures, vulnerability to countermeasures). As well it is argued that directed lie questions are not suitable controls for intrapersonal differences because they are too distinct from the crime-relevant questions (Ben-Sakhar, 2002).

Voice Stress Analysis (VSA) is another deception detection technique based on the concern approach. The assumption underlying VSA is that, in comparison to truth tellers, liars experience more psychological stress (Gamer, Rill, Vossel, & Gödert, 2006). As a result of this psychological stress, there are slight changes in blood circulation that in turn influence an individual’s voice characteristics. These supposed changes in voice characteristics, which are also referred to as Psychological Stress Evaluators, are said to be measured by VSA.

In VSA, microphones attached to computers record and measure voice indices such as intensity, frequency, pitch, harmonics, and micro tremors. VSA is actually tantamount to a polygraph test, the only difference being the physiological responses being measured. Thus, the CQT, an interrogation paradigm initially developed for use in polygraph examinations, is also used in VSA examinations. However, in comparison to the polygraph test, VSA is non-intrusive and data can be gathered more quickly and even more importantly, covertly. Yet despite this, VSA has important limitations. Findings from studies indicate that VSA may be an inaccurate deception detection test. Horvath, 1978 and Gamer and colleagues (2006) found that truth tellers and liars were indistinguishable from one another on the basis of voice stress analysis. However, the same truth tellers and liars were correctly classified at above chance on the basis of electrodermal activity.

Another limitation of VSA is that the CQT (which is considered by scholars and polygraph professionals to be the leading paradigm in use) cannot be performed covertly. The structure of the CQT requires that questions be discussed with examinees prior to the examination. As well, in order to develop probable lie questions, background information about the examinee must be gathered. This prevents voice stress analysis from being utilized as a covert technique. Lastly, the claims made by proponents of VSA are often inconsistent with empirical research findings. Most importantly, proponents of VSA claim high levels of accuracy, whereas research findings indicate the opposite (National Research Council, 2003).

Thermal imaging is a rather recently developed technique based on the concern approach. In thermal imaging, changes in temperature patterns around the eye are detected and measured by cameras. The use of this technique in deception detection is based on the assumption that warming around eyes will be observed in liars as the result of a fight-or-flight response (Vrij,

2008b). While accuracy of thermal imaging has been compared to that of a polygraph test, no attempts have been made to control for interpersonal and/or intrapersonal differences (as has been done with polygraph examinations). Therefore, while thermal imaging may be an increasingly popular tool in deception detection, its accuracy is still doubtful and there is a lack of empirically based evidence supporting its use in deception detection (National Research Council, 2003).

Orienting Reflex Approach. The Guilty Knowledge Test (GKT) (also referred to as the Concealed Information Test) represents another method of deception detection. Its structure differs from the other methods already discussed here primarily in that it is theoretically based on the orienting reflex (Pavlov, 1927; Sokolov, 1963). An orienting reflex occurs when someone experiences a "personally significant stimulus," such as someone calling out his or her name, and this stimulus elicits physiological responses that can then be measured by the polygraph (Vrij, 2008b). The orienting reflex phenomenon is applied to polygraph testing within criminal investigations by presenting examinees with evidence only the accused would know of. Since the evidence will be familiar to the accused, an orienting reflex should occur as a result.

The GKT paradigm can also be used to detect deception in EEG-P300 examinations. EEG-P300 is an event related potential (brain wave) that can be recorded and measured by an electroencephalogram (EEG). P300 brain waves peak after 300-1000 milliseconds of being exposed to a personally significant stimulus, resulting in an orienting reflex. Thus the P300 is of particular interest within the field of deception detection research (Vrij, 2008).

However, a major shortcoming of the GKT is that it has limited applicability. For instance, it cannot be used if the suspect is not claiming lack of knowledge (e.g. an alleged sexual assault in which the suspect admits to the sexual acts but maintains that it was consensual)

or if several suspects admit to being involved in the crime but deny having been the primary offender (Raskin, 1988). Overall, it is difficult to assess the accuracy of polygraph tests. Case studies are relatively easy to find, but the field is lacking in lab and field studies. The majority of relevant studies have examined either the GKT or the CQT, whereas the other methods described here less frequently been the focus of research.

As well, accuracy of polygraph tests is difficult to assess because the test is likely to yield both false positive results (detecting deception in a truthful individual) and false negative results (failing to detect deception in a lying individual). Thus there is a tradeoff that occurs with polygraph testing. For example, within a group of individuals determined to be positive (deceptive) by the polygraph, there will be both true positives and false positives (National Research Council, 2003).

One factor in particular that makes polygraph tests particularly susceptible to the occurrence of false positive and false negative results are base rates. Polygraph tests use base rates to determine an expected proportion of individuals within a given population who are deceptive. However, the lower a base rate is for a given population (for example, 5 out of 10,000), the more likely it is that false positives will occur. Yet the higher a base rate is for a given population (2,000 out of 10,000), the less likely it is that false positives will occur.

Prospective Study

The purpose of the present study was to begin exploring a novel method of deception detection that had not previously been examined in the research literature. Most established methods for detecting deception involve careful observation of the lying individual or "target." However, the present study proposed that it may be possible to detect deception, not by observing the behavior of the target, but by observing the nonverbal behavior of another individual (the non-target) who is present at the time the lie is told and knows that the target is lying.

The idea underlying the present study was inspired by the work of performer Patrick Redford and what he refers to as the "Prevaricator effect." In performances by Redford, he gives the impression that he is a sort of mind-reader who can tell what people are thinking. To demonstrate this supposed ability, Redford tells two subjects that he needs one of them to play the role of a "committed liar" and the other to play the role of a "devout truth teller," and he asks the two subjects to secretly decide between themselves which of them will play which role. After they have made the decision, Redford gives the subjects a coin and asks them to conceal it while he turns away. The subjects must decide which of them will conceal the coin and the hand where it will be concealed.

Once the coin has been concealed, Redford turns back around to face the subjects and asks each one if he or she has the coin. Because one subject will be lying and the other will be telling the truth, both subjects will either confirm that they have the coin or deny it. Yet, just by asking the same question twice ("Do you have the coin?") and observing the subjects' reactions, Redford claims, he is generally able to correctly determine who is lying.

Redford has made a DVD in which he explains how he performs his feat of apparent mind-reading. The secret of his success, he claims, is that while questioning each subject (i.e., the "target") about the coin, Redford observes the nonverbal behavioral cues of the other subject, that is, the "non-target" who is not being questioned. According to Redford, certain nonverbal behavioral cues related to curiosity or "partner monitoring" are more likely to be displayed by the truth-teller when the liar is the target, than by the liar when the truth-teller is the target. These nonverbal behaviors include (a) turning one's body toward the target while the target is being questioned, (b) briefly glancing at the target while the target is responding to the question, and (c), monitoring the target using peripheral vision while the target is responding. Such nonverbal "partner monitoring behavior" is indicative of the subject's level of interest. According to Redford, the subject who is telling the truth displays a higher level of interest in the subject who is lying than vice versa. The reason is that the truth-teller is highly motivated to monitor *whether the liar is doing a good job of being deceptive*, whereas the liar is not symmetrically motivated to monitor *whether the truth-teller is doing a good job of being honest*. Before discussing the present study in further detail, the next section will pause to review recent research that may be related to Redford's Prevaricator Effect and the present study.

Social Indicators of Deception

Post 9/11, it has become especially important to develop effective interviewing and investigation techniques that intelligence investigators can use to obtain accurate information from witnesses or persons of interest (Loftus, 2011) The interviewing and investigation techniques developed for use in forensic settings are also relevant to intelligence settings. However, there are important differences between the two types of settings and the aims of their investigations. In forensic settings, investigations generally seek to obtain information

concerning past events and are often focused on a single suspect. In contrast, in intelligence settings, investigations are typically more focused on obtaining accurate accounts about events that may occur in the future.

In intelligence settings, it is also commonly true that multiple individuals are questioned. For example, interviews may be conducted with several members of a terrorist group who are suspected of planning or carrying out a terrorist attack, as well as with other individuals who do not belong to the group but may know about some of its activities. An investigative approach that would take advantage of this circumstance might be helpful, for example by interviewing more than one suspect at the same time. For this reason, researchers are beginning to examine deception cues that may occur specifically between suspected accomplices who are interviewed together. These deceptive cues are referred to as "social indicators of deception" and are hypothesized by some theorists to occur as a result of transactive memory system processes (Wegner, Erber, & Raymond, 1991; Wegner, 1987). The underlying premise is that individuals who are recalling a jointly experienced event will think and behave differently than individuals who are jointly pretending to recall an event that did not actually occur. Specifically, it is proposed by some theorists that when recalling a past event, individuals who jointly experienced the event will engage in a transactive information search and will work together to retrieve information concerning this event by cuing one another and asking each other questions (Hollingshead, 1998; Wegner, 1987) In contrast, individuals who are only pretending to jointly recall an event will not engage in an information search or work to retrieve information in the same way.

Findings from two studies examining social indicators of deception in dyads have revealed differences in the social behaviors exhibited by truthful dyads versus lying dyads. Both

studies found that members of truthful dyads were more likely to gaze at their partners during interviews than were members of lying dyads (Driskell, Salas, & Driskell, 2012; Jundi et al., 2013). As well, members of truthful dyads were more likely to exhibit synchrony in their behavior and communication. Jundi and colleagues (2013) found that deceptive dyads were less likely to gaze at each other, but more likely to make eye contact with the interviewer. These findings suggest that members of deceptive dyads are less likely to exhibit synchrony or gaze at each other because they are more concerned with monitoring the interviewer to see if they are being believed.

Hypotheses

In the present study, participants were questioned using an approach similar to what Redford uses in his Prevaricator performances. One dyad member was designated a liar and the other a truth-teller. One of the two then hid a coin. The experimenter then guessed which member of the dyad was holding the coin. This scenario was repeated four times, in four separate "sequences," with each dyad. The following section will discuss the four hypotheses that were examined in the study.

Hypothesis 1: Between-partner differences in partner-monitoring behaviors

It was hypothesized that more partner monitoring behaviors would be shown (a) by truthful dyad members at the time that their (lying) partners were being questioned about the coin than (b) by lying dyad members when their (truthful) partners were being questioned about the coin. Put another way, each time that the members of a dyad were questioned about who had the coin, the truthful dyad member would show more partner monitoring behaviors than the lying dyad member.

Hypothesis 2: Within-participant differences in partner-monitoring

Each participant in the study was questioned about the coin four times, which is to say, once during each sequence. It was hypothesized that participants would show more partner monitoring behaviors (a) during the two sequences in which they were telling the truth (and their partner was lying) (b) than during the two sequences in which they were lying (and their partner was telling the truth).

Hypothesis 3: Correlations of partner monitoring with Big Five Traits:

It was hypothesized that the tendency to engage in partner monitoring behavior when one's partner is lying would be (a) positively correlated with participants' level of Agreeableness and Extroversion, and (b) negatively correlated with their level of Neuroticism, as measured by the Big Five Inventory (Goldberg, 1993; John & Srivastava, 1999). Put another way, individuals high in Agreeableness and Extroversion and low in Neuroticism would be relatively likely to engage in partner monitoring behavior when their partner was lying, whereas individuals low (or high with respect to Neuroticism) in these traits would be relatively unlikely to engage in these behaviors when their partner was lying. Agreeableness has been found to be related to higher-quality interactions in pairs when mediated by body openness and visual attention (Berry & Hansen, 2000; Graziano & Eisenberg, 1997; John & Srivastava, 1999). Regarding the relationship between extroversion and frequency of gaze in dyads, there have been mixed findings. Some studies have found a positive relationship between gazing at one's partner and extroversion (Kendon & Cook, 1969; Argyle & Ingham, 1972; Wiens, Harper & Matarazzo, 1980) while others have not (Iizuka, 1992; Rutter & Stephenson, 1972; Riggio, Lippa, & Salinas, 1990). In contrast, neuroticism has been found to be associated with gaze aversion (Campbell & Rushton, 1978). No similar hypothesis was made concerning partner monitoring behavior when the partner is telling the truth.

Hypothesis 4: Correlations of partner monitoring with self-reported Absorption and behaviorally measured Imaginative Suggestibility

It was hypothesized that the tendency to engage in partner monitoring behavior when one's partner was lying would be positively correlated with (a) participants' self-reported level of Absorption as measured by the Tellegen Absorption Scale (Tellegen & Atkinson, 1974) and (b)

participants behaviorally measured level of imaginative suggestibility as measured by the Creative Imagination Scale (Barber & Wilson, 1978). Absorption and imaginative suggestibility both involve a tendency to become emotionally and cognitively involved in imagined experiences or situations. Furthermore, imaginative suggestibility involves a tendency to express such emotional involvement through motor activity. Thus it was predicted that individuals high in absorption and imaginative suggestibility would tend to become emotionally involved in the imaginary lie detection scenario of the study, and that their emotional involvement would lead them to feel more interest in the outcome of the lie detection game, to monitor their partner more frequently, and to physically express their interest in the partner when he or she was lying. Appendix A presents a graph that depicts the central expected results of the study.

Method and Measures

Participants

Participants were recruited from the undergraduate Psychology participant pool (PSYC 1301) at the University of Texas at El Paso. Ninety-six participants completed sessions in pairs, for a total of 48 sessions. However, video data for one dyad was lost due to technical difficulties that occurred while the video was being uploaded to an external storage device. These participants were excluded from the study leaving 94 participants.

Measures

Big Five Inventory (BFI; John & Srivastava, 1999). The BFI is a 44-item measure assessing the big five personality traits: openness, conscientiousness, extroversion, agreeableness, and neuroticism. Participants are asked to indicate, on a scale of one (Disagree Strongly) to five (Agree Strongly), to what degree they agree with each statement. The reliability of the BFI scales range from $\alpha = .75$ to $\alpha = .90$ (John & Srivastava, 1999) (See Appendix B for list of scale items).

Creative Imagination Scale (CIS; Barber & Wilson, 1978). The CIS is a 10-item measure assessing imaginative suggestibility, which is the degree to which a person succeeds in having suggested experiences (e.g. imagining a force acting on your hands to them apart). Participants are asked carry out a series of ten tasks to assess how strongly they respond to suggestions to experience imaginative experiences. The tasks and brief descriptions are listed below (See Appendix C for list of scale of items and Appendix I for protocol):

Arm heaviness: The participant is instructed to close his or her eyes and place his or her left arm straight out in front at shoulder height, palm facing up. He or she is asked to

imagine that a very heavy dictionary is being placed on the palm of their left hand. He or she is then asked to imagine that a second large heavy dictionary is being placed on top of the first heavy dictionary. The participant is then instructed to “feel’ how heavy their arm begins to feel as he/she “pushes” up on the dictionaries. Next, they are asked to imagine that a third heavy dictionary is being placed on top of the other two dictionaries. Afterwards, he/she is instructed to tell himself/herself that his/her hand feels perfectly normal again and to lower and relax his/her hand.

Hand Levitation: The participant is instructed to close their eyes and place their right arm straight out in front of him/her, at shoulder height and with the palm facing down. He/she is then asked to picture a garden hose with a strong stream of water pushing against the palm of his/her right hand, pushing his/her hand up. They will be asked to “feel” the force of the water pushing his/her hand up and to let his/her hand begin to rise. The participant is then instructed to tell himself/herself that it is all in his/her own mind. He/she is then instructed to lower his/her arm and to relax.

Finger Anesthesia: The participant is asked to place his/her left hand on his/her lap with the palm facing up. He/she is then asked to close his/her eyes so as to focus on the sensations in the fingers of his/her left hand. The participant is asked to imagine and feel as if a local anesthetic has been injected into the side of his/her left hand next to the little finger so that his/her little finger will begin to feel like it does when it ‘falls asleep.’ The researcher instructs the participant to focus on his/her little finger, to become aware of every sensation as he/she thinks of the anesthetic slowly beginning to move into his/her little finger. He/she is then asked to think of the anesthetic moving into the second finger next to the little finger. The researcher instructs him/her to tell himself/herself that the

second finger is getting increasingly dull as the anesthetic begins to take effect. The researcher then asks the participant to touch his/her two fingers with his/her thumb and to notice how the fingers feel more and more dull. The participants are then instructed to tell himself/herself that it is all in his/her own mind and that he/she will bring the feeling back into the two fingers.

Water “Hallucination”: The participant is instructed to keep his/her eyes closed and that he/she can use his/her imagination to experience the feeling of drinking water. The researcher instructs the participant to imagine that he/she has been out in the sun for hours and that he/she is very thirsty. Then, the participant is instructed to imagine himself/herself on a mountain where snow is melting, forming a stream of water. The participant is then asked to imagine himself/herself dipping a cup into this stream so he/she can have a drink of water. As the participant imagines himself/herself taking a drink of water, he/she is asked to think of how it feels to take that drink.

Olfactory-Gustatory “Hallucination”: The participant is asked to keep his/her eyes closed and to picture himself/herself picking up an orange, peeling it, and eating it.

Music “Hallucination”: The participant is asked to keep his/her eyes closed and to think back to a time when he/she heard some wonderful music. The researcher then asks the participant to listen to the music as he/she creates it in his/her own mind. After a 15-second pause, the participant is instructed to stop thinking of the music.

Temperature “Hallucination”: The participant is instructed to close his/her eyes and to keep his/her hands in their lap with the palms facing down. The participant is asked to picture the sun shining on his/her right hand and to let himself/herself feel the heat. After

a minute and 15 seconds, the participant is then instructed to tell himself/herself that it is in his/her own mind and to make his/her hand feel normal again.

Time Distortion: The participant is instructed to keep his/her eyes closed and told that by controlling his/her thinking, he/she can make time seem to slow down. The researcher then reads from a script at a progressively slowing rate. After the script is read, the participant is instructed to tell himself/herself that time is speeding back up to its normal rate as he/she brings time back to normal.

Age Regression: The participant is instructed to keep his/her eyes closed and will be told that by directing his/her thinking, he/she can bring back the feeling that he/she experienced when he/she was in elementary school. The participant is asked to think of time going back to elementary school and to feel himself/herself becoming smaller and smaller. The researcher asks the participant to imagine he/she is sitting in a big desk and to observe the other children, teacher and various aspects of the classroom. This exercise continues for one minute and 20 seconds. After a 15 second pause, the participant is instructed to tell himself/herself/ that it is all in his/her own mind and to bring himself/herself back to the present.

Mind-Body Relaxation: The participant is instructed to keep his/her eyes closed and the researcher explains that by letting his/her thoughts go along with the instructions, he/she can make his/her mind and body feel very relaxed. The researcher then reads from a script, asking the participant to imagine they are on a beach, relaxing in the sun. The script will be read for two minutes and five seconds. The participant is then instructed to

open his/her eyes and to let himself/herself continue to feel relaxed and yet perfectly alert.

Immediately following the administration of these tasks, the participants are asked to complete the Creative Imagination Scale. Participants are asked to indicate, on a scale of one (0%-Not at all) to four (90+%-Almost exactly the same), to what degree they believe that they have responded to the suggestions from the experimenter in each task for having certain experiences or performing certain acts. The CIS includes 10 items. For total scale scores, the item scores are averaged (possible range = 0.00 to 4.00).

Tellegen Absorption Scale (Tellegen & Atkinson, 1974) The Tellegen Absorption Scale is a 34-item, true/false, self-report questionnaire assessing absorption, which refers to an individual's receptivity to the experience of emotional and cognitive alterations (Roche & McConkey, 1990; Tellegen, 1981; Tellegen & Atkinson, 1974) The scale has a high level of internal reliability ($r=.88$) and high-levels of test-retest reliability ($r=.91$) (Tellegen, 1982) (See Appendix D for list of scale items).

Basic Interest Markers Scale (BIM; Liao, Armstrong, & Rounds 2008) The Basic Interest Marker scale is a 370- item, 30-scale vocational interest measure. It contains a list of activities examining various vocational interests. Participants are asked to indicate how much they would like to do that activity by selecting the number that most accurately reflects how he or she feels about it: 1=*strongly dislike*, 2=*dislike*, 3=*neutral*, 4=*like*, 5=*strongly like* (See Appendix E for list of scale items). In the present study, only four of the BIM scales were used: Management, Performing Arts, Office Work, and Social Services. These scales were used to provide the basis for a spin-off study done by an undergraduate student.

The Management scale (9 items) measures a participant's level of interest in planning, organizing and coordinating the activities of others. The Office Work scale (11 items) measures a participant's level of interest in performing clerical tasks. The Performing Arts scale (11 items) measures a participant's level of interest in activities related to performing for an audience. The Social Service scale (12 items) measures a participant's level of interest in helping others cope with their problems.

Self-Monitoring Scale (Gangestad & Snyder, 1986) The Self-Monitoring Scale is an 18-item, true/false, self-report measure assessing propensity for self-monitoring, which refers to an individual's ability to regulate behaviors in response to social situations (See Appendix F for a list of scale items).

Short Dark Triad Scale (Paulhus & Jones, 2011) The Short Dark Triad Scale is a 27-item measure and assesses the three personality traits known as the "Dark Triad": Psychopathy, Narcissism, and Machiavellianism. Psychopathy is characterized by high impulsivity and low empathy. Narcissism is associated with exhibiting grandiosity and entitlement. Machiavellianism is characterized by cold, manipulative behavior. Participants are asked to indicate to what degree they agree with each statement on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree) (See Appendix G for a list of scale items).

Some of the measures described were included for purely exploratory purposes. These measures were the Basic Inventory Markers scales (Management, Office Work, Performing Arts, Social Services) (Liao, Armstrong, & Rounds 2008), the Self-Monitoring scale (Gangestad & Snyder, 1986), and the Short Dark Triad Scale (Paulhus & Jones, 2011).

Procedure

Upon arrival at the lab, the two participants were asked to read and sign informed consent forms (See Appendix H). After giving informed consent, the two participants were shown to a research room, where they were asked to take part in the following procedures (See Appendix I for coin task protocol).

First, the experimenter explained to the two participants that they were being asked to participate in a study of a novel technique for detecting if someone is lying or not. In order to see if this new technique works, the researcher would like participants to play a game that involved lying and truth telling. The experimenter would try to guess whether participants were being honest or deceptive by looking for certain telltale signs of lying (e.g. subtle changes in body language, voice tonality, etc.).

The experimenter would then tell the two participants that one of them would be considered "Participant 1" for the rest of the experiment and the other would be considered "Participant 2." The experimenter would flip a coin and ask one of the participants to call "heads" or tail" for the role of Participant 1.

Next, the researcher would tell the participants that they would be following randomly selected instructions for their respective parts for the remainder of the experiment. The experimenter would show the participants ten envelopes and ask Participant 1 to choose one of the envelopes and open it. Inside were be four pieces of paper labeled #1, #2, #3, and #4. Participant 1 was asked to open the piece of paper labeled # 1. Participant 1 and Participant 2 were then asked to read the instructions on this paper silently, without revealing their content to the experimenter.

After the participants read the instructions, the researcher explained the rules of the task. One of the participants had been assigned by instructions #1 to play the part of a truth teller, meaning that he/she must always tell the truth, no matter what he/she was asked. The other participant had been assigned to play the part of a liar, meaning that he/she must always lie, no matter what he/she was asked.

The experimenter would then turn his or her back on the participants and ask the participants to look at the instructions again. The truth teller held up his or her right thumb, to show that he or she was the one who will always tell the truth. Still keeping his or her back turned, the experimenter would then ask the participants if they knew who was the truth teller and who was the liar. The experimenter would remind the two participants not to reveal to him or her who was the truth teller and who was the liar.

Once the participants were sure who was the truth teller and who was the liar, the experimenter would turn back and face them. The experimenter would then give a coin to Participant 1, and then turn his or her back again. The experimenter would tell the participants to look at instructions #1 again. The instructions would tell one of the participants to hide the coin in his or her right hand, and then to hold that hand hidden behind his or her back. Again, the participants were instructed to not let the experimenter know which of them had the coin.

After the participants assured the researcher that the coin was concealed, the researcher would turn around to face the participants. The researcher would explain that he was about to ask each participant the same question: "Do you have the coin?" The truth teller was to answer the question honestly, and the liar was to answer the question untruthfully. The experimenter instructed the participants to silently think about how they were going to answer when the experimenter asked the questions.

After the participants had thought about how they were going to answer, the experimenter sequentially asked each participant twice “Do you have the coin?” The researcher would then guess (correctly) which participant had the coin and which participant was the liar. To the participants, it would seem that the researcher was very perceptive and able to tell who was lying. In fact, the researcher would know beforehand what instructions the participants had received, and which of the participants was holding the coin. Therefore the experimenter would always guess correctly, while appearing to have special powers of deception detection.

After the procedure was completed for instructions # 1, it was repeated three more times using instructions #2, #3 and #4. Thus there were four "rounds" of questioning, and each participant had two "turns" in each round in which he or she was asked "Do you have the coin?" The instructions were counterbalanced to ensure that each of the participants played each of the four possible roles exactly once in their four rounds: (a) truth teller with coin, (b) truth teller without coin, (c) liar with coin, and (d) liar without coin (See Appendix J for table depicting four possible roles). As the researcher repeated the procedure each time, he or she would politely “challenge” the participants to see if they could fool the experimenter in the next round.

The participants participated in four rounds. In each round, the coin was hidden, the experimenter took two "turns" questioning each participant, and then made a guess. After these four rounds were completed, participants were administered several tests individually. These tests were the Big Five Inventory (John & Srivastava, 1999), the Creative Imagination Scale (Barber & Wilson, 1978) (See Appendix K for Creative Imagination Scale tasks protocol), the Tellegen Absorption Scale (Tellegen & Atkinson, 1974), the Basic Interest Markers inventory (Liao, Armstrong, & Rounds, 2008), the Short Dark Triad Scale (Paulhus & Jones, 2011), and the Self-Monitoring Scale (Gangstead & Snyder, 1984). Participants were also asked to complete a

Debriefing Questionnaire (See Appendix L). The participants were put into separate rooms while they were administered these tests. After the participants had been administered the tests, they were debriefed. They were told that the study was designed to investigate partner monitoring behaviors in dyads, specifically when a truth teller is in the presence of a lie being told by another individual. (See Appendix M for debriefing statement). After being debriefed, the participants were thanked and allowed to leave.

The participants and the experimenter were video recorded while they performed the coin-guessing tasks. The video recording of each participant was later blindly scored by the experimenters for the following categories: (a) Did the participant turn his or her body toward his or her partner while the partner was being questioned? (0-Definitely No, 1-Ambiguous, 2-Definitely Yes) (b) Did the participant glance or otherwise look at the partner while the partner was being questioned? (0-Definitely No, 1-Ambiguous, 2-Definitely Yes); (c) Did the participant turn his or her head towards his or her partner while the partner was being questioned? (0-Definitely No, 1-Ambiguous, 2-Definitely Yes).

As already indicated, the participants in the study would have the impression that they had freely selected the tasks that they performed by randomly selecting one of ten envelopes. In fact, there were 24 sets of envelopes. Each set included ten envelopes, and the ten envelopes in each set contained the same instructions. Thus there were twenty-four sets of instructions and twenty-four corresponding sets of envelopes, with ten envelopes within each set. Each of the 24 sets of envelopes had a different set of instructions than the rest, but the ten envelopes with each of these sets all had the same instructions (See Appendix N for sets of instructions).

Changes to Experimental Protocol While Study was Underway

Once the experiment was underway, the experimenter noted that the number of participant errors was very high, resulting in missing data for more than 50% of participants. In consultation with the thesis chair, two changes were therefore made to the experimental protocol to reduce the level of participant error. The revised experimental protocol was called "Version B" (See Appendix J for Version B of the Coin Task protocol)

The first change in the protocol was made because several participants in the liar condition were confused by the original instructions, and lied not only when they were asked if they had the coin, but also when the experimenter made a guess. For instance, participants assigned to play the role of “liar with coin” were asked a probing question twice by the experimenter ("Do you have the coin?") and then the experimenter made her guess (“You have the coin, don’t you?”) The participants in this role were expected to *untruthfully* answer "no" to the probing questions, but then *truthfully* answer "yes" in response to the experimenter's correct guess. Instead, however, under the original experimental protocol, it was found that a substantial number of "liar with coin" participants incorrectly said "no" in response to the experimenter's guess, because they mistakenly thought they were supposed to continue playing the "liar" role even when the experimenter made her guess. To avoid this source of confusion, the experimental instructions were changed and participants were explicitly told that when the experimenter finally made her guess, both participants – including the one in the "liar" condition -- should stop playing their roles and should truthfully indicate whether the guess was correct.

The second change made to the protocol allowed the participants to briefly refer to their booklets one more time before being questioned by the experimenter. This was done in order to assist participants in remembering what their roles were and to take a second look in order to ensure that they had read and understood their instructions correctly.

Results

A total of 47 dyads (94 participants) took part in the study. However, a large proportion of participants had difficulty following the experimental instructions. Only 16 dyads (32 participants, 34%) carried out all four trials of the Coin Task according to instructions and without error. In each of the remaining 31 dyads at least one participant failed to follow the experimental instructions during at least one trial. These errors resulted in loss of data for some trials. Specifically, data was missing for one trial in 12 dyads (24 participants, 25.5% of dyads), for two trials in 16 dyads (32 participants, 34% of dyads), for three trials in 2 dyads (4 participants, 4.3% of dyads), and for four trials in one dyad (two participants, 2.1% of dyads).

Inter-rater reliability of scoring of Partner Monitoring Behavior

The dependent variables in the main analyses of this study reflected the level of Partner Monitoring Behavior (PMB) in either a single round (e.g., truth teller with coin) or in two rounds combined (e.g., truth-teller). Each round consisted of two trials. Two undergraduate students served as interrater reliability raters and scored each non-missing trial in each round based on the video recordings from all experimental sessions. For each non-missing trial, the raters scored the degree to which each participant engaged in the following behaviors: (a) eye-shift (i.e., shifting one's gaze toward one's partner); (b) head turn (turning one's head toward one's partner) or (c) body turn (i.e., turning one's body toward one's partner). Each of these behaviors was scored on a scale of 0 to 2, with a score of 0 indicating that the behavior did not occur during the trial, a score of 2 indicating the behavior definitely and unambiguously occurred during the round, and a score of 1 indicating that the behavior may have occurred during the round but the scorer felt that

the behavior was ambiguous. The scores for these three variables (eye shift, head, turn, body turn) were then used to arrive at a “Round Score” for each round. The Round Score for a round was equal to the highest level of PMB that was rated in that round. For example, suppose that in Round 1, Trial 1, a participant was rated 2 (definitely yes) for eye shift, 1 (ambiguous) for head turn, and 0 (definitely no) for body turn, and that in Round 1, Trial 2, the participant was rated 1 for eye shift, 0 for head turn, and 0 for body turn. In this example, the highest rating in Round 1 would be 2 (for "eye shift" in Trial 1) and therefore the Round Score for Round 1 would also be 2.

2. The Pearson product moment correlation (Pearson's r) was used to measure inter-rater reliability between the two scorers. Although the intraclass correlation coefficient (ICC) is often used as a measure of interrater reliability, Pearson's r is also considered an appropriate measure of inter-rater reliability when comparing only two scorers (LeBreton & Senter, 2008) and usually yields values that are highly similar to the ICC . Table 1 reports the correlation between the ratings of the two raters for each trial. As can be seen in Table 3, the correlation between raters, averaged across all eight trials, was only $r = 0.29$ ($SD=.24$), which is very poor.

Because the interrater reliability between the two scorers was poor, a Tie Breaker (the author of this thesis) re-scored all questions on which the two raters disagreed, while accepting the scoring for all questions for which the two raters were in agreement. The correlations of the ratings by the Tie Breaker with ratings made by Raters 1 and 2 are shown in Table 1. As can be seen, the correlation of the Tie Breaker with Rater 1 was high, $r = 0.93$ ($SD=.01$). However, the correlation of the Tie Breaker with Rater 2 was very low, $r = 0.32$ ($SD=.24$). It was concluded that Rater 1 and the Tie Breaker had probably scored partner-monitoring behavior accurately but Rater 2 had not. It was decided to use the ratings of Rater 1 to calculate scores for Partner

Monitoring behavior to be used in the statistical analyses. Thus, all analyses of Partner Monitoring Behavior reported in the remainder of this thesis are based on Rater 1 scoring.

Table 1. *Interrater reliability. Correlations between Ratings of Partner-Monitoring Behavior by Rater 1, Rater 2, and Tie Breaker for Each Trial in Each Round (N = 94)*

	Tie Breaker	Tie Breaker	Rater 1
	x	x	x
	Rater 1	Rater 2	Rater 2
Round 1			
Trial 1	0.92	0.29	0.27
Trial 2	0.91	-0.09	-0.11
Round 2			
Trial 1	0.95	0.22	0.18
Trial 2	0.92	0.14	0.09
Round 3			
Trial 1	0.95	0.69	0.66
Trial 2	0.93	0.59	0.61
Round 4			
Trial 1	0.92	0.24	0.20
Trial 2	0.92	0.52	0.39
Mean (SD)	0.93 (0.01)	0.32 (0.24)	0.29 (0.24)

Creation of Inclusive Data Set and imputation of missing data

Because of the high frequency of missing data, a dataset was created that included participants with two or more complete rounds of data (i.e. rounds without any participant error).

This set was referred to as the “Inclusive Data sample” and was composed of 44 dyads (88 participants, 93.5% of dyads). Most of the central statistical analyses reported here were carried out using this sample. The sample included 32 participants with complete data for all four rounds, 24 participants who had missing data for exactly one round, and 32 participants who had missing data for exactly two rounds.

For the 88 participants within the Inclusive Data sample, the highest rating for partner monitoring behavior out of both trials within each round was determined (except in the case of missing data) and was called the "Round Score" for this round. For example, as already explained, suppose that in Round 1, Trial 1, a participant scored 2 (definitely yes) for eye shift, 1 (ambiguous) for neck shift, and 0 (definitely no) for body shift, and that in Round 1, Trial 2, the participant scored 1 (ambiguous) for eye shift, 1 (ambiguous) for neck shift, and 0 (definitely no) for body shift. In this example the highest rating for Round 1 would be 2 (scored for the eye shift in Trial 1), and therefore the participant's Round Score for Round 1 would be 2.

Because 56 of the participants in the Inclusive Data sampler were missing data for at least one round, multiple imputation was used to estimate the missing Round Scores for these participants. Specifically, the Missing Value Imputation program in SPSS Version 19.0 was used to impute five data sets, with each data set containing an imputed/estimated value for each missing Round Score. These imputed values were estimated using multiple regression, with each participant's two or three non-missing Round Scores being used to impute the missing Round Scores for the same participant. Wherever a participant had a missing Round Score, the average of the five imputed Round Scores was calculated and inserted in place of the missing Round Score. For example, suppose a participant made an error on Round 1 of the Coin Task and therefore had a missing Round Score for that round. Using the participant's Round Scores

on Rounds 2, 3, and 4 as predictors, five imputed values for Round 1 would be generated. For instance, suppose the five imputed values were 2, 1, 2, 0, and 0, yielding an average equal to 1. This average of 1 would be inserted as the participant's Round Score for Round 1, replacing the missing data.

At the end of the imputation process, each participant in the Inclusive Data Set had four Round Scores. These Round Scores were then used to calculate the central dependent variable of the study: level of Partner Monitoring Behavior (PMB) displayed by each participant while playing the four possible roles: (a) truth teller with coin, (b) truth teller, no coin, (c) liar with coin, (d) liar, no coin. For instance, if a participant played the role of truth teller with coin during Round 1, and the Round Score for this Round was 2, then the participant's score for the role of truth teller with coin would also be 2.

In addition, data from some conditions were combined to form two aggregate variables, called Truth Condition and Liar Condition. Specifically, PMB values from the “truth teller with coin” and “truth teller, no coin” conditions were averaged to form the PMB score for “Truth condition.” Similarly, the PMB values from the “liar with coin” and “liar, no coin” conditions were averaged to form the PMB score for “Liar Condition.”

Creation of "Complete" and "Combined" Data Sets and calculation of demographic statistics for all data sets

For the purpose of complete reporting, two additional datasets were created. First, the 16 dyads (32 participants) with complete data for all four trials were included in what is called the “Complete Data Sample.” Second, the data from all participants ($N=94$, 47 dyads) was included in what is called the “Combined Data sample,” but with no attempt to impute missing values.

The main analyses reported here used the Inclusive Data Sample, although in some analyses, as reported in the text, additional analyses were repeated in the Complete and Combined Data Sample to determine whether the study findings were similar in all samples.

Demographic data and descriptive statistics for each of the three samples are reported in Tables 2 and 3. Of particular importance is the fact that in none of the dyads in the Complete Data Sample did the two participants know each other prior to participating in the study. In the Inclusive Data Sample, only 6.9% of the participants knew each other prior to participating.

Despite the prevalence of participant error, findings from the debriefing questionnaire indicated that majority of the participants understood what was taking place in the study. In the Inclusive Data Sample, 92% of participants indicated that there was not anything in the study that they did not understand. As well, majority of the participants did not indicate that there was anything about the study that made them feel suspicious (in the Combined Sample, 93%). Table 4 reports descriptive statistics for the three samples for the debriefing questionnaire.

Table 2. *Participant Characteristics for the Complete Data sample, Inclusive Data sample, and Combined Sample*

	Inclusive Data Sample <i>n</i> =88	Complete Data Sample <i>n</i> =32	Combined Sample <i>N</i> =94
Gender			
Male	42.50%	31.30%	42.00%
Female	57.50%	68.80%	58.00%
Age			
Mean (SD)	20.32 (3.28)	19.78 (1.66)	20.27 (3.15)
Range	18-43	18-26	18-43
Ethnicity			
White	10.30%	15.60%	10.00%
Hispanic or Latino	81.60%	78.10%	82.00%
Black or African American	4.60%	0.00%	5.00%
Other	3.40%	6.30%	3.00%
Education			
High School Diploma	11.50%	12.50%	17.00%
Some college	78.20%	81.30%	73.00%
Associate's degree	8.00%	3.10%	8.00%
Bachelor's degree	1.10%	0.00%	1.00%
Graduate level training	1.10%	3.10%	1.00%
Marital Status			
Single	94.30%	96.90%	94.00%
Married	5.70%	0.00%	6.00%
Knew Partner			
Not at all	93.10%	100.00%	94.00%
Slightly	2.30%	0.00%	2.00%
Moderately well	1.10%	0.00%	1.00%
Very well	3.40%	0.00%	3.0%

Table 3. *Descriptive Statistics for Personality and Other Measures in the Complete Data Sample, Inclusive Data Sample, and Combined Sample*

	Inclusive Data Sample		Complete Data Sample		Combined Sample	
	<i>n</i> =88		<i>n</i> =32		<i>N</i> =94	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Big Five Inventory						
Extraversion	3.43	0.74	3.45	0.93	3.43	0.72
Agreeableness	3.66	0.48	3.54	0.48	3.68	0.47
Conscientiousness	3.55	0.57	3.43	0.61	3.51	0.55
Neuroticism	2.86	0.74	2.98	0.70	2.90	0.74
Openness	3.66	0.52	3.58	0.57	3.68	0.51
Short Dark Triad Scale						
Machiavellianism	3.06	0.70	3.23	0.74	3.06	0.71
Psychopathy	2.35	0.59	2.30	0.57	2.34	0.59
Narcissism	3.03	0.53	3.03	0.57	3.00	0.53
Basic Interest Markers Inventory						
Management	3.02	0.80	2.96	0.74	3.00	0.80
Office Work	3.03	0.79	3.05	0.90	3.01	0.90
Performing Arts	3.09	0.92	2.95	0.94	3.14	0.93
Social Services	4.08	0.71	4.08	0.75	4.07	0.74
Self-Monitoring Scale	2.88	0.40	2.90	0.43	2.89	0.39
CIS Scale*	2.26	0.67	2.20	0.76	2.24	0.69
Absorption	4.29	2.35	4.59	2.17	4.14	2.34

* *CIS Scale = Creative Imaginative Suggestibility Scale*

Table 4. *Descriptive Statistics for Debriefing Questionnaire in the Complete Data, Inclusive Combined Data samples*

	Inclusive Data Sample <i>n</i> =88		Complete Data Sample <i>n</i> =32		Combined Data Sample <i>N</i> =94	
	No	Yes	No	Yes	No	Yes
Was there anything about the study you didn't understand?	92.00%	8.00%	90.60%	9.40%	93.00%	7.00%
Was there anything about the study that made you feel uncomfortable?	94.30%	5.70%	90.60%	9.40%	95.00%	5.00%
Was there anything that made you question the purpose of the study?	85.10%	14.90%	87.50%	12.50%	85.00%	15.00%
Was there anything about the study that made you feel suspicious?	92.80%	8.00%	90.60%	9.40%	93.00%	7.00%
Was there anything unusual about this study that made you feel that there was something more to it than meets the eye?	74.10%	25.90%	76.70%	23.30%	74.50%	25.5%

Internal Reliability of Measures

Internal consistency was calculated for the measures in the study other than PMB, to ensure that they demonstrated adequate internal consistency reliability, as indicated by Cronbach's $\alpha > .70$ (Bernardi, 1994). Results are shown in Table 6. Three scales had reliabilities $< .70$: the Tellegen Absorption Scale ($\alpha = .61$), Openness ($\alpha = 0.69$), and Narcissism ($\alpha = 0.56$). The remaining 12 scales had reliabilities higher than .70.

Table 5. *Internal Reliability (Cronbach's α) of Scales in the Present Study (N =94)*

<i>Scale Name</i>	<i>α</i>
Tellegen Absorption Scale	0.61
Creative Imaginative Suggestibility Scale	0.78
Self-Monitoring	0.73
Basic Inventory Markers	
Management Scale	0.86
Office Work	0.88
Performing Arts	0.89
Social Services	0.93
Big Five Inventory	
Extraversion	0.83
Agreeableness	0.78
Conscientiousness	0.71
Neuroticism	0.78
Openness	0.69
Short Dark Triad	
Machiavellianism	0.79
Psychopathy	0.72
Narcissism	0.56

Descriptive Statistics for Partner Monitoring Behavior and Other Measures

The dependent variable in the present study was Partner Monitoring Behavior. It was calculated by determining the highest rating received for any of the three forms of partner

monitoring behavior (eye shift, head turn, body turn) for each of the four rounds. The mean frequencies and standard deviations of partner monitoring behavior for each role are displayed in Table 6.

The mean and standard deviations for Eye Shift and Head Turn (Body Turn was not observed for any participant in the study) for each of the four roles were also calculated and are listed in Table 7. These values were calculated in a similar fashion to the dependent variable. For example, the highest rating of Eye Shift out of both trials for each round was determined. For rounds with missing data, imputed values were used.

As well, bivariate correlations were run to examine the relationships between the two partner monitoring behaviors, Eye Shift and Head Turn, when playing the role of the Truth teller or the role of the Liar. Within the Inclusive Data sample, significant and positive correlations were found between (a) eye shift while playing the truth teller and head turn while playing the truth teller ($r=.26, p=.02$) (b) eye shift while playing the liar and head turn while playing the liar ($r=.27, p=.01$), and (c) head turn while playing the liar and head turn while playing the truth teller ($r=.53, p=.03$) (Table 8a). However, only one of these findings, a positive and significant correlation between eye shift while playing the truth teller and head turn while playing the truth teller, was replicated within the Complete Data sample ($r=.51, p=.01$) (Table 8b).

Table 6. Means and Standard Deviations of Partner Monitoring Behavior for the Complete Data Sample and Inclusive Data Sample

	Inclusive Data Sample <i>n</i> =88		Complete Data Sample <i>n</i> =32	
	M	SD	M	SD
Truth teller with coin	0.98	0.75	0.91	0.86
Truth teller, no coin	0.89	0.76	0.72	0.77
Liar with coin	1.06	0.78	1.13	0.83
Liar, no coin	0.90	0.77	0.81	0.82
Truth teller, combined	0.93	0.64	0.81	0.72
Liar, combined	0.98	0.63	0.97	0.67

Table 7. Means and Standard Deviations for Eye Shift and Head Turn in the Inclusive and Complete Data Samples

	Inclusive Data Sample <i>n</i> =88		Complete Data Sample <i>n</i> =32	
	M	SD	M	SD
Truth Teller with Coin				
Eye Shift	0.96	0.74	0.91	0.86
Head Turn	0.38	0.61	0.31	0.69
Truth Teller, no coin				
Eye Shift	0.84	0.74	0.72	0.77
Head Turn	0.26	0.55	0.13	0.49
Liar with Coin				
Eye Shift	1.02	0.78	1.13	0.83
Head Turn	0.41	0.68	0.28	0.68
Liar, no Coin				
Eye Shift	0.90	0.77	0.81	0.82
Head Turn	0.28	0.52	0.19	0.54
Truth, combined				
Eye Shift	0.86	0.70	0.75	0.80
Head Turn	0.29	0.56	0.19	0.59
Liar, combined				
Eye Shift	1.00	0.74	1.06	0.80
Head Turn	0.28	0.53	0.16	0.51

Table 8. *Correlations among Partner Monitoring behaviors for the Truth Condition and the Lie Condition in the Inclusive Data Sample (n=88) and Complete Data Sample (n=32)*

Table 8a. *Inclusive Data Sample (n=88)*

	1	2	3	4
1. Truth teller, Eye Shift	-	0.20	0.26	0.16
2. Liar, Eye Shift	-	-	0.10	0.27
3. Truth teller, Head Turn	-	-	-	0.53
4. Liar, Head Turn	-	-	-	-

Table 8b. *Complete Data Sample (n=32)*

	1	2	3	4
1. Truth teller, Eye Shift	-	0.13	0.51	0.49
2. Liar, Eye Shift	-	-	0.11	0.29
3. Truth teller, Head Turn	-	-	-	0.32
4. Liar, Head Turn	-	-	-	-

Hypothesis 1: Between-partner differences in partner-monitoring behaviors

Analyses were next carried out to test the hypotheses of the study. In Hypothesis 1, a between-participants effect was predicted, such that more partner monitoring behaviors would be shown (a) by truthful dyad members at the time that their (lying) partners were being questioned about the coin than (b) by lying dyad members when their (truthful) partners were being questioned about the coin.

To test this hypothesis, a 2 (Role: Truth Teller vs Lie) X 2 (Subject: Subject 1 vs Subject 2) mixed-model ANOVA was carried out using the Complete Data sample. Role was a within-subjects factor and Subject was a between-subjects factor. The dependent variable was Partner Monitoring Behavior. As previously explained, the "coin" and "no coin" scores were summed within the Truth-teller category and within the Liar Category.

As can be seen in Table 6, the mean of Partner Monitoring Behavior was 0.93 ($SD=0.64$) in the truthful dyad members, and 0.98 ($SD=0.63$) in their lying partners. Contrary to what was predicted, the ANOVA indicated there was no significant main effect for Role (Wilks Lambda = 0.993, $F(1,86) = .597$, $p = .442$). No main effect was found for Subject ($F(1, 86) = .090$, $p = .764$) or the interaction of Role X Subject (Wilks Lambda = 0.990, $F(1,86) = .846$, $p = .360$).

Hypothesis 2: Within-participant differences in partner-monitoring behavior

In Hypothesis 2 a within-subjects effect was predicted, such that participants would show more partner monitoring behaviors (a) during the two sequences in which they were telling the truth (and their partner was lying) (b) than during the two sequences in which they were lying (and their partner was telling the truth).

To test this hypothesis, a paired samples t-test was carried out using the Inclusive Data sample. The dependent variable was Partner Monitoring Behavior, measured in two conditions for each participant: Truth-telling or Lying. Again, the "coin" and "no coin" scores were summed within the Truth-teller condition and within the Liar condition.

There was no significant difference in Partner Monitoring Behavior, $t(87)=-.773$, $p=.442$, when participants were in the Truth-Teller condition ($M=0.93$, $SD=0.64$) compared with when they were in the Liar condition ($M=0.98$, $SD=0.63$). A strong correlation ($r=0.58$, $p=.000$; Spearman's rho = 0.56, $p = .001$) was found between participants' level of Partner Monitoring Behavior in the Truth Teller condition and their level of Partner Monitoring Behavior in the Liar condition. Although the means are the same as those discussed in the previous section for Hypothesis 1, the paired samples t test run for Hypothesis 2 resulted in less error (standard error=.016) than the 2 x 2 mixed model ANOVA run for Hypothesis 1 (standard error=.096).

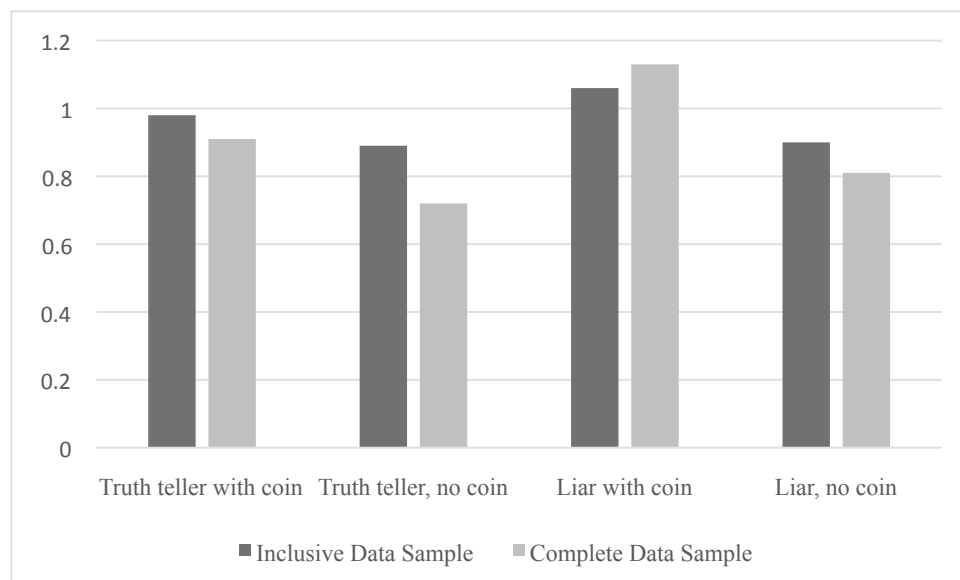


Figure 1. *Mean Frequencies of Partner Monitoring Behavior in the Complete Data sample and Inclusive Data sample for each of the four roles*

Hypothesis 3: Correlations of Partner Monitoring with Big Five Traits

In Hypothesis 3, it was predicted that Partner Monitoring when one's partner is lying would be (a) positively correlated with participants' level of Agreeableness and Extroversion, and (b) negatively correlated with their level of Neuroticism, as measured by the Big Five Inventory (Goldberg, 1993; John & Srivastava, 1999).

For purposes of complete reporting, Table 7 presents the correlations of Partner Monitoring Behavior in the Liar condition and Partner Monitoring Behavior in the Truth condition with all individual difference measures included in the present study. These correlations were calculated using the Inclusive Data Sample. The correlations that were specifically predicted to be significant in Hypothesis 3 are indicated in bold type. As can be seen, there were no significant correlations between the hypothesized measures (Agreeableness, Extroversion, Neuroticism) and partner monitoring behavior when one's partner is lying.

Table 7. *Correlations of Big Five Traits with Partner Monitoring Behavior in the Inclusive Data Sample (n =88)*

	Partner Monitoring Behavior	
	Truth	Liar
	Condition	Condition
Big Five Inventory		
Extraversion	0.04	-0.02
Agreeableness	-0.00	-0.06
Conscientiousness	-0.17	-0.16
Neuroticism	-0.10	0.06
Openness	0.10	0.03
Short Dark Triad Scale		
Machiavellianism	-0.00	0.07
Psychopathy	-0.03	0.04
Narcissism	0.11	0.04
Basic Interest Markers Inventory		
Management	-0.03	-0.12
Office Work	-0.25*	-0.21
Performing Arts	-0.01	-0.05
Social Services	0.01	-0.13
Self-Monitoring Scale	-0.13	-0.04
Creative Imaginative Suggestibility Scale	-0.23*	-0.08
Absorption	-0.01	-0.11

*Note: * indicates $p < .05$*

Hypothesis 4: Correlations of partner monitoring with self-reported Absorption and Imaginative Suggestibility

In Hypothesis 4, it was predicted that Partner Monitoring behavior when one's partner is lying (that is, when the participant is in the Lie condition) would be positively correlated with (a) participants' self-reported level of Absorption as measured by the Tellegen Absorption Scale (Tellegen & Atkinson, 1974) and (b) participants' behaviorally measured level of imaginative suggestibility as measured by the Creative Imagination Scale (Barber & Wilson, 1978).

To test this hypothesis, the correlations of Partner Monitoring in the Truth condition with scores on the Absorption and Creative Imagination scales were calculated in the Complete Data sample, Incomplete Data sample, and Inclusive Data sample. For purposes of completeness, the correlations of Partner Monitoring in the Lie condition were also included. The results are shown in Table 8.

Within the Complete, Incomplete, and Inclusive samples Partner Monitoring Behavior in the Truth condition (that is, when one's partner is lying) was not significantly correlated with level of Absorption. However, within the Complete Data sample, partner monitoring behavior in the Lying condition (that is, when one's partner is telling the truth) was significantly correlated with level of Absorption ($r=-.41, p=0.02$). However, in the Incomplete Data sample, this correlation between partner monitoring in the Lying condition and Absorption was not statistically significant ($r=-0.21, p=.13$)

Within the Inclusive sample, Partner Monitoring Behavior in the Truth condition (that is, when one's partner is lying) was significantly correlated with Imaginative Suggestibility ($r=-0.23, p=.01$). Imaginative Suggestibility scores were not significantly correlated with partner

monitoring behavior when one's partner is lying (i.e., in the Truth condition) in either the Complete Data sample ($r = -.19$, n.s.) or the Incomplete Data sample ($r = -.14$, n.s.).

Table 8. *Correlations of the Absorption and Creative Imagination scales with Partner Monitoring Variables in Complete (n=32) and Inclusive Sample Data (n=88)*

	Partner Monitoring Behavior	
	Truth Condition	Liar Condition
Tellegen Absorption Scale		
Inclusive Data Sample	0.01	0.11
Complete Data Sample	0.04	-0.41
Creative Imaginative Suggestibility Scale		
Inclusive Data Sample	-0.23	-0.08
Complete Data Sample	-0.19	-0.20

Note: Bold-face type indicates $p < .05$

Correlations of partner monitoring behavior with level of interest in Management, Office Work, Performing Arts, and Social Services

As part of a separate project carried out within the present study by an undergraduate student, participants were also asked to indicate their level of occupational interest using subscales of the Basic Interest Markers Scale (Liao, Armstrong & Rounds, 2008). The Basic Interest Marker scale is a 370-item, self-report questionnaire with 30 scales that measure occupational interests. Each BIM item describes an activity (e.g. "Plan and direct training and staff development for a business", "Provide customer service"). Participants are asked to indicate

how much they would like to do that activity: on a 5-point Likert-type scale (See Appendix E for list of scale items).

The correlations of these four BIM scales with Partner Monitoring in the Lie Condition and Partner Monitoring in the Truth condition for both the Inclusive Data Sample and Complete Data Sample are shown in Table 9. As can be seen, two BIM scales correlated with Partner Monitoring.

Table 9. *Correlations of Basic Interest Markers scales With Partner Monitoring in Inclusive (n=88) and Complete Data Samples (n=32)*

	Truth Condition	Liar Condition
Inclusive Data Sample		
Management	-0.03	-0.12
Office Work	-0.25	-0.21
Performing Arts	-0.01	-0.05
Social Services	0.01	-0.13
Complete Data Sample		
Management	0.05	-0.12
Office Work	-0.14	-0.31
Performing Arts	-0.04	-0.23
Social Services	0.03	-0.26

Note: Bold-face type indicates $p < .05$

In the Complete Data sample, none of these correlations were statistically significant. Within the Inclusive sample, level of interest in Office Work was significantly and negatively correlated with tendency to engage in partner monitoring behavior when one's partner is lying

($r=-0.25, p=.02$). Level of interest in Office Work was not significantly correlated with tendency to engage in partner monitoring behavior when one's partner is telling the truth, however findings did approach significance ($r=-0.21, p=.055$).

Intercorrelations of Individual Difference Variables

For archival purposes, correlations were calculated among all individual difference variables in the Combined Data Sample. Results are shown in Table 10. Due to the large size of the correlation table, it has been broken down in to three parts: A, B, and C.

Table 10. Part A Correlations Among Individual Difference Measures and Partner Monitoring Variables in Combined Sample Data (N = 94)

	1	2	3	4	5	6	7	8	9
1. Extraversion	-	0.08	0.10	-0.19	-0.05	-0.05	-0.10	0.37	0.14
2. Agreeableness	-	-	0.26	-0.21	0.30	0.38	-0.41	0.01	-0.18
3. Conscientiousness	-	-	-	-0.39	0.10	-0.20	-0.23	0.12	0.12
4. Neuroticism	-	-	-	-	-0.14	0.12	0.15	-0.36	-0.22
5. Openness	-	-	-	-	-	-0.15	-0.01	0.20	0.11
6. Machiavellianism	-	-	-	-	-	-	0.58	0.21	0.18
7. Psychopathy	-	-	-	-	-	-	-	0.21	0.18
8. Narcissism	-	-	-	-	-	-	-	-	0.39
9. Management	-	-	-	-	-	-	-	-	-

Note: Bold-face type indicates $p<.05$

Table 10. Part B Correlations Among Individual Difference Measures and Partner Monitoring Variables in Combined Sample Data (N = 94)

	10	11	12	13	14	15
1. Extraversion	0.11	0.09	0.22	0.28	0.06	0.09
2. Agreeableness	0.03	0.20	0.18	0.21	0.20	0.13
3. Conscientiousness	0.26	0.17	0.07	0.22	0.13	0.05
4. Neuroticism	0.06	0.01	0.14	0.35	0.11	0.03
5. Openness	0.05	0.46	0.21	0.04	0.49	0.03
6. Machiavellianism	0.02	0.02	0.30	0.42	0.13	0.12
7. Psychopathy	0.02	0.02	0.30	0.46	0.13	0.12
8. Narcissism	0.04	0.25	0.03	0.06	0.03	0.06
9. Management	0.46	0.29	0.33	0.14	0.13	0.05

Note: Bold-face type indicates $p < .05$; 10=Office Work, 11= Performing Arts, 12= Social Service, 13=Self-Monitoring Scale, 14=Absorption, 15=Imaginative Suggestibility, 16= Partner Monitoring, Truth condition, 17=Partner Monitoring, Lie Condition

Table 10. Part C Correlations Among Individual Difference Measures and Partner Monitoring Variables in Combined Sample Data (N = 94)

	10	11	12	13	14	15
10. Office Work	-	0.15	0.40	0.06	0.25	0.19
11. Performing Arts	-	-	0.22	0.29	0.37	0.18
12. Social Service	-	-	-	-0.01	0.32	0.0
13. Self-Monitoring	-	-	-	-	-0.20	0.05
14. Absorption	-	-	-	-	-	0.23
15. Imaginative Suggestibility	-	-	-	-	-	-

Note: Bold-face type indicates $p < .05$

Discussion

Within the present study the following analyses were run in order to examine differences in partner-monitoring behavior between truth tellers and liars: a 2 x 2 mixed-model ANOVA and a paired samples t-test. In addition, 136 bivariate correlations were run to examine the relationships between partner monitoring behavior and measures of individual differences. Given the number of comparisons being made within the present study, there is the increased likelihood of committing Type I error. However, three findings of the present thesis are particularly notable.

First, the main hypotheses regarding Partner Monitoring as an indicator of deception were not supported. Second, Partner Monitoring was found to correlate with a few individual difference measures, including the BIM Office Work scale and Creative Imaginative Suggestibility scale, but in general the correlations did not replicate between the Inclusive and Complete Data samples. Third, participants had much more difficulty following the experimental instructions than was anticipated at the beginning of the study, and new procedures for reducing participant error were tested in a pilot study. Each of these findings will be discussed in the sections that follow.

Findings did not support Partner Monitoring Behavior as an Indicator of Deception

Patrick Redford states that by using the “Prevaricator Effect” he is able to detect when an individual is lying with success. However, findings from the present study were unable to replicate Redford’s success and failed to confirm that it is possible to tell when an individual in a dyad is lying, not by observing the behavior of the lying partner, but by observing the behavior of the truth telling partner. Specifically, participants in the present study showed a non-significant tendency to display more partner monitoring behavior when playing the role of “Liar

with Coin” than when playing any of the other three role (Liar, no coin; Truth teller, coin; Truth teller, no coin).

While it is possible that Redford’s claim of success in using the “Prevaricator Effect” is unsubstantiated and the “Prevaricator Effect” is not necessarily a viable method of deception detection, there are other factors that may have also influenced the outcome of the study. One such factor that may have influenced the outcome of the present study was the lack of prior acquaintance among the dyad members. In the present study, the majority of participants did not know their dyad partner before the experiment. In contrast, studies on dyads and deception carried out by Driskell et al. (2012) and Jundi et al. (2013) used police officers and firefighters who had served as partners before participating in the experiments. Familiarity with one’s partner may be an important factor to consider in future studies because, as discussed earlier in the document, some writers have proposed that social indicators of deception should be conceptualized within the theoretical framework of transactive memory systems.

A transactive memory system is a process by which information from a shared experience is stored and encoded by several individuals within a pair or group. When prompted to recall the shared experience, the members of the pair/group interact with each other and work together to retrieve that information. The interactive nature of this informational transaction results in observable verbal and nonverbal behaviors, such as gazing or gesturing at one’s partner (Wegner, 1987). .

The design of the present study did not encourage participants to engage in such transactive memory processes. Not only were most participants unfamiliar with their partner, but

there was also no time given to dyads to interact with each other prior to being questioned. Participants were questioned immediately after hiding the coin.

Relationship between Partner-Monitoring Behavior and Measures of Individual Differences

Bivariate correlations were run between (a) measures of individual differences: Big Five Inventory traits (Openness, Agreeableness, Conscientiousness, Extroversion, Neuroticism), Psychopathy, Narcissism, Machiavellianism, Absorption, Creative Imaginative Suggestibility, Self-Monitoring, Basic Inventory Marker traits (Management, Office Work, Performing Arts, Social Services) and (b) Partner Monitoring Behavior, measured in two conditions for each participant: Truth-telling or Lying. Again, the "coin" and "no coin" scores were summed within the Truth-teller condition and within the Liar condition. It was predicted that there would be a significant and positive correlation between partner-monitoring behavior and level of Agreeableness, Extroversion, Absorption and Creative Imaginative Suggestibility. It was also predicted that a significant and negative correlation would be present between partner-monitoring behavior and level of Neuroticism.

In the Inclusive Data Sample, a significant and negative correlation was found between one hypothesized measure of individual differences (Creative Imaginative Suggestibility scale) and partner-monitoring behavior while playing the truth teller. This may suggest that individuals who are likely to succeed in having a suggested experience are also likely to respond to the suggested experience that is playing the role of a "Truth teller." As a result, these individuals are more likely to monitor their partner to see whether their partner is successful at deceiving the interviewer.

As well, within the Inclusive Data Sample, a significant and negative correlation was found between one of the Basic Interest Marker scales (Office Work) and partner-monitoring behavior while playing the truth teller. Although there is little research examining the relationship between occupational interests in relation to deception cues, this finding suggests that occupational interests as a measure of individual differences may be a variable of interest to look at in future studies.

Within the Complete Data sample, there was a significant and negative correlation between Absorption and partner monitoring behavior when playing the Liar. This may suggest that individuals who are more susceptible to becoming absorbed in a task are also likely to become engaged and absorbed in playing the role of the “Liar.” As a result, these individuals are more likely to monitor the interviewer to see if they are being believed as opposed to monitoring the actions of their truth telling partners.

However, correlations with partner monitoring behavior reported in this section may have been due to chance. There were correlations between partner monitoring behavior and measures of individual differences that were significant in the Complete Data sample (level of Absorption) that were not significant in the Inclusive Data sample. As well, there were correlations between partner monitoring behavior and measures of individual differences that were significant in the Inclusive Data sample (Office Work and Creative Imaginative Suggestibility) that were not significant in the Complete Data Sample.

Difficulty Following Instructions

Participant error was present in 66% of the overall sample and occurred as a result of instructions not being followed correctly during the Coin Task (e.g. Liar with coin responding

“yes” to the question “Do you have the coin?”; Participant 1 hiding the coin when Participant 2 was instructed to do so). The number of participants without any error and a complete set of data was small, approximately one third of the original sample.

Follow-up study

Because the rate of participant error in the main study was unexpectedly high, a small follow-up study was carried out to see if procedures could be developed to reduce such errors (See Appendix O for Follow-up Study protocol). The participants in this follow-up study were 20 undergraduates from the UTEP PSYC 1301 participant pool, who were run as 10 dyads. Most of the procedures used in the main thesis study were also used in the follow-up. However, three specific changes were made in the procedures to see if they would reduce participant error.

The first change introduced into the follow-up study was the addition of a brief testing procedure near the beginning of the experiment to make sure that participants understand the instructions. Specifically, after participants had been given instructions for the experiment, they were asked to fill out a brief paper-and-pencil test that assessed whether they correctly understood the instructions. If the participants did not correctly understand the instructions, they were given feedback and additional instruction by the experimenter.

The second change involved the addition of a practice round. That is, before beginning the actual experimental task, participants were asked to go through a practice session similar to a round of questioning in the actual experiment. Each participant was given a set of instructions for the practice round explaining what role he/she would be playing and was allowed to look at the instructions for reference during the practice round. The experimenter would then hand the coin to the participant that was instructed to take and hide the coin. Next, the experimenter would

explain that he/she would be asking each of the participants the same question: “Do you have the coin?” and that the participants would answer according to the instructions they were given. If the participants did not provide the correct responses to the question “Do you have the coin?” the experimenter would again provide feedback and additional instructions if necessary. This practice round was introduced by the researcher in the hopes that it would familiarize participants with the experimental procedures and reduce errors when participants began the main part of the experiment.

The third change made to the procedure involved the addition of a “social bonding exercise” at the beginning of the experiment, to encourage interaction between the two experimental participants before the main part of the experiment began. This change was introduced in hopes that the participants would interact more spontaneously and naturally during the dyadic coin task if they first participated in a social bonding activity together.

The social bonding activity and procedure was the same as that used by Martin and colleagues (2015) and involved having participants play four songs (“Twist and Shout”, “I Want to Hold Your Hand”, “Hard Day’s Night”, “Revolution”) together in the video game, Beatles Rock Band. The Martin et al study found that playing four songs in Beatles Rock Band decreased levels of social stress in dyads consisting of two strangers. This social bonding experience also increased the level of empathy that participants experienced for their partners.

With the implementation of these three changes, 70% of dyads in the follow-up study sample had zero participant error and complete sets of data. Participant error was successfully reduced from 66% of dyads in the main study to 30% in the follow-up. These numbers are only suggestive, given the small size of the follow-up sample. However, they suggest that the

procedures might be worth implementing in future studies on the Prevaricator effect, to reduce participant errors and loss of data.

Limitations of the Present Study

A serious limitation of the present study was the attrition that occurred due to participant error. Out of 47 dyads, only 16 followed directions for the Coin Task correctly and had complete data. In order to avoid participant error and small sample size, future studies should utilize the clarifications and improvements made to the procedure that were discussed in the previous section, specifically, the addition of a practice round and social bonding activity.

Another limitation is that the present study did not examine partner-monitoring behavior exclusively in dyads that knew each other prior to the experiment. Although it is unknown whether Patrick Redford's dyads knew each other before he performed his deception detection act for them, previous studies examining social indicators of deception dyads have observed dyads who did know each other prior to the study (Driskell, Salas, & Driskell, 2012; Jundi et al., 2013). Future studies should examine whether partner-monitoring behavior is more likely to occur in dyads that are familiar with each other, as opposed to dyads composed of strangers.

Another possible limitation is that Patrick Redford's "Prevaricator Effect" is done as part of a performance and he reports that he is able to determine if someone is lying with 98% accuracy. However, it is possible that the effect was not present due to the much more highly controlled setting the Coin Task took place in within the present study.

There are several steps involved in the Coin Task (e.g. flipping a coin to decide who plays what part, selecting a folder with booklets, reading through the instructions in each booklet, taking the coin and hiding it, etc.). It is procedural, repetitive, and the premise of the

task was unclear and confusing to many participants. In Patrick Redford's performance, on the other hand, the premise of the "Prevaricator Effect" is more straightforward and to the point (the participants decide what role they want to play, he/she hides the coin, Redford questions the participants and then guesses who had the coin).

As well, if one of Redford's participants were to get confused and answer incorrectly, Redford can use this to his advantage (i.e. as a deception cue) and achieve success in his performance as a deception detector. However, within the present study, participant error could not be used to the experimenter's advantage in such a way.

Future Directions

Although findings from the present study did not indicate any difference in partner monitoring between truthful dyad members and lying dyad members, future studies should continue to examine partner-monitoring behavior as a social indicator of deception. Given that examination of social indicators of deception in dyads is a relatively new approach within deception detection research, knowledge in this area is still developing and some findings do indicate that there may be an effect present.

A major weakness of the present study was the prevalence of participant error within the sample. Future studies should, in addition to implementing a procedure that minimizes participant error, also further explore the trend in partner monitoring behavior that was found *post hoc* in the present study: participants monitored their partners more frequently when playing the role of "Liar, with coin". One suggestion would be to examine whether this trend is also present in dyads who are familiar with each other and to see how and if they differ from dyads who are unfamiliar with each other. It would be of interest to see whether Patrick Redford's

“Prevaricator Effect” is only present in dyads who are familiar with each other. One way to accomplish this would be to require participants to bring a friend with them to participate in the study, a strategy that other studies in the department have used with success.

If future studies are able to determine whether the “Prevaricator Effect” is a viable method of deception detection, it would of interest to apply the “Prevaricator Effect” within contexts that are more relevant to the forensic area. One suggestion would be to expose dyads to a shared experience and to investigate whether or not social indicators of deception are still present when a truthful dyad member is paired with a lying dyad member.

Another suggestion would be to introduce incentives to be successful at deception. Monetary incentives may be a possible incentive for participants. For example, a future study could involve participants earning \$5 for every round he/she is able to successfully deceive the experimenter. A participant could stand to earn up to \$20, however given the set-up of the experiment, the experimenter would have a correct guess every round. Lastly, it would be of interest to examine whether ego depletion affects the display of partner monitoring behavior (eye shift/neck shift/body shift towards one’s partner). After being given an ego depletion task, it is possible that the cognitive resources needed in order to play the role of a truth teller or liar may no longer be available, thus affecting an individual’s display of partner monitoring behaviors.

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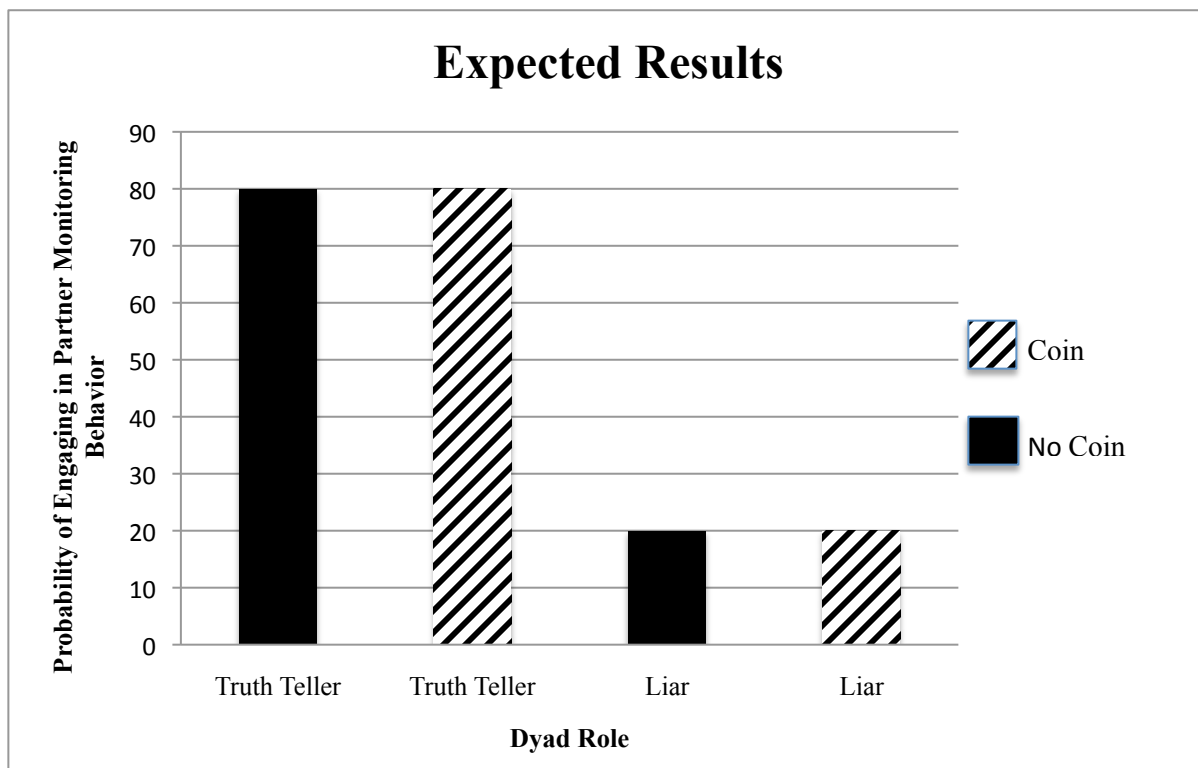
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Appendix A: Expected Results



Appendix B: Big Five Inventory – 44

Instructions: Please indicate how much you agree with the following statements using the scale below.

1	2	3	4	5
Disagree Strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly

I see myself as someone who....

- _____ 1. Is talkative
- _____ 2. Tends to find fault with others
- _____ 3. Does a thorough job
- _____ 4. Is depressed, blue
- _____ 5. Is original, comes up with new ideas
- _____ 6. Is reserved
- _____ 7. Is helpful and unselfish with others
- _____ 8. Can be somewhat careless
- _____ 9. Is relaxed, handles stress well
- _____ 10. Is curious about many different things
- _____ 11. Is full of energy
- _____ 12. Starts quarrels with others
- _____ 13. Is a reliable worker
- _____ 14. Can be tense
- _____ 15. Is ingenious, a deep thinker
- _____ 16. Generates a lot of enthusiasm

- _____ 17. Has a forgiving nature
- _____ 18. Tends to be disorganized
- _____ 19. Worries a lot
- _____ 20. Has an active imagination
- _____ 21. Tends to be quiet
- _____ 22. Is generally trusting
- _____ 23. Tends to be lazy
- _____ 24. Is emotionally stable, not easily upset
- _____ 25. Is inventive
- _____ 26. Has an assertive personality
- _____ 27. Can be cold and aloof
- _____ 28. Perseveres until the task is finished
- _____ 29. Can be moody
- _____ 30. Values artistic, aesthetic experiences
- _____ 31. Is sometimes shy, uninhibited
- _____ 32. Is considerate and kind to almost everyone
- _____ 33. Does things efficiently
- _____ 34. Remains calm in tense situations
- _____ 35. Prefers work that is routine
- _____ 36. Is outgoing, sociable
- _____ 37. Is sometimes rude to others
- _____ 38. Makes plans and follows through with them
- _____ 39. Gets nervous easily

- _____ 40. Likes to reflect, play with ideas
- _____ 41. Has few artistic interests
- _____ 42. Likes to cooperate with others
- _____ 43. Is easily distracted
- _____ 44. Is sophisticated in art, music, or literature

Appendix C: Creative Imaginative Suggestibility Scale

10. In the first test, you were asked to imagine that one, two, then three dictionaries were being piled on the palm of your hand. Compared to what you would have experienced if three dictionaries were actually on your hand, what you experienced was:

0	1	2	3	4
0%	25%	50%	75%	90+%
Not at all the same	A little the same	Between a little and much the same	Much the same	Almost exactly the same

2. In the second test you were asked to think of a strong stream of water from a garden hose pushing up against the palm of your hand. Compared to what you would have experienced if a strong stream of water were actually pushing up against your palm, what you experienced was:

0	1	2	3	4
0%	25%	50%	75%	90+%
Not at all the same	A little the same	Between a little and much the same	Much the same	Almost exactly the same

3. In the third test you were asked to imagine that local anesthetic had been injected into your hand and it made two fingers feel numb. Compared to what you would have experienced if local anesthetic had actually made the two fingers feel numb, what you experienced was:

0	1	2	3	4
0%	25%	50%	75%	90+%
Not at all the same	A little the same	Between a little and much the same	Much the same	Almost exactly the same

4. In the fourth test you were asked to think of drinking a cup of cool mountain water. Compared to what you would have experienced if you were actually drinking cool mountain water, what you experienced was:

0	1	2	3	4
0%	25%	50%	75%	90+%
Not at all the same	A little the same	Between a little and much the same	Much the same	Almost exactly the same

5. In the fifth test you were asked to imagine smelling and tasting an orange. Compared to what you would have experienced if you were actually smelling and tasting an orange, what you experienced was:

0	1	2	3	4
0%	25%	50%	75%	90+%
Not at all the same	A little the same	Between a little and much the same	Much the same	Almost exactly the same

6. When you were asked to imagine listening to some music, how similar was the experience to that of actually listening to some music?

0	1	2	3	4
0%	25%	50%	75%	90+%
Not at all the same	A little the same	Between a little and much the same	Much the same	Almost exactly the same

7. When you were asked to imagine the sun shining on your hand and making it feel hot, how similar was the experience to how you would actually feel if the sun was shining on your hand, making it feel hot?

0	1	2	3	4
0%	25%	50%	75%	90+%
Not at all the same	A little the same	Between a little and much the same	Much the same	Almost exactly the same

8. When you were asked to imagine time slowing down, how similar was the experience to that of time actually slowing down?

0	1	2	3	4
0%	25%	50%	75%	90+%
Not at all the same	A little the same	Between a little and much the same	Much the same	Almost exactly the same

9. When you were asked to imagine that you were a child at primary school, how similar was the experience to that of actually being a child in primary school?

0	1	2	3	4
0%	25%	50%	75%	90+%
Not at all the same	A little the same	Between a little and much the same	Much the same	Almost exactly the same

10. When you were asked to imagine yourself relaxing on the beach, how similar was the experience to that of actually relaxing on the beach?

0	1	2	3	4
0%	25%	50%	75%	90+%
Not at all the same	A little the same	Between a little and much the same	Much the same	Almost exactly the same

Appendix D: Absorption Scale

Instructions: Read the following statements and circle 'T' if you agree with that statement or 'F' if you do not agree with that statement.

- | | | |
|---|---|--|
| T | F | 1. I can be deeply moved by a sunset. |
| T | F | 2. When listening to organ music or other powerful music, I sometimes feel as if I am being lifted into the air. |
| T | F | 3. Sometimes thoughts and images come to me without any effort on my part. |
| T | F | 4. If I wish, I can imagine (or daydream) some things so vividly that it's like watching a good movie or hearing a good story. |
| T | F | 5. Sometimes I can change noise into music by the way I listen to it. |
| T | F | 6. I can often somehow sense the presence of another person before I actually see or hear her/him. |
| T | F | 7. The sound of a voice can be so fascinating to me that I can just go on listening to it. |
| T | F | 8. Some music reminds me of pictures or changing patterns of color. |
| T | F | 9. I can so completely wander off into my own thoughts while doing a routine task that I actually forget that I am doing the task and then find a few minutes later that I have finished it. |
| T | F | 10. I can sometimes recall certain past experiences in my life so clearly and vividly that it is like living them again, or almost so. |
| T | F | 11. At times I somehow feel the presence of someone who is not physically there. |
| T | F | 12. Sometimes I am so immersed in nature or in art that I feel as if my whole state of consciousness has somehow been temporarily changed. |

Appendix E: Basic Interest Marker Scale

Instructions: Please indicate how much you would like to do an activity by selecting the number that most accurately reflects how you feel about it:

1 Strongly Dislike	2 Dislike	3 Neutral	4 Like	5 Strongly Like
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Management: Planning, organizing, and coordinating the activities of others

- _____ 1. Direct the business affairs of a university
- _____ 2. Direct all sales activities for a company
- _____ 3. Plan and coordinate a convention for a professional association
- _____ 4. Administer city government
- _____ 5. Plan and direct training and staff development for a business
- _____ 6. Serve as a president of a university
- _____ 7. Direct and coordinate the work activities of subordinates
- _____ 8. Coordinate the activities of all departments in a bank
- _____ 9. Direct the operations of a medium size company

Office Work: Performing clerical tasks

- _____ 1. Perform office work
- _____ 2. Develop procedures to improve office efficiency
- _____ 3. Operate commonly-used office machines
- _____ 4. Improve a system for handling employee reimbursements
- _____ 5. Order and maintain an inventory of office supplies
- _____ 6. Provide customer service
- _____ 7. Design an office filing system

- _____ 8. Record meeting minutes
- _____ 9. Schedule, maintain, and update appointments
- _____ 10. Organize files and documents
- _____ 11. Prepare payrolls

Performing Arts: Performing for an audience

- _____ 1. Study one of the performing arts
- _____ 2. Participate in a musical performance
- _____ 3. Act in a television commercial
- _____ 4. Sing on a stage
- _____ 5. Perform magic tricks on stage
- _____ 6. Act in a play
- _____ 7. Appear in a talent show
- _____ 8. Direct the performance of actors
- _____ 9. Conduct an orchestra
- _____ 10. Take a screen test for a movie
- _____ 11. Act in a movie

Social service: Helping people cope with problems

- _____ 1. Assist people with disabilities to find employment
- _____ 2. Help families to adopt a child
- _____ 3. Counsel families in crisis
- _____ 4. Help the homeless find shelter
- _____ 5. Help people find community resources
- _____ 6. Provide childcare services

- _____7. Organize a social support group
- _____8. Volunteer for a community service center
- _____9. Help children from disadvantaged background adjust to school
- _____10. Counsel clients with personal problems
- _____11. Provide services to individuals with disabilities
- _____12. Help people overcome social problems

Appendix F: Self-Monitoring Scale

Instructions: Please indicate how much you agree with the following statements using the scale below.

1	2	3	4	5
Disagree Strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly

- _____ 1. I find it hard to imitate the behavior of other people.
- _____ 2. At parties and social gatherings, I do not attempt to do or say things that others will like.
- _____ 3. I can only argue for ideas which I already believe.
- _____ 4. I can make impromptu speeches even on topics about which I have almost no information.
- _____ 5. I guess I put on a show to impress or entertain others.
- _____ 6. I would probably make a good actor.
- _____ 7. In a group of people I am rarely the center of attention.
- _____ 8. In different situations and with different people, I often act like very different persons.
- _____ 9. I am not particularly good at making other people like me.
- _____ 10. I'm not always the person I appear to be.
- _____ 11. I would not change my opinions (or the way I do things) in order to please someone or win their favor.
- _____ 12. I have considered being an entertainer.
- _____ 13. I have never been good at games like charades or improvisational acting.

- _____ 14. I have trouble changing my behavior to suit different people and different situations.
- _____ 15. At a party I let others keep the jokes and stories going.
- _____ 16. I feel a bit awkward in public and do not show up quite as well as I should.
- _____ 17. I can look anyone in the eye and tell a lie with a straight face (if for a right end).
- _____ 18. I may deceive people by being friendly when I really dislike them.

Appendix G: Short Dark Triad (SD3)

Instructions: Please indicate how much you agree with the following statements using the scale below.

1	2	3	4	5
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

- _____ 10. It's not wise to tell your secrets.
- _____ 2. I like to use clever manipulation to get my way.
- _____ 3. Whatever it takes, you must get the important people on your side.
- _____ 4. Avoid direct conflict with others because they may be useful in the future.
- _____ 5. It's wise to keep track of information that you can use against people later.
- _____ 6. You should wait for the right time to get back at people.
- _____ 7. There are things you should hide from other people because they don't need to know.
- _____ 8. Make sure your plans benefit you, not others.
- _____ 9. Most people can be manipulated.
- _____ 10. People see me as a natural leader.
- _____ 11. I hate being the center of attention.
- _____ 12. Many group activities tend to be dull without me.
- _____ 13. I know that I am special because everyone keeps telling me so.
- _____ 14. I like to get acquainted with important people.
- _____ 15. I feel embarrassed if someone compliments me.
- _____ 16. I have been compared to famous people.
- _____ 17. I am an average person.

- _____18. I insist on getting the respect I deserve.
- _____19. I like to get revenge on authorities.
- _____20. I avoid dangerous situations.
- _____21. Payback needs to be quick and nasty.
- _____22. People often say I'm out of control.
- _____23. It's true that I can be mean to others.
- _____24. People who mess with me always regret it.
- _____25. I have never gotten into trouble with the law.
- _____26. I enjoy having sex with people I hardly know.
- _____27. I'll say anything to get what I want.

Appendix H: Informed Consent Form

University of Texas at El Paso (UTEP) Institutional Review Board Informed Consent Form for Research Involving Human Subjects

Protocol Title: Deception Detection in Dyads

Principal Investigator: Lora Marquez

UTEP: Psychology

1. Introduction

You are being asked to take part voluntarily in the research project described below. Please take your time making a decision and feel free to discuss it with your friends and family. Before agreeing to take part in this research study, it is important that you read the consent form that describes the study. Please ask the study researcher or the study staff to explain any words or information that you do not clearly understand.

2. Why is this study being done?

You have been asked to take part in a research study examining deception detection in dyads (pairs). Studies have shown that when people lie, they often display subtle changes in body language. For example, a liar's body may become stiff rather than relaxed. However, many of these studies only examine body language occurring within individual interviews rather than in interviews with two or more interviewees. The purpose of this study is to examine subtle changes in body language that may occur in pairs of individuals (that is, in dyads) when a lie is being told.

A secondary purpose of this study is to explore whether some individuals are more likely than others to engage in these subtle changes in body language. For example, are anxious people more likely to avoid eye contact when telling a lie than non-anxious people are? Personality traits that this study is going to assess are the Big Five (Openness, Conscientiousness, Extroversion, Agreeableness, and Neuroticism), Absorption (an individual's responsiveness to sensory and imaginative experiences, which alter an individual's perception, memory, and mood), Imaginative Suggestibility (the degree to which a person succeeds in having suggested experiences such as imagining a force acting on your hands to break them

apart), Self-Monitoring (an individual's ability to regulate behaviors in response to social situations), Dark Triad personality factors (Psychopathy, Machiavellianism, Narcissism), and vocational interests.

Approximately 100 students will be enrolling in this study at UTEP. You are being asked to be in the study because you are a male or female college-aged student, eighteen years and older, currently enrolled in undergraduate psychology courses at the University of Texas at El Paso.

If you decide to enroll in this study, your involvement will last about 30-45 minutes.

3. What is involved in the study?

If you agree to take part in this study, the research team will ask you to play a game that involves lying and truth telling. You and your partner will be given a coin and asked to hide it. The experimenter will then ask you and your partner if you have the coin. One of you will answer the experimenter by telling the truth, the other will lie. The experimenter will try to guess which of you is lying by looking for certain telltale signs.

After you and your partner have hidden the coin four times, and the experimenter has guessed each time, you will both be administered several tests individually. Most of these tests are questionnaires. One of the tests will involve you being asked to have certain experiences, such as feeling your hand become heavy. You and your partner will be put in separate rooms while you are administered these tests.

After you have been administered the tests, you will be asked to complete a debriefing questionnaire. Then you will be debriefed (told more about the study) and invited to ask questions. After being debriefed, you will be thanked and allowed to leave.

You and the experimenter will be video recorded while performing the coin-guessing tasks. The video will be scored for the study. In addition, the video may be retained by the experimenter for future analyses and studies. In addition, the video may be shown to professional and educational groups, including psychology classes, to teach about how deception can be detected.

4. What are the risks and discomforts of the study?

Two risks are involved with this study. First, you will be asked to tell a lie as part of a game. Some people feel uncomfortable telling lies, even as part of a game. If you are one of these people, you may feel uncomfortable during the experiment. Second, the video of you and your partner playing the game may be retained and shown in professional settings, conferences, colloquia or class presentations. It is

possible that the video of you playing the game will be shown at UTEP during a colloquium or class. It is possible that you might feel embarrassment or discomfort if this happens.

5. What will happen if I am injured in this study?

The University of Texas at El Paso and its affiliates do not offer to pay for or cover the cost of medical treatment for research related illness or injury. No funds have been set aside to pay or reimburse you in the event of such injury or illness. You will not give up any of your legal rights by signing this consent form. You should report any such injury to Lora Marquez (915-525-7924) and to the UTEP Institutional Review Board (IRB) at (915-747-8841) or irb.orsp@utep.edu.

6. Are there benefits to taking part in this study?

There will be no direct benefits to you for taking part in this study. As an introductory student required to participate in research as part of a learning experience, you will be exposed to psychology research by observing firsthand the experimental procedures of research.

7. What other options are there?

You have the option not to take part in this study. There will be no penalties involved if you choose not to take part in this study.

8. Who is paying for this study?

Internal Funding: *Not applicable*

External Funding: *Not applicable*

9. What are my costs?

There are no direct costs. You will be responsible for travel to and from the research site and any other incidental expenses.

10. Will I be paid to participate in this study?

You will not be paid for taking part in this research study.

11. What if I want to withdraw, or am asked to withdraw from this study?

Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you do not take part in the study, there will be no penalty.

If you choose to take part, you have the right to stop at any time. However, we encourage you to talk to a member of the research group so that they know why you are leaving the study. If there are any new findings during the study that may affect whether you want to continue to take part, you will be told about them.

The researcher may decide to stop your participation without your permission, if he or she thinks that being in the study may cause you harm.

12. Who do I call if I have questions or problems?

You may ask any questions you have now. If you have questions later, you may call Lora Marquez at 915-525-7924, lcmarquez@miners.utep.edu, or Dr. James Wood at 915-244-7766, jawood@utep.edu

If you have questions or concerns about your participation as a research subject, please contact the UTEP Institutional Review Board (IRB) at (915-747-8841) or irb.orsp@utep.edu.

13. What about confidentiality?

Your part in this study is partly but not entirely confidential. None of the test scores saved in our files will identify you by name. Participants will be assigned a number that will be used for data analysis. This number will not be linked with your name or any other information that identifies you as an individual. The only written record of your participation will be the signed informed consent form, which will be kept in a locked file cabinet and separate from their recorded data. The file cabinet will also be locked in the lab. All electronic data will be stored upon a computer database, in which a password is required for

access. The informed consent form will not be linked with your data analysis number so it will not be possible to link participants with your responses. However, the video of your interview will be retained and may be shown at conferences, colloquia or classes at UTEP or elsewhere. Thus, even though your test results will be kept entirely confidential, the video of you playing the game will not be kept confidential and may be seen by people you know.

14. Mandatory reporting

If information is revealed about child abuse or neglect, or potentially dangerous future behavior to others, the law requires that this information be reported to the proper authorities.

15. Authorization Statement

I have read each page of this paper about the study (or it was read to me). I know that being in this study is voluntary and I choose to be in this study. I know I can stop being in this study without penalty. I will get a copy of this consent form now and can get information on results of the study later if I wish.

Participant Name: _____ Date: _____

Participant Signature: _____ Time: _____

Participant or Parent/Guardian Signature: _____

Consent form explained/witnessed by: _____

Signature

Printed name: _____

Date:

Time:

Appendix I: Prevaricator Task Protocol (Version A)

Researcher: Hello and welcome to the Child and Adult Suggestibility Lab. Our lab has been doing research. We have found a new way to tell if someone is lying. Now before we go on, I need both of you to read and sign this informed consent form.

[Give participants enough time to read and sign informed consent form]

Do you have any questions? Ok, great. Let's get started.

Many people believe that it's impossible to look someone in the eye and tell a lie. In fact, the exact opposite is true. You can definitely lie and look someone in the eye at the same time!

When we speak our eyes naturally shift up to the right or left as we are gathering our thoughts. Our eyes physically move up and grab a hold of that information.

But when a person tells a lie, their mind has already decided what that lie will be. So the eyes don't have to gather any information. It's very easy to look into someone's eyes and tell a flat out lie. Let me show you....

[Researcher looks into the eyes of a participant and with a serious face states, "I'm 80 years old!"]

See? It's easy to tell a lie without looking away.

I'd like to play a game with you about lying and truth telling. I'm going to look at your body language. For instance whether you're stiff or relaxed, or how your voice sounds.

For the rest of this experiment one of you will be considered "Participant 1" and the other will be considered "Participant 2." I'm going to flip a coin now to decide who will be 'Participant 1' and who will be 'Participant 2.'

[Gesture to one of the participants and ask them to call "heads" or "tails". No matter what the participant calls, you will look at the coin and tell the participant that he or she will be Participant 1 throughout the rest of the experiment, whereas the other participant will be Participant 2.]

Ok, so you will be Participant 1 (gestures at participant) and you'll be Participant 2 (gestures at other participant). Throughout the experiment today you will be following instructions for your respective parts. The instructions are contained in these folders

(Show the participants the ten envelopes).

You're Participant 1. I want you to go ahead and choose one of the envelopes. Inside the envelope you will find two booklets, one labeled 'Participant 1' and the other labeled 'Participant 2.' Go ahead and take the booklet that belongs to you. Inside you'll find four sets of instructions. I want you to go to the page labeled #1. Please read your instructions silently. Don't let me know what they say.

(Give the participants a moment to silently read their instructions)

One of you has been assigned to take on the role of the "truth teller" and the other has been assigned to take on the role of the "liar." The truth teller will always tell the truth no matter what is asked, and the liar will always lie no matter what is asked.

I'm going to turn my back to you now (Turn back to participants) and I would like each of you to take another look at your instructions. I would like the truth teller to hold up his or her right thumb to show that he or she is the one who will always tell the truth.

(With back still turned) Are you sure now? Do you know who is the truth teller and who is the liar? Remember, you don't want me to know who is the truth teller and who is the liar.

(Turn around to face the participants)

Participant 1, go ahead and take this coin.

(Hand Participant 1 a coin and then turn back to participants again)

I would like both of you to take a look at your instructions again. The instructions will tell one of you to hide the coin. Again, neither of you should let me know which of you has the coin.

Has the coin been hidden? (Once participants have confirmed that the coin has been hidden, turn around to face the participants)

I'm going to ask each of you the same question: "Do you have the coin?" The truth teller should answer the question honestly, and the liar should answer the question untruthfully.

After I have asked each of you if you have the coin, I am going to guess who has the coin.

I want you to think silently about how you're going to answer when I ask the question. If you need to refer to your booklets at this time, you may do so now.

(Give the participants a moment to think about how they are going to answer)

Are you ready? (Once the participants assure you that they are ready, begin questioning)

(Turn towards one of the participants) "Do you have the coin?"

(Allow participant to answer)

(Turn towards the other participant) “Do you have the coin?”

(Allow participant to answer)

[Hesitate, appear to be thinking very carefully]

Hmmm...Let me try this one more time.

(Turn toward the participant who was questioned first) “Do you have the coin?”

(Allow participant to answer)

(Turn to the other participant) “Do you have the coin?”

Hmm (pause) You have the coin, don’t you? [Correctly identify the participant with the coin]

Use this portion for Instructions #2, #3 & #4

Let’s try this again and see if you can beat me this next round. I’ll turn my back around and give you a moment to go over instructions #2 (#3) (#4).

Again, one of you has been assigned to take on the role of the “truth teller” and the other has been assigned to take on the role of the “liar.”

I’m going to turn my back to you now (Turn back to participants) and I would like each of you to take another look at your instructions. Again, I would like the truth teller to hold up his or her right thumb to show that he or she is the one who will always tell the truth.

Do you know who is the truth teller and who is the liar? (Wait for response)

Ok, now I would like you to look at your instructions again. The instructions will tell one of you to hide the coin. Do not let me know which of you has the coin.

Has the coin been hidden? Ok, let’s try this again. (Turns to face participants)

I’m going to ask each of you the same question as last time: “Do you have the coin?” Again, I want you to think silently about how you’re going to answer when I ask the question.

(Give the participants a moment to think about how they are going to answer)

Are you ready? (Once the participants assure you that they are ready, begin questioning)

(Turn towards one of the participants) “Do you have the coin?”

(Allow participant to answer)

(Turn towards the other participant) “Do you have the coin?”

(Allow participant to answer)

[Hesitate, appear to be thinking very carefully]

Hmmm...Let me try this one more time.

(Turn toward the participant who was questioned first) “Do you have the coin?”

(Allow participant to answer)

(Turn to the other participant) “Do you have the coin?”

Hmm (pause) You have the coin! That’s two for two [three for three] now.

--

[After the fourth round has been completed] Well you two are both pretty good liars but I think I might be a better lie detector. Thanks for playing with me but let’s go ahead and move on to the next part of the experiment.

Now that we have played this game four times, you are going to be administered several tests individually. Most are questionnaires. For one of the tests you will be asked to perform certain actions.

Participant 1, I want you to stay here and I’m going to walk Participant 2 to another room.

I’ll be back, but in the meantime I would like you to get started on these questionnaires.
[Hand Participant 1 Questionnaire packet]

Any questions? Ok, great. Let me walk Participant 2 to your room.

[Walk Participant 2 to separate research room]

Ok, so while Participant 1 is in the other room completing those questionnaires, we are going to get started on one of the tests. This test will ask you to perform certain actions like imagining a force of water pushing up against your hand.

Are you ready? Ok, let’s get started.

[Go straight into Creative Imaginative Scale tasks protocol and complete all ten tasks]

Ok, that was the last task for this test. Now that you are done, I would like to fill out these questionnaires. The first questionnaire will be asking you questions about the tasks we just completed.

After you have completed the questionnaires, please wait here quietly until I come back so that you and your partner can be debriefed and dismissed.

[Leave Participant 2 to complete remaining questionnaires and walk over to Participant 1's research room]

Hello, have you completed all the questionnaires yet? Great. We are now going to get started on the last test. This test will ask you to perform certain actions like imagining a force of water pushing up against your hand.

Are you ready? Ok, let's get started.

[Go straight into Creative Imaginative Scale test script and complete all ten tasks]

Ok, that was the last task for this test. Now that you are done, I would like to fill out this questionnaire about the tasks we just completed.

I am going to give you a couple of moments to complete this task and then Participant 2 is going to join us again for debriefing.

[Once both participants have completed all of the questionnaires, take Participant 2 into the same research room as Participant 1. Have both participants complete the debriefing questionnaire. Once that is complete, go over the debriefing statement.]

Appendix J: Prevaricator Task Protocol (Version B)

Researcher: Hello and welcome to the Child and Adult Suggestibility Lab. Our lab has been doing research. We have found a new way to tell if someone is lying. Now before we go on, I need both of you to read and sign this informed consent form.

[Give participants enough time to read and sign informed consent form]

Do you have any questions? Ok, great. Let's get started.

Many people believe that it's impossible to look someone in the eye and tell a lie. In fact, the exact opposite is true. You can definitely lie and look someone in the eye at the same time!

When we speak our eyes naturally shift up to the right or left as we are gathering our thoughts. Our eyes physically move up and grab a hold of that information.

But when a person tells a lie, their mind has already decided what that lie will be. So the eyes don't have to gather any information. It's very easy to look into someone's eyes and tell a flat out lie. Let me show you....

[Researcher looks into the eyes of a participant and with a serious face states, "I'm 80 years old!"]

See? It's easy to tell a lie without looking away.

I'd like to play a game with you about lying and truth telling. I'm going to look at your body language. For instance whether you're stiff or relaxed, or how your voice sounds.

For the rest of this experiment one of you will be considered "Participant 1" and the other will be considered "Participant 2." I'm going to flip a coin now to decide who will be 'Participant 1' and who will be 'Participant 2.'

[Gesture to one of the participants and ask them to call "heads" or "tails". No matter what the participant calls, you will look at the coin and tell the participant that he or she will be Participant 1 throughout the rest of the experiment, whereas the other participant will be Participant 2.]

Ok, so you will be Participant 1 (gestures at participant) and you'll be Participant 2 (gestures at other participant). Throughout the experiment today you will be following instructions for your respective parts. The instructions are contained in these folders

(Show the participants the ten envelopes).

You're Participant 1. I want you to go ahead and choose one of the envelopes. Inside the envelope you will find two booklets, one labeled 'Participant 1' and the other labeled 'Participant 2.' Go ahead and take the booklet that belongs to you. Inside you'll find four sets of instructions. I want you to go to the page labeled #1. Please read your instructions silently. Don't let me know what they say.

(Give the participants a moment to silently read their instructions)

One of you has been assigned to take on the role of the "truth teller" and the other has been assigned to take on the role of the "liar." The truth teller will always tell the truth no matter what is asked, and the liar will always lie no matter what is asked.

I'm going to turn my back to you now (Turn back to participants) and I would like each of you to take another look at your instructions. I would like the truth teller to hold up his or her right thumb to show that he or she is the one who will always tell the truth.

(With back still turned) Are you sure now? Do you know who is the truth teller and who is the liar? Remember, you don't want me to know who is the truth teller and who is the liar.

(Turn around to face the participants)

Participant 1, go ahead and take this coin.

(Hand Participant 1 a coin and then turn back to participants again)

I would like both of you to take a look at your instructions again. The instructions will tell one of you to hide the coin. Again, neither of you should let me know which of you has the coin.

Has the coin been hidden? (Once participants have confirmed that the coin has been hidden, turn around to face the participants)

In a moment, I'm going to ask each of you the same question: "Do you have the coin?" The truth teller should answer the question honestly, and the liar should answer the question untruthfully.

After I have asked each of you if you have the coin, I am going to guess who has the coin. At this point the truth teller no longer has to play the truth teller and the liar no longer has to play the liar. Just go ahead and reveal who has the coin.

I want you to think silently about how you're going to answer when I ask the question. *If you need to refer to your booklets at this time, you may do so now.*

(Give the participants a moment to think about how they are going to answer)

Are you ready? (Once the participants assure you that they are ready, begin questioning)

(Turn towards one of the participants) "Do you have the coin?"

(Allow participant to answer)

(Turn towards the other participant) “Do you have the coin?”

(Allow participant to answer)

[Hesitate, appear to be thinking very carefully]

Hmmm...Let me try this one more time.

(Turn toward the participant who was questioned first) “Do you have the coin?”

(Allow participant to answer)

(Turn to the other participant) “Do you have the coin?”

Hmm (pause) You have the coin, don’t you? [Correctly identify the participant with the coin]

Use this portion for Instructions#2, #3 & #4
--

Let’s try this again and see if you can beat me this next round. I’ll turn my back around and give you a moment to go over instructions #2 (#3) (#4).

Again, one of you has been assigned to take on the role of the “truth teller” and the other has been assigned to take on the role of the “liar.”

I’m going to turn my back to you now (Turn back to participants) and I would like each of you to take another look at your instructions. Again, I would like the truth teller to hold up his or her right thumb to show that he or she is the one who will always tell the truth.

Do you know who is the truth teller and who is the liar? (Wait for response)

Ok, now I would like you to look at your instructions again. The instructions will tell one of you to hide the coin. Do not let me know which of you has the coin.

Has the coin been hidden? Ok, let’s try this again. (Turns to face participants)

I’m going to ask each of you the same question as last time: "Do you have the coin?" Again, I want you to think silently about how you’re going to answer when I ask the question. *If you need to refer to your booklets at this time, you may do so now.*

(Give the participants a moment to think about how they are going to answer)

Are you ready? (Once the participants assure you that they are ready, begin questioning)

(Turn towards one of the participants) “Do you have the coin?”

(Allow participant to answer)

(Turn towards the other participant) “Do you have the coin?”

(Allow participant to answer)

[Hesitate, appear to be thinking very carefully]

Hmmm...Let me try this one more time.

(Turn toward the participant who was questioned first) “Do you have the coin?”

(Allow participant to answer)

(Turn to the other participant) “Do you have the coin?”

Hmm (pause) You have the coin! That’s two for two [three for three] now.

--

[After the fourth round has been completed] Well you two are both pretty good liars but I think I might be a better lie detector. Thanks for playing with me but let’s go ahead and move on to the next part of the experiment.

Now that we have played this game four times, you are going to be administered several tests individually. Most are questionnaires. For one of the tests you will be asked to perform certain actions.

Participant 1, I want you to stay here and I’m going to walk Participant 2 to another room.

I’ll be back, but in the meantime I would like you to get started on these questionnaires.

[Hand Participant 1 Questionnaire packet]

Any questions? Ok, great. Let me walk Participant 2 to your room.

[Walk Participant 2 to separate research room]

Ok, so while Participant 1 is in the other room completing those questionnaires, we are going to get started on one of the tests. This test will ask you to perform certain actions like imagining a force of water pushing up against your hand.

Are you ready? Ok, let’s get started.

[Go straight into Creative Imaginative Scale tasks protocol and complete all ten tasks]

Ok, that was the last task for this test. Now that you are done, I would like to fill out these questionnaires. The first questionnaire will be asking you questions about the tasks we just completed.

After you have completed the questionnaires, please wait here quietly until I come back so that you and your partner can be debriefed and dismissed.

[Leave Participant 2 to complete remaining questionnaires and walk over to Participant 1's research room]

Hello, have you completed all the questionnaires yet? Great. We are now going to get started on the last test. This test will ask you to perform certain actions like imagining a force of water pushing up against your hand.

Are you ready? Ok, let's get started.

[Go straight into Creative Imaginative Scale test script and complete all ten tasks]

Ok, that was the last task for this test. Now that you are done, I would like to fill out this questionnaire about the tasks we just completed.

I am going to give you a couple of moments to complete this task and then Participant 2 is going to join us again for debriefing.

[Once both participants have completed all of the questionnaires, take Participant 2 into the same research room as Participant 1. Have both participants complete the debriefing questionnaire. Once that is complete, go over the debriefing statement.]

Appendix K: Four Possible Roles

	Participant 1	Participant 2
Sequence 1	Liar – Takes coin	Truth teller – No coin
Sequence 2	Liar – No coin	Truth teller – Takes
Sequence 3	Truth teller – Takes	Liar – No coin
Sequence 4	Truth teller– No	Liar – Takes coin

Appendix L: Creative Imagination Scale Tasks Protocol

10. Arm Heaviness

By letting your thoughts go along with these instructions you can make your hand and arm feel heavy. Please close your eyes and place your left arm straight out in front of you at shoulder height with the palm facing up.”

(Begin timing) “Now imagine that a very heavy dictionary is being placed on the palm of your left hand. Let yourself feel the heaviness. Your thoughts make it feel as if there is a very heavy dictionary on your hand. You create the feeling of heaviness in your hand by thinking of a large heavy dictionary. Now think of a second large heavy dictionary being placed on top of the first heavy dictionary. Feel how heavy your arm begins to feel as you push up on the dictionaries. Push up on the heavy dictionaries as you imagine the weight; notice how your arm feels heavier and heavier. As you push up on them. Now tell yourself that third big heavy dictionary is being piled on top of the other two heavy dictionaries in your hand and your arm is very, very heavy. Let yourself feel as if there are three heavy dictionaries on the palm of your hand and your arm is getting heavier and heavier and heavier. Feel your arm getting heavier and heavier and heavier, very, very, very heavy, getting heavier and heavier...very heavy.”

(Approximately 1’20” since the beginning of timing)

“Now tell yourself that your hand and arm feel perfectly normal again and just let your hand and arm come back down and relax.”

2. Hand Levitation

“By directing your thoughts you can make your hand feel as if it is rising easily, without effort. Keep your eyes closed and place your right arm straight out in front of you at shoulder height with the palm facing down.”

(Begin timing) “Now picture a garden hose with a strong stream of water pushing against the palm of your right hand, pushing up against the palm of your hand. Think of a strong stream of water pushing your hand up. Let yourself feel the strong stream of water pushing up against the palm of your hand, pushing it up. Feel the force of the water, pushing your hand up. Feel it pushing against the palm of your hand. Tell yourself that the force of the water is very strong, and, as you think about it, let your hand being to rise. Feel your hand rising as you imagine a strong stream of water pushing it up, and up, and up, higher and higher. Tell yourself that a strong stream of water is pushing your hand up and up, raising your arm and hand higher as the strong stream of water is pushing your hand up and up, raising your arm and hand higher as the strong stream of water just pushes it up, just rises and pushes and just pushes it up, higher and higher.” (End of timing: about 1’10”)

“Now tell yourself it’s all in your own mind and just let your hand and arm come back down and relax.”

3. Finger Anesthesia

“By focusing your thinking you can make your fingers feel numb. Please place your left hand in your lap with the palm facing up. Keep your eyes closed so you can focus fully on the sensations in the fingers of your left hand.”

(Begin timing) “Now, try to imagine and feel as if a local anesthetic has just been injected in to the side of your left hand next to the little finger so that your little finger will begin to feel like it does when it ‘falls asleep.’ Focus on the little finger. Become aware of every sensation and the slight little changes as you think of the anesthetic slowly beginning to move into your little finger, just slowly moving in. Notice the slight changes as the little finger begins to get just a little numb and a little dull. The little finger is becoming numb as you think of the anesthetic moving in slowly.”

“Now think of the anesthetic moving into the second finger next to the little finger. Tell yourself that the second finger is getting duller and duller, more and more numb as you think of how the anesthetic is beginning to take effect.”

“Tell yourself that these two fingers are beginning to feel kind of rubbery and losing feelings and sensations. As you think of the anesthetic moving in faster, the fingers feel duller and duller...more and more numb...dull, numb and insensitive. As you think of the anesthetic taking effect, the two fingers feel duller and duller...more and more numb...dull...numb...insensitive.”

“Keep thinking that the two fingers are dull, numb, and insensitive as you touch the two fingers with your thumb. As you touch the two fingers with your thumb notice how they feel duller and duller, more and more numb, more and more insensitive.”

“Keep thinking that the two fingers are dull, numb, and insensitive as you touch the two fingers with your thumb. As you touch the two fingers with your thumb notice how they feel duller and duller, more and more numb, more and more insensitive...dull, numb, rubbery and insensitive.”
(End of timing: about 1’50”)

“Now tell yourself its all in your own mind and you’re going to bring the feeling back; bring the feeling back into the two fingers.”

4. Water Hallucination

“Keep your eyes closed. By using your imagination constructively you can experience the feeling of drinking cool, refreshing water.”

(Begin timing) “First imagine you’ve been out in the hot sun for hours and you’re very, very thirsty and your lips are dry and you’re so thirsty. Now, picture yourself on a mountain where the snow is melting, forming a stream of cool, clear water. Imagine yourself dipping a cup into this

mountain stream so you can have a cool, refreshing drink of water. As you think of sipping the water tell yourself it's absolutely delicious as you feel it going down your throat...cold and beautiful and delicious. Feel the coolness and the beauty of the water as you take a sip. Now, think of taking another sip of water and feel it going over your lips and tongue, going down your throat, down into your stomach. Feel how cool, refreshing, delicious and beautiful it is as you take another sip...so cool...cold...sweet...beautiful...delicious and refreshing. Think of taking another sip now and feel the cool water going into your mouth, around your tongue, down your throat and down into your stomach...so beautiful and cool and wonderful...absolutely delicious...absolute pleasure." (End of timing: about 1'30")

5. Olfactory-Gustatory "Hallucination"

"Keep your eyes closed. By using your imagination creatively you can experience the smell and taste of an orange."

(Begin timing) "Picture yourself picking up an orange and imagine that you're peeling it. As you create the image of the orange, feel yourself peeling it and let yourself see and feel the orange skin on the outside and the soft white pulp on this inside of the skin. As you continue peeling the orange, notice how beautiful and luscious it is and let yourself smell it and touch it and feel the juiciness of it. Now think of pulling out one or two of the orange sections with your fingers. Pull out part of the orange and bite into it. Experience how juicy, luscious and flavorful it is as you imagine taking a deep, deep bite. Let yourself smell and taste the orange and notice that it's absolutely delicious. Let yourself feel how delicious, beautiful, and luscious it is. Just the most beautiful, juicy orange...absolutely juicy and wonderful. Let yourself taste and smell the juicy orange clearly now as you think of taking another large bite of the delicious, juicy orange." (End of timing: about 1'30")

6. Music "Hallucination"

"Keep your eyes closed"

(Begin timing) "Now, think back to a time when you heard some wonderful, vibrant music; it could have been anywhere, and by thinking back you can hear it even more exquisitely in your own mind. You make it yourself and you can experience it as intensely as real music. The music can be absolutely powerful...strong...exquisite...vibrating through every pore of your body...going deep into every pore...penetrating through every fiber of your being. The most beautiful, complete, exquisite, overwhelming music you ever heard. Listen to it now as you create it in your own mind." (End of timing: about 45")

(15-second pause) "You may stop thinking of the music now."

7. Temperature "Hallucination"

"Keep your eyes closed and place your hands in your lap with the palms facing down and resting comfortably on your lap. By focusing your thinking you can make your right hand feel hot."

(Begin timing) “Picture the sun shining on your right hand and let yourself feel the heat. As you think of the sun shining brightly, let yourself feel the heat increasing. Feel the sun getting hotter and feel the heat penetrating your skin and going deep into your hand. Think of it getting really hot now...getting very hot. Feel the heat increasing. Think of the sun getting very, very hot as it penetrates into your hand...getting very hot. Tell yourself, ‘The rays are increasing...the heat is increasing...getting hotter and hotter.’ Feel the heat penetrating through your skin. Feel the heat going deeper into your skin as you think of the rays of the sun increasing and becoming more and more concentrated...getting hotter and hotter. Feel your hand getting hot from the heat of the sun. It’s a good feeling of heat as it penetrates deep into your hand...hot, pleasantly hot, penetrating your hand now. It’s a pleasantly hot feeling, pleasantly hot.” (End of timing: about 1’15”)

“Now tell yourself it’s all in your own mind and make your hand feel perfectly normal again.”

8. Time Distortion

“Keep your eyes closed. By controlling your thinking you can make time seem to slow down.”

(The following is to be read progressively more slowly, with each word drawn out with a long 2-6 second pause between statements.)

(Begin timing) “Tell yourself that there’s lots of time, lots of time between each second. Time is stretching out and there’s lots of time...more and more time between each second. Every second is stretching out. There’s lots of time between each second...lots of time. You do it yourself, you slow time down.” (End of timing: about 1’40”)

(The following is to be read at a normal rate) “And now tell yourself that time is speeding back up to its normal rate again as you bring time back to normal.”

9. Age Regression

“Keep your eyes closed. By directing your thinking you can bring back the feeling that you experienced when you were in primary school-in first, second, third, or fourth year.”

(Begin timing) “Think of time going back, going back to primary school and feel yourself becoming smaller and smaller. Let yourself feel your hands, small and tiny, and your legs and your body, small and tiny. As you go back in time feel yourself sitting in a big desk. Notice the floor beneath you. Feel the top of the desk. You may feel some marks on the desktop, or maybe its smooth, cool surface. There may be a pencil slot and perhaps a large yellow pencil. Feel the under side of the desk and you may feel some chewing gum. Observe the other children around you, and the teacher, the blackboard, the notice board, where the cloakroom is, and the windows. Smell the chalk dust or the paste. You may hear the children and the teacher speaking. Now just observe and see what happens around you.” (End of timing: about 1’20”)

(15-second pause) “Now tell yourself it’s all in your own mind and bring yourself back to the present.”

10. Mind-Body Relaxation

“Keep your eyes closed. By letting your thoughts go along with these instructions you can make your mind and body feel very relaxed.”

(The following is to be read slowly) (Begin timing) “Picture yourself on a beautiful warm summer day lying under the sun on a beach of an ocean or lake. Feel yourself lying on the soft, soft sand or on a beach towel that is soft and comfortable. Let yourself feel the sun pleasantly warm and feel the gentle breeze touching your neck and face. Picture the beautiful clear blue sky with fluffy little white clouds drifting lazily by. Let yourself feel the soothing, penetrating warmth of the sun and tell yourself that your mind and body feel completely relaxed and perfectly at ease...peaceful, relaxed, comfortable, calm, so at ease, at peace with the universe...completely relaxed...relaxed, peaceful, lazy, tranquil...calm...comfortable. Your mind and body are completely relaxed...completely relaxed...calm, peaceful, tranquil, flowing with the universe.” (End of timing: about 2’05”)

“Now you can open your eyes, let yourself continue to feel relaxed and yet perfectly alert...peaceful, alert, normal again. Open your eyes.”

Appendix M: Debriefing Questionnaire

Debriefing Questionnaire

What do you think was the purpose of the present study?_____

Was there anything about the study you didn't understand? *Yes No*

If yes, please explain:

Was there anything about the study that made you feel uncomfortable? *Yes No*

If yes, please explain:

Was there anything that made you question the purpose of the study? *Yes No*

If yes, please explain:

Was there anything about the study that made you feel suspicious? *Yes No*

If yes, please explain:

Many psychology studies sometimes are “more than meets the eye” when it comes to what they are after, was there anything unusual about this study that made you feel that way? *Yes No*

If yes, please explain:

Appendix N: Debriefing Statement

Deception Detection in Dyads Study

Debriefing Statement

The study you have just completed was designed to investigate how people behave when they are interviewed together and one of them is lying. In this study, either you or your partner was asked to lie. We wanted to see whether the lying partner behaved differently than the partner who was telling the truth. We hypothesized that when one partner lied, the non-lying partner would watch the lying partner closely, to see whether the liar was “giving himself (or herself) away”.

Thank you for your participation. Please do not discuss the contents of the study with other students. Our experiment will not work if other students know beforehand what we are looking for, or how we how we try to tell the liar from the truth-teller. If you have any questions about the study please feel free to contact Lorae Marquez or Dr. James Wood at 915-747-6570.

Appendix O: 24 Unique Sets of Instructions

Set	Variations
1	1234
2	1243
3	1324
4	1342
5	1423
6	1432
7	2134
8	2143
9	2314
10	2341
11	2413
12	2431
13	3124
14	3142
15	3214
16	3241
17	3412
18	3421
19	4123
20	4132
21	4213
22	4231
23	4312
24	4321

Note: Variations-(1) Truth Teller with coin; (2) Truth Teller, no coin; (3) Liar with coin; (4) Liar, no coin

Appendix P: Follow-Up Study Protocol

Researcher: Hello and welcome to the Child and Adult Suggestibility Lab. Our lab has been doing research. We have found a new way to tell if someone is lying. Now before we go on, I need both of you to read and sign this informed consent form.

[Give participants enough time to read and sign informed consent form]

Do you have any questions? Ok, great. Let's get started.

As part of the experiment, the two of you will actually be working together to complete a task. To help you feel more comfortable working together as a team, I want you to play a game.

You will be playing four well-known songs by the Beatles in the video game Rock Band. Your score will be determined by how well you play together. So the better you play together, the higher your score will be. Please follow me to the research room down the hall and I will give you further instructions.

[Walk participants to research room where Rock Band is set up]

At this time, go ahead and choose the instrument you would like to play. You can choose to play lead guitar, bass, drums or vocals.

[Allow participants a moment to choose their instruments and to get situated]

In case you are unfamiliar with this game, I will briefly go over the instructions. There are four difficulty levels you can choose from: easy, medium, hard, and expert. You will notice that the buttons on the guitar and bass are color-coded and so is the drum set. When the song starts, different colored "notes" will come down the screen and will be in time with the song.

Once the note reaches the "strike zone", a bright line at the bottom of the screen, you will press the corresponding button on your instrument. If you are playing the guitar or bass, you will press the corresponding button and strum the strum bar on your instrument. If you are playing the drums, you will strike the corresponding colored pad. You will continue doing this until the song finishes. Once you complete a song, your score will be displayed.

Do you have any questions about how to play the game? Ok, the first song you will be playing is "Twist and Shout". The next three songs I would like you to play are listed here. Once you have completed all four songs, I will come back and give you instructions for the next part of the experiment.

[Experimenter steps out of room]

[Once fourth song has been completed, step back in the room] You guys sounded great! So now that you know what it's like to work with each other as a team, let's go ahead and move on to the next part of the experiment. Please set your instruments aside and follow me to the other research room.

[Walk participants over to research room where coin task is set up]

Many people believe that it's impossible to look someone in the eye and tell a lie. In fact, the exact opposite is true. You can definitely lie and look someone in the eye at the same time!

When we speak our eyes naturally shift up to the right or left as we are gathering our thoughts. Our eyes physically move up and grab a hold of that information.

But when a person tells a lie, their mind has already decided what that lie will be. So the eyes don't have to gather any information. It's very easy to look into someone's eyes and tell a flat out lie. Let me show you....

[Researcher looks into the eyes of a participant and with a serious face states, "I'm 80 years old!"]

See? It's easy to tell a lie without looking away.

I'd like to play a game with you about lying and truth telling. I'm going to look at your body language. For instance whether you're stiff or relaxed, or how your voice sounds.

For the rest of this experiment one of you will be considered "Participant 1" and the other will be considered "Participant 2." I'm going to flip a coin now to decide who will be 'Participant 1' and who will be 'Participant 2.'

[Gesture to one of the participants and ask them to call "heads" or "tails" for the part of Participant 1]

Ok, so you will be Participant 1 (gestures at participant) and you'll be Participant 2 (gestures at other participant). Throughout the experiment today you will be following instructions for your respective parts.

What I would like to do next is go over the instructions of the game we will be playing. [Hand each participant a practice- round instructions sheet that corresponds to their part]

Please take a moment to read over your instructions silently.

[Give participants a moment to read over their instructions]

Participant 1, you will notice that you have been assigned to play the part of the truth teller. Participant 2, you have been assigned to play the part of the liar.

One of you has also been assigned to take and hide a coin while the other has been instructed to let their partner take and hide a coin.

Who has been assigned to take and hide the coin? [Participant 1 should raise hand and/or say “Me”]

Ok, great. So go ahead and hide the coin somewhere on your person, for example, in a pocket or in your hand.

I’m going to ask each of you the same question: “Do you have the coin?” The truth teller should answer the question honestly, and the liar should answer the question untruthfully.

To help you prepare what your response will be, I have provided you with a practice sheet on the back of your instructions. Go ahead and take a moment to fill it out.

[Give participants a moment to fill out practice sheet for practice round]

Are you ready?

Participant 1, you are playing the role of the truth teller and you have the coin. When I ask the question, “Do you have the coin?” what will your response be? [Response should be “yes”]

Great. Participant 2, you are playing the role of the liar and you do not have the coin. When I ask the question, “Do you have the coin?” what will your response be? [Response should be “yes”]

Even though you are playing different roles, you will notice that both of you will have the same response to the question, “Do you have the coin?”

After I ask each of you if you have the coin, I am going to guess who has the coin. At this point, the truth teller no longer has to play the truth teller and the liar no longer has to play the liar. Just go ahead and reveal who has the coin.

For example, Participant 1, if I were to guess that you had the coin what would your response be? [Participant 1’s response should be “yes”.]

Ok, great. Participant 2, if I were to guess that you had the coin, what would your response be? [Participant 1’s response should be “no”.]

Ok, great. Do you have any questions? Let’s go ahead and move on to the actual game.

(Show the participants the ten envelopes).

As I mentioned earlier, each of you will be following instructions for your respective parts. These instructions are contained in these envelopes.

(Show the participants the ten envelopes).

Participant 1, I want you to go ahead and choose one of the envelopes. Inside the envelope you will find two booklets, one labeled 'Participant 1' and the other labeled 'Participant 2.' Go ahead and take the booklet that belongs to you. Inside you'll find four sets of instructions. I want you to go to the page labeled #1. Please read your instructions silently. Don't let me know what they say. I don't know what parts you will be playing.

[Allow participants a moment to read over instructions]

One of you has been assigned to take on the role of the "truth teller" and the other has been assigned to take on the role of the "liar."

As well, one of you has been assigned to hide the coin and the other has been assigned to let their partner hide the coin.

I am going to step out of the room for a minute. I would like you to go over your instructions on the page labeled #1 together and practice how you will answer when I ask the question "Do you have the coin?" To help you formulate your response, you may use the practice sheets contained in these folders [hand each participant folder containing a practice sheet].

[Experimenter steps out of room and one minute later knocks on door]

Are you ready? Was that enough time to go over your instructions?

Ok, let's get started.

Now I'm going to ask each of you the same question: "Do you have the coin?" The truth teller should answer the question honestly, and the liar should answer the question untruthfully.

Are you ready? (Once the participants assure you that they are ready, begin questioning)

(Turn towards one of the participants) "Do you have the coin?"

(Allow participant to answer)

(Turn towards the other participant) "Do you have the coin?"

(Allow participant to answer)

[Hesitate, appear to be thinking very carefully]

Hmmm...Let me try this one more time.

(Turn toward the participant who was questioned first) "Do you have the coin?"

(Allow participant to answer)

(Turn to the other participant) “Do you have the coin?”

Hmm (pause) You have the coin, don’t you? [Correctly identify the participant with the coin]

Use this portion for Instructions#2, #3 & #4
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Let’s try this again and see if you can beat me this next round. Please open your booklets to the page labeled #2 (#3)(#4) and take a moment to read over your instructions silently.

[Allow participants a moment to read over instructions]

Again, one of you has been assigned to play the truth teller and the other has been assigned to play the liar. As well, one of you has been assigned to hide the coin and the other has been assigned to let your partner hide the coin.

I am going to step out of the room for a minute. I would like you to practice how you will answer when I ask the question “Do you have the coin?” To help you formulate your response, you may use the practice sheet.

[Return to room after one minute and resume game]

I’m going to ask each of you the same question as last time: "Do you have the coin?"

(Give the participants a moment to think about how they are going to answer)

Are you ready? (Once the participants assure you that they are ready, begin questioning)

(Turn towards one of the participants) “Do you have the coin?”

(Allow participant to answer)

(Turn towards the other participant) “Do you have the coin?”

(Allow participant to answer)

[Hesitate, appear to be thinking very carefully]

Hmmm...Let me try this one more time.

(Turn toward the participant who was questioned first) “Do you have the coin?”

(Allow participant to answer)

(Turn to the other participant) “Do you have the coin?”

Hmm (pause) You have the coin! That's two for two [three for three] now.

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[After the fourth round has been completed] Well you two are both pretty good liars but I think I might be a better lie detector. Thanks for playing with me but let's go ahead and move on to the next part of the experiment.

Now that we have played this game four times, you are going to be administered several tests individually. Most are questionnaires. For one of the tests you will be asked to perform certain actions.

Participant 1, I want you to stay here and I'm going to walk Participant 2 to another room.

I'll be back, but in the meantime I would like you to get started on these questionnaires.
[Hand Participant 1 Questionnaire packet]

Any questions? Ok, great. Let me walk Participant 2 to your room.

[Walk Participant 2 to separate research room]

Ok, so while Participant 1 is in the other room completing those questionnaires, we are going to get started on one of the tests. This test will ask you to perform certain actions like imagining a force of water pushing up against your hand.

Are you ready? Ok, let's get started.

[Go straight into Creative Imaginative Scale tasks protocol and complete all ten tasks]

Ok, that was the last task for this test. Now that you are done, I would like to fill out these questionnaires. The first questionnaire will be asking you questions about the tasks we just completed.

After you have completed the questionnaires, please wait here quietly until I come back so that you and your partner can be debriefed and dismissed.

[Leave Participant 2 to complete remaining questionnaires and walk over to Participant 1's research room]

Hello, have you completed all the questionnaires yet? Great. We are now going to get started on the last test. This test will ask you to perform certain actions like imagining a force of water pushing up against your hand.

Are you ready? Ok, let's get started.

[Go straight into Creative Imaginative Scale test script and complete all ten tasks]

Ok, that was the last task for this test. Now that you are done, I would like to fill out this questionnaire about the tasks we just completed.

I am going to give you a couple of moments to complete this task and then Participant 2 is going to join us again for debriefing.

[Once both participants have completed all of the questionnaires, take Participant 2 into the same research room as Participant 1. Have both participants complete the debriefing questionnaire. Once that is complete, go over the debriefing statement.]

Curriculum Vita

Lorae Marquez was born in El Paso, Texas in 1989. The oldest child of Steve and Rosa Marques, she graduated from Hanks High School in 2007. She entered St. Mary's University and graduated in 2011 with a Bachelor of Arts in Psychology. She enrolled in a Clinical Psychology graduate program at the University of Texas at El Paso. She completed her clinical internship at Family Services of El Paso, providing individual therapy to children, adolescents and adults. She is currently working as an Intake Coordinator for the Admissions and Referrals Department at Peak Behavioral Health Services.

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