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## What makes a good liar? The relationship between cognitive and personality assessments' and lying ability using traditional and strategic interview approaches

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**What makes a good liar? The relationship between cognitive and personality assessments'  
and lying ability using traditional and strategic interview approaches**

by

**Dominick Joseph Atkinson**

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

DOCTOR OF PHILOSOPHY

Major: Psychology

Program of Study Committee:  
Christian A. Meissner, Major Professor  
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Stephen Gilbert

The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this dissertation. The Graduate College will ensure this dissertation is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University

Ames, Iowa

2019

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## DEDICATION

I would like to dedicate this dissertation to my father Scott. Thank you for all that you have done and all that you continue to do.

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## ABSTRACT

Over the past several decades, scholars have sought to better understand and refine the process of detecting deception (see Vrij, 2015). However, considerably less research has focused on identifying the characteristics and abilities of effective liars. The purpose of the present project was to begin to examine individual differences in lying ability and identify skills and traits of more successful liars. Participants in this study lied or told the truth under various conditions and then naïve observers judged the veracity of those statements. Overall, participants did not demonstrate good calibration between confidence in their ability and performance on the task. Additionally, some individual difference measures (e.g., working memory capacity, task switching ability, and Machiavellianism) were found to be related to the ability to lie well while others (e.g., inhibitory control, narcissism, and psychopathy) were not. Additionally, good liars were not affected by new strategic interview approaches (e.g., reverse order recall) as performance during control phases of interviews was related to performance during strategic phases. The relationships between confidence, ability, personality traits, cognitive abilities, and strategic interviewing approaches was examined.

*Keywords:* interview, lying, deception, individual differences

## CHAPTER 1. INTRODUCTION

The use of undercover police officers and federal agents is a common tactic used to collect evidence and build cases against suspected criminals, especially when other evidence (e.g., fingerprints, DNA, eyewitnesses) is lacking. The challenge of undertaking such assignments can be significant, as officers frequently must adopt a new life, complete with a novel history of who they are and what they have done. Further, these assignments can vary greatly in the length of time that the officer must stay in role. While some operations may only last a few hours, others may require the officer to remain undercover for months or years. Take, for example, F.B.I. special agents Joaquin Garcia and Joseph Pistone who both spent several years undercover infiltrating the mafia. These special agents likely had to fabricate information and conceal their identities on a daily basis, and they had to do it with the knowledge that if their true identities were uncovered they would likely be killed. Clearly, those agents and others like them who participate in these types of operations are very skilled at creating and maintaining a cover identity; however, very little research is available to understand this deception “skill.” More broadly, a question that has received less empirical research is, “what makes someone a good liar?” Might certain basic cognitive or social psychological skills or traits make one better or worse at deception? Do individuals generally know if they are good at lying or not? How will more vs. less skilled liars fare against newer interview techniques that have been developed? The current project seeks to answer these questions in a series of lab-based experiments.

### **Detecting Deception**

Over the past several decades, research on the ability to detect deception in others has been abundant (see Vrij, 2015). Scholars have sought to identify the behavioral, verbal, and para-verbal indicators (or cues) associated with deception. These cues to deception have been

examined in dozens, maybe even hundreds of studies and several meta analyses. The collective findings of these studies can be largely summarized in two major points. First, people are not very accurate when attempting to detect deception (Bond & DePaulo, 2008). More specifically, across 247 samples, researchers found that human lie detection accuracy was only slightly greater than chance performance (54%). Second, verbal indicators of deception appear to be more reliable than para-verbal or behavioral cues (DePaulo, Lindsay, Malone, Muhlenbruck, Charlton, & Cooper, 2003). Verbal cues of deception, such as the amount of detail about an event or how plausible the story is, lead to higher accuracy in truth or deception judgments than any behavioral (e.g., eye gaze, fidgeting, smiling) or para-verbal (e.g., tone, speech rate) cues. However, there are new challenges to such findings (see Levine, 2018) that suggest that while verbal cues are the most reliable of the available cues, even they may only be useful under certain conditions (e.g., cognitive load or the Cognitive Interview). In light of this research, scholars have sought to identify and test interview techniques that might amplify the availability of verbal cues to deception in order to aid law enforcement professionals and other entities in the detection of deception. Many such techniques have been developed and explored, including the induction of cognitive load, asking unexpected questions, and use of the Cognitive Interview (see Granhag, Vrij, & Verschuere, 2015). Before discussing further research on lying, I offer a definition of what a lie is as well as what makes a person good at it is required.

### **What Does it Mean To Be a Good Liar?**

Lying can be defined as “a deliberate attempt to convince someone of something the liar believes is untrue,” (Vrij, 2015, pg. xv). Thus, a person could conceivably lie about anything such as cheating on a test, the color of a car, or their plans for the evening as long as the statement is untrue and their goal is to deceive the recipient of the lie. The list of things that

could be lied about is extensive, but for the purpose of this project, lies will be about autobiographical events and opinions (more on those below). In current context, liars were tasked with convincing an interviewer that their statements about their autobiographical events and personal opinions were true.

In addition to defining what a lie is, the definition of what a good liar is must also be defined. In the deception detection literature (e.g., Meissner & Kassin, 2002), lying has been analyzed in terms of observers' or interviewers' ability to discriminate truths from lies in a sender. In other words, these studies examine how often lies and truths are correctly categorized as such. This allows for the investigation of questioning techniques or conditions that might improve (or hinder) performance. One recent way in which this has been done is through the use of Signal Detection Theory (Green & Swets, 1966). Signal detection theory allows for the creation of statistics related to discrimination ( $d'$ ) and response bias ( $c$ ). In the current context, discrimination refers to the extent to which truths are correctly identified as truths and lies are correctly identified as lies. Response bias is the extent to which people are generally seen as truthful or deceptive. This is done by calculating the percentage of correct identifications on target present trials ("hits") and the percentage of false identifications on target absent trials ("false alarms"). For example, the hit rate would be the percentage of trials in which a lie was correctly classified as a lie and the false alarm rate is the percentage of trials in which a truth was incorrectly classified as a lie. Those percentages are then used to create measures of discrimination:

$$d' = Z_{\text{Hits}} - Z_{\text{FalseAlarms}},$$

and response bias:

$$c = 0.5(Z_{\text{FalseAlarms}} + Z_{\text{Hits}}).$$

A positive  $d'$  would indicate good discrimination and a negative  $d'$  would indicate poor discrimination. However, such an approach fails to capture key performance differences between better vs. worse liars. It is true that bad liars may have a high  $d'$  and be easily discriminated; however, a low  $d'$  may not be indicative of lie performance. For example, a good liar should have hit and false alarm rates of 0 (i.e., their truths and lies are always judged as truths). That would give them a  $d'$  estimate of approximately 0 (0 hits – 0 false alarms = 0). However, someone who had hit and false alarm rates of 1 (i.e., always seen as lying) would also have a  $d'$  score of 0. Thus, while the  $d'$  score is the same between the two people, it is for very different reasons. Therefore, a more appropriate measure when assessing the performance of liars may be response bias ( $c$ ). A positive response bias indicates that they are seen as truthful and a negative response bias indicates that they are seen as deceptive. Good liars want to be seen as truthful in all situations and thus should be more likely to demonstrate a positive response bias. Poor liars should be seen as truthful less often (either in truthful or deceptive situations) and thus have a lower response bias. Therefore, throughout the remainder of the introduction, when referring to overall lie ability, the author is referring to the overall percentage of time that a person is seen as truthful in both truthful and deceptive situations.

### **Overview of the Current Project**

While research into detection ability has been abundant, considerably less attention has been given to differences in or indicators of senders' ability to deceive – that is, what makes a good liar. In fact, there has been a call from some in the deception detection field to investigate such differences in sender (i.e., liar) ability. In their meta-analysis of deception judgments, Bond and DePaulo (2008) examined the variability in sender (i.e., liar) credibility and detectability by examining the standard deviations (where available) surrounding liar detectability. Overall, they

found greater range and variation in detectability than was expected by chance. This led Bond and DePaulo to conclude that there is substantially greater variation in lying ability than in detector ability, and that accurate deception judgments may depend more on the ability of the sender of the lie than the receiver.

There have also been significant advances in our theoretical understanding of the basic mechanisms that underlie lying and deception detection (e.g., Walczyk, Harris, Duck, & Mulay, 2014). The field has shifted from examining the emotions that a liar experiences (e.g., Ekman, 1989) or how they control their behavior (e.g., Zuckerman, DePaulo, & Rosenthal, 1981) to a focus on the cognitive processes involved in creating and telling a lie (see Vrij, 2015; Walczyk et al. 2014). This shift has led to the development of some lie detection techniques such as the induction of cognitive load or the use of unexpected questions. However, some in the field caution that we need to better understand why these specific techniques work (e.g., Blandon-Gitlin, Fenn, Masip, & Yoo, 2014; Bond, 2012). They suggest that the role of basic cognitive functions such as working memory capacity, inhibitory control, or processing speed in creating and presenting lies needs to be better understood. Furthermore, those findings carry potential implications with respect to how individuals with more or less of these cognitive abilities fare when being judged for deception, and exemplify the need for further research into the role of individual differences in lying and with especially the basic mechanisms that may be related to lying ability.

The current dissertation begins to address these issues by exploring several research questions. First, can individuals objectively predict how effective they are at deceiving others? The literature on lying behaviors and habits will be reviewed. Most of these studies have relied upon self-report data such as surveys or diary studies to examine the types of lies that people

generally tell and how often they tell them. However, none have systematically examined calibration between self-reported lying ability and success at lying in a given situation. The current studies will examine how well self-reported assessments of lying ability align with other measures of lie performance (e.g., third party observers).

Second, can we identify individual differences that clearly relate to lying ability?

Research on lying has led to three primary, though not mutually exclusive, perspectives of lying that focus on *affective* (Ekman, 1989), *impression management* (Zuckerman et al. 1981), and *cognitive* (Walczyk et al. 2014) processes. These perspectives are outlined in greater detail below and related individual difference measures have been identified based upon each theoretical approach. Research on personality traits and lying has also largely relied upon self-report data, though several studies will be discussed that have assessed participants' proclivity to lie in mock online dating or job interview scenarios. Conversely, research on cognitive abilities and lying has predominantly relied upon mock crime scenarios and/or lying about autobiographical events. Studies on neuroimaging and lying will also be discussed as they relate to how lying activates certain brain regions believed to be associated with particular cognitive abilities.

Finally, how might more vs. less skilled liars fare against evidence-based interview techniques that are designed to make lying more difficult (and therein expose liars)? Studies assessing these novel interview techniques (e.g., cognitive load, controlled cognitive engagement, devil's advocate approach) will be discussed, and predictions will be offered with respect to how more skilled liars might fare against such approaches.

### **Self-Reported Lying**

Research on how and when people lie has historically relied upon self-report data (e.g., Serota, Levine, & Boster, 2010), finding that most people tell between one to two lies per day

(Serota & Levine, 2015; DePaulo, Kashy, Kirkendol, Wyen, & Epstein, 1996; Serota et al., 2010) and that such lies can typically be considered “white lies” rather than more substantial attempts at deception (Serota & Levine, 2015). However, there is evidence to suggest that the data may be skewed, with many participants reporting lying very infrequently or not at all, and others reporting a significant number of lies (identified as prolific liars by Serota and Levine, 2015). For example, Serota et al. (2010) found that half of all lies reported were told by 5.3% of the sample, and that nearly one-quarter (22.7%) of the lies were told by less than 1% of the sample, with some individuals reporting more than fifty lies in a twenty-four-hour period.

Additional research has found that the nature of the lie a person generates depends upon whom the intended audience of the lie is (DePaulo & Kashy, 1998). For example, lies told to an unfamiliar other tend to be more self-serving (e.g., avoiding embarrassment or maintaining privacy) whereas lies told to close friends and family members tend to be more altruistic (e.g., not wanting to hurt the individual’s feelings or to protect them from harm).

Despite the prevalence of research on self-reported lying behavior, few studies have sought to understand how successful people are at lying. One of the few studies to assess this, via self-report, found that individuals reported being generally successful at lying – with subjective detection rates of 15% to 25% (see DePaulo et al., 1996). Such findings suggest that people generally believe themselves to be effective liars that avoid detection most of the time. Of course, we have good reason to be skeptical of such self-reports – research across multiple domains of psychology consistently demonstrate that people are generally overconfident in their own abilities (e.g., Dunning, Heath, & Suls, 2004; Ehrlinger, Mitchum, & Dweck, 2016; Zell & Krizan, 2014). In fact, the relationship between actual ability and perceived ability across a multitude of tasks appears modest at best. Many studies have found that the correlation between

perceived ability and actual ability is somewhere between 0.2 and 0.4 (Dunning et al., 2004), and this finding appears consistent across a wide range of abilities including general intelligence (Hansford & Hattie, 1982), academic performance (Chemers, Hu, & Garcia, 2001), classroom learning (Hartwig & Dunlosky, 2017), memory for word-list pairs (Finn & Metcalfe, 2007), and memories for autobiographical events and experiences (Barclay & Wellman, 1986). It should be noted that when referring to confidence, in this context it refers to the extent to which one's estimation of performance relates to actual performance, also referred to as overestimation (Moore & Healy, 2008). Additional forms of over confidence have been researched in other contexts (e.g., overplacement and overprecision), but the focus of the current project is solely on estimates of overestimation.

Another consistent finding in the literature is that while most people are overconfident in their own abilities, the skill level of the individual can moderate the relationship between confidence and performance. Referred to as the *Dunning-Kruger effect* (see Dunning, 2011), studies find that while people of low skill are often highly overconfident in their abilities, individuals at a higher skill level are generally better calibrated when predicting their performance. Little or no research has investigated such effects within the deception context. The current dissertation will explore this research and pose the following hypothesis:

***H1: Participants will be highly confident in their lying ability overall; however, those more skilled in deception will demonstrate better calibration between perceived and actual lying ability, consistent with the Dunning-Kruger effect.***

### **Psychological Perspectives on Lying**

Over the years, researchers have developed several different, though not mutually exclusive, perspectives of how people lie and the psychological mechanisms that mediate their

performance in such contexts. In general, these perspectives have focused on the emotional, behavioral, and cognitive aspects of lying. *Affective perspectives* of deception focus on the emotions that occur when one engages in lying. This approach posits that feelings of joy, guilt, fear, or anxiety may be experienced when lying, and that such affective states must be effectively managed by the liar (Ekman, 1989). If the liar is unable to manage these emotions, then paravocal and non-verbal indicators of these emotions will become apparent.

*Impression management* perspectives of deception posit that in order to conceal their intentions, individuals will attempt to control their behavior when engaging in deception (Zuckerman et al., 1981). These perspectives state that liars maintain an awareness of their behavior while lying and that this is accomplished primarily in two ways. First, individuals will attempt to monitor the self for any verbal or behavioral indicators of deception when providing their lie. Second, individuals will observe the recipient of the lie to assess whether the lie is believed. As liars gather information both from themselves and the person being lied to, they will seek to alter their behavior to appear as credible as possible throughout the process.

Finally, *cognitive* perspectives focus on the mental processes that underlie the act of deception, including its generation from memory and the cognitive resources (or executive function) required to engage in this process (Vrij, 2015; Walczyk et al., 2014; see Dianiska, Cash, Lane, & Meissner, 2018). These approaches focus on the supposition that lying is more cognitively demanding than telling the truth, and thus it requires more executive or cognitive resources to generate and monitor the lie. This then leaves fewer resources to focus on other potential indicators of deception (e.g., making sure that the story is plausible or highly detailed). Further, such perspectives posit that working memory and long-term memory systems contribute differentially to liars and truth tellers, leading to reliable differences in the narratives (see Sporer,

2016). As described below, these perspectives will serve as a guide to identify cognitive and social psychological skills or traits that may distinguish more vs. less successful liars. However, before covering those traits, first the role of appearance and initial judgments and how they are related to deception and credibility assessment is briefly discussed.

### **Perceptions of Credibility**

In the early days of deception research, some scholars began to find that there were certain individuals who were always judged as deceptive or truthful regardless of the veracity of their statements. Zuckerman, DeFrank, Hall, Larrance, and Rosenthal (1979) referred to this as a demeanor bias. Put another way, the researchers had found that some of their subjects simply appeared more honest or trustworthy than others and that judges of deception were relying on those appearance judgements when making their decisions. Over the years, these findings have been replicated (e.g., Bond, Kahler, & Paolicelli, 1985; Downs, & Lyons, 1991) and show that judgments of things like honesty, trustworthiness, and attractiveness are related to judgments of deception and credibility. These judgments are made relatively quickly (i.e., in less than one second, Willis & Todorov, 2006), but are not always accurate (Porter, England, Juodis, ten Brinke, & Wilson, 2008). In fact, when participants attempted to correctly categorize faces of Nobel Peace Prize recipients and criminals from America's Most Wanted, they were only correct around 55% of the time (Porter et al. 2008). These findings led to the development of the *Dangerous Decisions Theory* of credibility assessment (Porter & ten Brinke, 2009). This theory posits that people will make rapid judgments about an individual's character that will influence subsequent interactions and perceptions of them. In other words, first impressions matter in credibility assessment and how a person looks can influence later perceptions of them (Porter, ten Brinke, & Gustaw, 2010). That being said, the focus of this project is not on these types of

credibility assessments. As such, steps will be taken to attempt to control for any demeanor bias to allow for a greater understanding of the role of individual differences in personality and cognitive functions in deception. The individual difference measures of interest are outlined below.

### **Affective Perspective**

As noted above, affective perspectives of deception focus on the role of emotions experienced by liars and truth tellers (Ekman, 1989). The act of lying is hypothesized to invoke different emotions than recalling the truth. For example, affective approaches posit that liars are likely to experience more anxiety and guilt than truth tellers. Conversely, liars may experience happiness or joy at the thought of deceiving another. These emotions are proposed to therein produce differences in para-vocal and non-verbal behavior that can differentiate honest and deceptive responding. One personality trait that has been identified that may relate to a person's ability to manage their emotions in such situations is psychopathy.

**Psychopathy.** Psychopathy is one of three components of the *Dark Triad* that, along with Machiavellianism and narcissism (addressed in more detail later), are generally considered to be dysfunctional traits (Kowalski, 2001). Psychopathy is a sub-clinical (i.e., non-DSM) condition and is correlated with the other two components of the Dark Triad (Paulhus, 2014). This trait is defined by a lack of affect or empathy for others, impulsivity, and overall callous and antisocial behavior (Jones & Paulhus, 2014). This overall lack of caring for others could be advantageous in situations requiring deception. An individual high in psychopathy would likely not feel guilt or remorse about having to lie to anyone; additionally, they may experience joy at the prospect of deceiving another person. They would thus be insulated from the negative emotions of guilt or fear, but not from positive emotions. Studies in the field support these notions as higher scores of

psychopathy are positively related to the number of lies told as well as the number of people lied to (Baughman, Jonason, Lyons, & Vernon, 2014; Jonason, Lyons, Baughman, & Vernon, 2014; Roeser, McGregor, Stegmaier, Mathew, Kubler, & Meule, 2016; Rose & Wilson, 2014).

Psychopathy is also related to the type of lies told, as scores in psychopathy correspond to the acceptability and justifiability of telling lies for self-gain (Rose & Wilson, 2014), but not to telling lies for altruistic purposes. Individuals high in scores of psychopathy are also more likely to lie to obtain a reward or to increase their own self-presentation (Spidel, Herve, Greaves, & Yuille, 2011). Additionally, those higher on the scale appear to find the act of lying more enjoyable as scores on psychopathy were related to the pleasure derived from lying (Baughman et al., 2014; Spidel et al. 2011). Finally, psychopathy is significantly related to confidence in the ability to lie – higher levels of psychopathic traits were positively correlated with the perceived ability to successfully deceive others (Giammarco, Atkinson, Baughman, Veselka, & Vernon, 2013) as well as self-rated lying ability (Jonason et al. 2014). However, no research has assessed whether psychopaths are, in fact, superior liars. Nevertheless, the following hypothesis will be assessed:

***H2. Psychopathy will be positively related to self-reported frequency of lying, confidence in the ability to lie well, and overall lying ability.***

### **Impression Management Perspective**

Impression management perspectives posit that when a person lies they focus on controlling their behavior and actions to appear more credible to the recipient of the lie (Zuckerman et al., 1981). Furthermore, they are purported to pay attention to the recipient of the lie in order to determine whether their lie is being believed or whether corrections are necessary to increase credibility. Two individual difference measures have been identified that would likely

relate to the ability to monitor another's behavior as well as correct one's own behavior to appear credible. Those characteristics include: Machiavellianism and narcissism.

**Machiavellianism.** Machiavellianism is the second component of the *Dark Triad* that will be discussed (Kowalski, 2000). This trait is identified by the tendency to be manipulative and cynical, but also socially charming (Jones & Paulhus, 2014; Paulhus, 2014). A person who is high in Machiavellianism would likely be very skilled at lying. They are often seen as socially charming and thus would be good at both presenting themselves as credible as well as adapting their own behavior based on any feedback (verbal or non-verbal) from the recipient of a lie. Those high in Machiavellianism are often thought of as “master manipulators,” and thus are likely skilled at getting what they want from others. Additionally, they may simply lie for the enjoyment of manipulating someone. These individuals would likely be more experienced liars and experts at adapting their behavior to influence others. High scores in Machiavellianism are related to both the number of lies told overall (Kashy & DePaulo, 1996) and the number of people lied to (Jonason et al. 2014). It is also related to the likelihood of lying as higher scores on the trait have been found to be indicative of the probability of lying (Baughman et al. 2014; Roeser et al., 2016), particularly for self-gain (Jonason et al., 2014; Kashy & DePaulo, 1996; McLeod & Genereux, 2008). Those high in the trait are more likely to lie to make themselves appear good, suggesting that they are concerned with the impression that they offer to others. Additionally, Machiavellianism is related to confidence in the ability to lie, as it has been shown to correlate with the perceived ability to deceive (Giammarco et al., 2013) and self-rated lying ability (Jonason et al., 2014). However, this confidence found in those with high scores may be justified, as one study found that those high in Machiavellianism were perceived as lying less

often than those low in it (DePaulo & Rosenthal, 1979). These findings lead to the following hypothesis:

**H3: Machiavellianism will be positively related to the ability to lie well, to self-reported lie frequency, and to confidence in overall lying ability.**

**Narcissism.** Narcissism is the third and final component of the Dark Triad that will be reviewed (Kowalski, 2001). It is characterized by attitudes of grandiosity, entitlement, and dominance and, like psychopathy and Machiavellianism, is a sub-clinical condition (Jones & Paulhus, 2014; Paulhus, 2014). Narcissists tend to have a high or inflated sense of self and believe that they are better and more important than those around them. This could be advantageous in a deceptive situation, as a narcissist's inflated ego will lead them to focus on themselves and their own behaviors. They will likely be very attuned to the impression that they are offering, as well as how much attention the recipient of the lie is paying to them. This could lead narcissists to lie more often and more successfully, and to be more confident in their own ability. Research on self-reported lying supports these notions as higher scores of narcissism predict the frequency of lying in hypothetical scenarios (Rose & Wilson, 2014). Additional evidence from a diary study found that narcissism was correlated with the number of lies told overall, for self-gain, and for no reason at all over a seven-day period (Jonason et al., 2014). Narcissists may also be more willing to lie when the consequences are harsher. Azili et al. (2016) found that narcissism was not related to general lying behavior but was related to lying in hypothetical high-stakes situations (e.g., getting caught cheating on an assignment). In addition to lying more often, narcissism is also related to confidence in lying ability. Narcissism has been found to be related to the perceived ability to deceive (Giammarco et al., 2013), belief in the

success of lies told (Baugham et al., 2014), and self-rated lying ability (Jonason et al. 2014). These findings allow for the following hypothesis:

**H4. *Narcissism will be positively related to self-reported lying frequency, to overall lying ability, and to expressed confidence in the ability to lie***

### **Cognitive Perspective**

Cognitive perspectives of lying are based upon the idea that it is more cognitively demanding to lie than to tell the truth (Walczyk et al. 2014; Walczyk, Schwartz, Clifton, Adams, Wei, & Zha, 2003). Scholars have suggested that liars must engage in more processing requirements when compared with truth tellers, as they must not only create and present the lie, but also ensure that it does not conflict with the truth and that the two (the truth and the lie) are not conflated. Additionally, the liar must be able to remember the lie and what they have said in order to accurately recount or reference it later. Research has also shown that most lies are hidden within an otherwise truthful statement (Bond & Speller, 2009). This suggests that liars will need to monitor and track features of the truth and lie while not leaking any indicators of deception. These suppositions suggest that several cognitive processes may be at work when an individual is engaged in lying. The need to inhibit the truth when necessary, to effectively switch back and forth between the truth and the lie, and to manage large amounts of information suggest that the cognitive skills of inhibitory control, task-switching, and working memory capacity may be paramount to effective lying. However, before discussing each of the three cognitive traits individually, a summary of relevant neuroimaging research is provided.

**Cognitive Neuroimaging Research.** Neuroimaging research uses techniques that record brain activity (fMRI, PET scan, EEG) to assess activation patterns in the brain during lies and truths. However, it should be noted that these studies are typically very simple in nature with

participants responding to yes/no questions about an item. Thus, it is still unclear whether these same processes occur under instances of more complex deception. Nevertheless, these studies have shown that the ventrolateral prefrontal cortex and the dorsolateral prefrontal cortex are more activated when lying than when telling the truth (Abe, 2011; Christ, Van Essen, Watson, Brubaker, & McDermott, 2009). The ventrolateral prefrontal cortex is an area of the brain that has also been shown to be activated by tasks that require inhibitory control and task switching ability. Additionally, the dorsolateral prefrontal cortex is an area that has been shown to be active during tasks that require working memory capacity. Taken together, these studies provide support for the notion that the executive functions of inhibitory control, task switching ability, and working memory capacity are related to lying.

**Inhibitory Control.** The concept of inhibitory control can be thought of as the ability to suppress or reduce attention to any unwanted stimulus or thought (Friedman & Miyake, 2004). Nigg (2000) goes further to identify four separate types of inhibitory control. *Interference control* reflects the ability to suppress any stimulus that may interfere with the current task. *Cognitive inhibition* is the ability to suppress any unrelated or intrusive ideas that may tax working memory. *Behavioral inhibition* is the ability to suppress any automatic behavioral response or reflex. Finally, *oculomotor inhibition* is the ability to suppress the reflex to look at a new target in the visual field. The current dissertation will assess the extent to which interference control, cognitive inhibition, and behavioral inhibition may be required to appear truthful.

Interference control and cognitive inhibition may both be important with respect to overcoming or suppressing the truth. Researchers have suggested that such a skill is necessary for effective lying, as one would have to suppress the truth and prevent any unwanted truthful details from either a) interfering with the lie that is being told and/or b) accidentally being

incorporated into the lie and thus potentially contradicting something previously said. Evidence of the need for inhibitory control can be found in studies showing that a truthful memory or event must be activated, and then inhibited, before a lie can be told (e.g., Debey, De Houwer, & Verschuere, 2014; Duran, Dale, & McNamara, 2010). Additionally, several studies have examined the relationship between inhibitory control and deception, albeit using a basic paradigm - the Concealed Information Test (CIT). The CIT was adapted from the Guilty Knowledge Test originally developed by Lykken (1959). In this paradigm, participants are asked to respond to a series of questions about an event (e.g., a murder with a knife). Some of these questions are relevant to the event (e.g., questions about the murder weapon), while others share categorical similarity but are, in fact, irrelevant (e.g., questions about other knives). The basic premise is that guilty people will respond more slowly when asked about relevant items compared to the irrelevant items, while innocent people will show no differences. This reaction time (RT) based CIT has been used extensively to study deception (see Verschuere & de Houwer, 2011). More specifically, researchers have found that inhibitory control is negatively correlated with reaction time differential in these studies (Debey, Ridderinkhof, de Houwer, de Schryver, & Verschuere 2015; Visu-Petra, Miclea, Bus, & Visu-Petra, 2014). Put another way, greater inhibitory control is associated with a smaller difference in RT for liars between relevant and irrelevant items. Hence, liars with good inhibitory control appear more like truth tellers.

In addition to interference control and cognitive inhibition of the truth, the relationship between behavioral inhibition and deception has been examined. As discussed above, researchers have long sought to identify any behavioral cues that may indicate deception such as eye gaze or hand movements (DePaulo et al. 2003). Thus, the ability to control those behaviors and appear as credible as possible is thought to be paramount to deceiving others (Ekman, 2001). However,

controlling behavior takes effort and can result in other physiological responses. For example, Pennebaker and Chew (1985) found that when participants controlled their behavior during deceptive responses on a guilty knowledge test, their electrodermal activity (i.e., skin conductance level) showed an increased stress response. Additionally, there is evidence for a relationship between the three types of inhibition discussed above such that activating one type of inhibition may increase the efficacy of others. Tuk, Trampe, and Warlop (2011) found that inducing inhibitory control in one domain (increasing the need to urinate) resulted in better performance in another domain (the Stroop task), a finding which they referred to as the Inhibitory Spillover Effect (ISE). Fenn, Bandon-Gitlin, Coons, Pineda, and Echon (2015) investigated this effect in the context of deception. Participants had to lie or tell the truth about a strongly held opinion after drinking a small (50 mL) or large (700 mL) amount of water. Those in the high inhibition condition (who drank 700 mL of water) displayed fewer behavioral cues to deception, more cues to veracity, and gave longer and more detailed statements than those telling the truth. Thus, inducing behavioral control actually resulted in greater cognitive control and more indicators of the truth. The above research suggests the following hypothesis:

**H5: *Inhibitory control will be positively related to the ability to lie well.***

**Task Switching Ability.** Task switching refers to a person's ability to effectively alternate between two separate tasks absent a detriment in performance (Pashler, 2000). Individuals frequently embed their lies within a context of truth (Bond & Speller, 2009) – as such, lying generally requires the ability to alternate between telling the truth about certain details and lying about other aspects. Evidence for this can be found in research examining the strategies that liars use to construct their lies. For example, Leins, Fisher and Ross (2013 – Experiment 1) asked liars about the strategies that they used and found that their primary

strategies were to report something previously experienced (86%), something that occurred recently (78%), or something that would be typical for that event (73%). Overall, these findings support the notion that good liars likely incorporate the truth into their accounts, and suggest that in order to do so they must be able to seamlessly switch back and forth between lying and the truth.

A separate line of research has investigated the role of task-switching by examining the impact of requiring individuals to alternate between lying and telling the truth. These studies used the CIT paradigm (described above) and examined participants' response times for both truthful and deceptive responses. The general finding was that there were switch costs in both directions, but that responding with the truth was still faster than with a lie (Debey, Liefoghe, de Houwer, & Verschuere, 2015). Put another way, there is a detriment to reaction time when switching from a lie trial to a truth trial, or vice versa, but regardless of this switch cost truths are still accessed more quickly than lies. Therefore, there are inherent costs (in reaction time) to lying, and the ability to efficiently switch between the true and false aspects of a story would facilitate lying ability. Visu-Petra et al. (2014) examined this by analyzing the relationship between task switching ability and reaction time in the CIT paradigm. The authors found that task switching ability was a significant predictor of the time taken to tell a lie. More specifically, those with a higher score on a task switching assessment were able to lie more quickly than those that scored low. This suggests that such individuals were able to overcome the costs associated with lying.

There is also evidence that task-switching alone may not be the only ability associated with these findings. Research has shown that lying gets easier the more that you do it, but harder the less that you do it (Verschuere, Spruyt, Meijer, & Otgaar, 2011) – 'truth proportion effect.'

Put another way, experience can moderate the switch cost and those who lie more frequently may have smaller costs. One proposed explanation for this effect is that fewer switch costs occur when people lie continuously. Van Bockstaele, Wilhelm, Meijer, Debey, and Verschuere (2015) tested this by controlling for the number of switches between truthful and deceptive behavior, but still found the truth proportion effect. In other words, there were fewer errors when the participants primarily responded with deception than when they only occasionally responded with deception. These findings suggest that while task switching ability is related to overall lying ability, experience can moderate the relationship between task-switching and lying abilities. This further suggests that task-switching ability may be less important for those who lie often, as the switch costs that must be overcome are smaller. Together, these findings support the following hypothesis:

**H6: *Task switching ability will be positively related to overall lying ability.***

**Working Memory Capacity.** Working memory is a system that “consists of temporary memory stores with associated mechanisms for rehearsing stored information and a mechanism of central or executive attention that regulates the contents of the active portion of the memory” (Engle, 2002, p.19). That is, working memory allows an individual to hold and manipulate information that they are currently using. In the case of a person lying, the ability to hold and manipulate information effectively is critical to successfully presenting a lie as the truth. It has been proposed that individuals high in working memory capacity will be better able to create, maintain, and present lies (Sporer, 2016). However, findings from the literature are mixed in their support of this proposition.

Research using the CIT paradigm has found significant *negative* relationships between working memory and deception ability (Farrow, Hopwood, Parks, Hunter, & Spence, 2010;

Visu-Petra, Miclea, & Visu-Petra, 2012; Visu-Petra et al., 2014). More specifically, participants with higher working memory capacity had a greater discrepancy in reaction time between their lies and truths such that they took longer to respond deceptively (relative to truths) than those with low working memory capacity. Additionally, research by Jordan (2016) found no relationship between working memory capacity and the ability to tell convincing lies such that working memory capacity was not a significant predictor of whether or not a person would be accurately judged as a liar or not. Further counterintuitive findings were found with regards to the relationship between cues to deception and working memory. Unexpectedly, those with higher working memory capacity exhibited *more* behavioral cues to deception (eye blinks and hand movements) when telling the truth than when lying. These findings suggest that working memory may be unrelated to lying or perhaps even a detriment to lying well.

A separate line of research has, in contrast, provided some support for the notion that working memory ability may be required for effective lying. Specifically, such studies have explored the influence of inducing cognitive load in an interview context (Vrij, 2015). These load inducing tasks are designed to tax cognitive resources and consequently make it more difficult to convincingly lie. Cognitive load manipulations have included asking a person tell the story in reverse order or requiring them to perform a secondary task while telling the story. Telling a story in reverse order requires manipulating the actual order of events and therein effectively managing the chronological order of information in working memory. This is difficult when telling the truth, but especially problematic when telling a lie, as both memory for the lie and its chronological order must be maintained within working memory. Research supports the challenges of reverse order for deceptive respondents, as those participants who have to recall in reverse order report that it is more difficult, time consuming, and requires them to think harder

than those that recalled in chronological order (Evans, Michael, Meissner, & Brandon, 2013). Furthermore, this increased difficulty has led to improved discrimination between liars and truth tellers (Vrij, Mann, Fisher, Leal, Milne, & Bull, 2008). In fact, researchers have been able to significantly improve lie and truth detection to as high as 87% when using the reverse order recall technique, which is significantly higher than the 54% average reported in the Bond and DePaulo (2008) meta-analysis (Vrij, Leal, Mann, & Fisher, 2012a).

In addition to reverse order recall, completing a secondary task while lying or telling the truth is also expected to tax working memory, as the individual must be able to focus on two separate tasks at once. Again, this is a difficult while telling the truth, but exerts an even greater tax on resources while lying. The use of a secondary task while being interviewed has not been as extensively researched; however, in one such study performance on the secondary task (following a dot on a computer screen with a mouse) was shown to be worse when lying than when telling the truth, even when the lies and truths were practiced (Hu et al., 2015).

Taken together, the data above show mixed support for the view that working memory is integral part of the act of deception. Working memory was inversely related to reaction time and had no relationship to lying ability in one study suggesting that it is not related to lying ability. Conversely, several studies that have induced cognitive load while lying have found that it leads to more cues to deception. Overall, it has been theorized that a higher working memory capacity should lead an individual to be more capable of maintaining and manipulating different parts of a lie. The current dissertation will seek to resolve these discrepancies and test the following hypothesis:

**H7: Working memory capacity will be positively related to overall lying ability.**

## Strategic Interview Approaches

The third major research question that this project seeks to investigate is how more vs. less skilled liars will fare against novel interview strategies that have been developed in the literature. In recent years, scholars have sought to create strategic interview approaches that allow for greater discrimination between liars and truth tellers (Granhag et al. 2015). These approaches are designed to aid in the detection of deception both by making it easier to tell the truth (e.g., by enhancing memory and reporting for truth tellers via the Cognitive Interview, see Fisher & Geiselman, 1992), and by making it harder to lie (e.g., challenging liars' ability to tell convincing lies by inducing cognitive load or asking unexpected questions, see Vrij, 2015). For the purposes of this project, three such approaches have been identified for further assessment. The first approach involves *inducing cognitive load*, which makes the interview more difficult overall, but especially for those attempting to lie (Vrij, 2015). The second strategy, *controlled cognitive engagement* (CCE), is an interview approach that combines pieces of other strategies (e.g., rapport building, unanticipated questions) and is specifically designed to be used in brief interactions to assess credibility (Ormerod & Dando, 2015). Finally, the *Devil's Advocate approach* was developed for assessing whether the opinion someone presents is indicative of their true beliefs or not (Leal, Vrij, Mann, Fisher, 2010). All three approaches were design to take advantage of a cognitive or strategic understanding of lying, as described in detail below.

**Cognitive Load.** As mentioned above, the cognitive load technique involves adding an extra layer of difficulty to the task in order to make recall and presentation more difficult (Vrij, 2015). Importantly, the cognitive load technique is based on the principle that lying is a more cognitively demanding, or difficult, task than telling the truth. Therefore, when the extra load is added or induced, it should differentially affect liars as they should find it more challenging to

manage the information given the additional constraints placed upon them. Studies have shown the inducing cognitive load leads to more diagnostic cues (particularly verbal or story-based cues) in liars' narratives (e.g., Evans et al., 2013). Cognitive load can be induced in several ways including having the subject recall the story in reverse order, requiring the subject to perform a secondary task during the interview, or having the subject maintain eye contact with the interviewer throughout the interview (Vrij, 2015).

Having interviewees recall a story in reverse order capitalizes on the fact that events are typically learned and remembered in chronological order (Kahana, 1996). As noted above, recalling events in reverse order has been found to be more cognitively demanding (Evans et al., 2013). Although recalling in reverse order is more difficult for both liars and truth tellers, it is even more difficult for liars because the fake events were likely put together into a story that was designed to be told in a forward order with each event cueing the one after it. Conversely, for truth tellers, the events that were actually experienced serve as cues to both the events before and after them (stored in long-term memory), leading to enhanced memory reporting and cueing of unique event details (Geiselman & Callot, 1990; Fisher & Geiselman, 1992). Research into the reverse order interview technique has yielded two consistent findings. First, recalling an event in reverse order leads to more cues to deception than recalling it in chronological order (Evans et al., 2013; Vrij et al., 2012a; Vrij, et al. 2008; Zurloni, Diana, Elia, & Anolli, 2016). More specifically, liars exhibited more cues to deception (e.g., less detail and plausibility of the narrative) than truth tellers in the reverse order condition, but there were no differences in the chronological order condition. The second consistent finding is that when naïve observers view and judge the liars and truth tellers, they are more accurate in the reverse order condition than the chronological condition (e.g., Vrij et al., 2012a; 2008).

A second technique for inducing cognitive load involves requiring interviewees to maintain eye contact with the interviewer while they respond to questions. In general, maintaining eye contact with another person makes spontaneous speech more difficult and results in more hesitations and false starts during the conversation (Beattie, 1991). Maintaining eye contact with another person also appears to make cognition more difficult because not only does it add another task requirement, but it also prevents cognitive offloading via gaze aversion (looking away). When attempting to answer difficult questions, children and adults will avert their gaze to aid in the processing of the question and report that it is more cognitively demanding to answer while maintaining eye contact with the interviewer than to look at the floor or close their eyes (Doherty-Sneddon, Bonner, & Bruce, 2001). It is believed that the reason for this is to reduce any cognitive input from the environment and instead allocate cognitive resources that would be used to process the environment to answering the difficult question (Doherty-Sneddon & Phelps, 2005). Research supports these suppositions in that forcing interviewees to maintain eye contact with the interviewer results in more cues to deception (e.g., fewer details) in liars as opposed to truth tellers (Vrij, Mann, Leal, Fisher, 2010c). Similar results were found with a sample of children ages 8 to 11 who, when lying, provided fewer details about the event compared to those telling the truth (Lawrence et al., 2017).

A third method of inducing cognitive load involves having participants perform a secondary task while lying. As noted above, cognitive resources are thought to be finite, and having a person perform a secondary, unrelated task while recalling an event places a greater burden on those resources. Research into this technique is limited, but at least two such studies have examined lying performance under dual-task conditions. Hu and colleagues (2015) found that having participants lie while attempting to perform a secondary task (which involved

following a dot with a mouse on a computer screen) resulted in not only more cues to deception, but also greater difficulty at performing the secondary task. Similar results were found using a more complicated secondary task. Specifically, Gawrylowicz, Fairlamb, Tanto, Qureshi, Redha, and Ridley (2016) asked participants to lie or tell the truth while engaging in a driving simulator. They found that when the participants were lying, performance on the secondary task suffered as demonstrated by slower reaction times when compared with truth tellers. The authors suggested that as a result of having to expend cognitive resources on lying, respondents appeared to have fewer cognitive resources available to attend to any surprising events. Additionally, truth tellers provided more detailed accounts of the events they were describing compared to liars, suggesting that it was more difficult for liars to add to their narratives while being distracted by the secondary task. Taken together, these results suggest that cognitive load interview techniques (reverse order recall, maintaining eye contact, and performing a secondary task) may be effective because they render the task of describing events or opinions more difficult for liars, thereby enhancing the differences between liars and truth tellers.

A recent meta-analysis has examined the general effect of imposing cognitive load on detecting deception (Vrij, Fisher, & Blank 2015). Across five samples, imposing load only improved accurate truth detection from 56% to 58% (Cohen's  $d = 0.09$ ), while it improved lie detection from 34% to 63% ( $d = 0.94$ ). These findings appear to support the notion that imposing load helps to improve the detection of liars by making it harder for them to effectively present their lies while having minimal corresponding effects on truth tellers. While the above findings show that cognitive load is an effective tool to detect deception overall, the current dissertation will examine how such techniques might impact more vs. less skilled liars. As predicted above, good liars will have enhanced cognitive abilities such as improved working memory capacity,

inhibitory control, and task switching abilities. The research above and prior predictions therein lead to the following hypothesis:

**H8: *More skilled liars will be detected as lying significantly less often under conditions of cognitive load when compared to less skilled liars.***

**Controlled Cognitive Engagement.** Controlled cognitive engagement (CCE) is an interview technique originally developed by Ormerod and Dando (2015). The technique was designed as a veracity testing approach that focuses not on the behavior of the sender, but rather on the verbal interaction between the sender and receiver. CCE uses a combination of techniques including effective questioning approaches, the use of cognitive load, and assessing changes in verbal behavior and content. All of these techniques are combined across three phases of the interview. First, a rapport building phase occurs which allows for a small amount of relationship building between the interviewer and interviewee. Additionally, several baseline questions are used that allow the interviewer to obtain an initial assessment of how the interviewee answers honestly. The next two phases consist of a cycle of information gathering and veracity testing. During these phases, the interviewer asks strategic questions about the interviewee's history and background and then looks for changes in the way they respond to these questions. These changes could include differences in the level of detail or plausibility of the statements/answers that the interviewee is making. The interviewer then probes these differences with additional questions in an effort to identify or clarify any inconsistencies or inaccuracies in the responses.

In the only empirical test of this approach, Ormerod and Dando (2015) trained a selection of airport security agents in the CCE approach and examined how well they were able to identify fake passengers going through airport security. All screeners had received training in the traditional approach to detecting deception for airport security (known as *Suspicious Signs*

*Training*). Additionally, half of the sample received an additional week of training in CCE in the classroom and another week of on-the-job training. During an 8-month trial, mock travelers (who were recruited and given a cover story) were sent through airport security to be screened by the participants. Overall, the CCE approach was significantly more successful than the suspicious signs approach: while the suspicious signs approach yielded only 6% of the mock passengers at month 1 and 0% at month 6, the CCE approach identified 60% of mock passengers at month 1 and 72% at month 6. Furthermore, agents using the CCE approach asked more open ended (and fewer closed ended) questions, without taking more time to conduct the interview. This finding indicates that this approach is effective at assessing credibility in brief interactions. The current dissertation will explore the extent to which CCE might be effective across more vs. less skilled liars. The following hypothesis will be tested:

***H9: Lying ability will be significantly related to rate of detection in the CCE approach such that more skilled liars will be detected less often when compared with less skilled liars.***

**Devil's Advocate.** The Devil's Advocate (DA) approach to deception detection involves having individuals create and present arguments both for and against an opinion that they may hold. The key assumption is that truth tellers will be able to generate more information for an opinion that they support than one that they oppose, while liars will generate an equal amount of information to support both sides. This hypothesis is based upon the idea that it is easier to support arguments for ideas that we agree with than those that we don't (Ajzen, 2001; Nickerson, 1998). Furthermore, research has found that liars prepare more for an interview than do truth tellers when they are about to be interviewed (Hartwig, Granhag, & Stromwall, 2007; Leins, et al., 2013; Vrij et al. 2009), and that liars report attempting to be consistent across statements such

that their truthful statements resemble their deceptive statements (Granhag, Giolla, Stromwall, & Rangmar, 2013; Stromwall & Willen, 2011). Hence, truth tellers were expected to show a greater discrepancy between the opinion they hold and the one they oppose, while liars were expected to be consistent in their two statements.

To date, only two studies have assessed the DA approach to deception detection. Leal et al. (2010) first tested the approach by asking participants to identify a strongly held opinion or belief and then respond to two prompts about it. The opinion prompt asked participants to support the belief and the DA prompt asked the participant support the counter argument. Their findings suggested that truth tellers spoke more (i.e., gave more information and details) in response to the opinion question than the DA question, while liars responded equally to both prompts. Additionally, truth tellers responded faster to the opinion prompt than the DA prompt, and again liars showed no difference in reaction time. In a second phase of the study, naïve observers watched videos of the statements liars and truth tellers had provided and rendered several judgments about them. Similar to the results of the first phase, observers noted that truth tellers were more talkative, emotionally involved, and plausible in response to the opinion question than the DA question. Conversely, no differences in ratings were found between the opinion and DA questions for liars.

These findings were replicated in a study by Deeb and colleagues (2018) wherein consistency was examined between pairs of participants. Similar to the results of Leal et al. (2010), truthful pairs were more consistent with one another in response to the opinion question than to the DA question. Put another way, when giving their true opinions, truth tellers were consistent with one another in the amount of information provided about the opinion that they held, but had greater variability in responding to the DA prompt. Conversely, lying pairs had

similar levels of consistency across both prompts. In other words, liars gave the same amount of information to support both the opinion prompt and the DA prompt. These findings support the proposition that truth tellers actually show less consistency across their statements than liars do. The current dissertation examines the extent to which more vs. less skilled liars might be susceptible to the DA approach when being interviewed about beliefs. Based upon the above research, the following hypothesis will be tested:

**H10: *Lying ability will be significantly related to rate of detection in the Devils'***

***Advocate approach such that more skilled liars will be identified by this technique at a lower rate compared to less skilled liars.***

### **The Present Study**

The present study investigated the relationship between self-reported lying ability, personality traits, executive functions, strategic interview approaches, and measures of lying ability and perceived credibility. Three primary research questions were evaluated. First, do individuals demonstrate calibration between self-reported lying ability and actual lying performance? This was assessed by comparing individuals' self-rated ability to naïve observer judgments. Second, can research-informed personality traits and cognitive abilities predict self-reported frequency of lying, confidence in lying ability, and lie detection rates obtained via observer judgments? Third, might more (vs. less) skilled liars be detected less often when exposed to novel, strategic interviewing strategies such as inducing cognitive load, controlled cognitive engagement, or the Devil's Advocate approach? Each strategy was paired with a specific task or situation that it had been developed for. More specifically, the method of inducing cognitive load was paired with an alibi task, the CCE approach was paired with a travel experience task, and the Devil's Advocate approach was paired with an opinion task. As detailed

below, the study was divided into two phases - Phase I involved the assessment of individual difference measures and the collection of interview statements from respondents, while Phase II involved assessment of participants' lie ability via naïve observer judgments. Additionally, a separate set of naïve observers provided perceptions of participants honesty, trustworthiness, and attractiveness to allow for control for any potential demeanor bias.

## CHAPTER 2. METHODS

### Study 1 - Assessing Individual Differences and Collecting Interview Statements

In the first part of this project, the individual difference measures describe above were collected for each participant. More specifically, data were collected to measure each participant's score on the personality traits of psychopathy, Machiavellianism, and narcissism, as well as performance on measures of their inhibitory control, task-switching ability, and working memory capacity. Participants also provided self-reports of their lying behavior in everyday life. Next, they completed three tasks (travel experience, alibi, and opinion) while lying and telling the truth. Each task consisted of a control portion and a strategic portion. The control portion involved simple open-ended prompts. The strategic portion varied with each task. More specifically, each strategic interview approach described above was paired with one of the tasks. Controlled Cognitive Engagement (CCE) was paired with the travel experience task, cognitive load was paired with the alibi task, and Devil's Advocate approach was paired with the opinion task. All tasks were completed twice, once lying and once telling the truth, and were video recorded for use in Phase II. The measures and tasks were approved by Iowa State University's Institutional Review Board (Appendix A) and are outlined in more detail below.

#### *Part 1 – Collection of Individual Difference Measures*

In the first part of this study, participants were recruited to the laboratory to complete a series of individual difference measures, as described previously, related to affective, impression management, and cognitive perspectives of deception. Participants completed all measures as well as provided self-reports about their perceived lying frequency, ability, and confidence.

**Participants.** 157 undergraduates from a large Midwestern university participated in Part 1. Participants had an average age of 19.5 years ( $SD = 2.2$ ) and were predominantly female

(62.4%). Additionally, the sample was predominantly Caucasian (77.1%) followed by Hispanic (7%), African American (5.7%), Asian (5.7%), and other (4.5%) (note that the majority of other responses indicated biracial ethnicity). English as a second language (ESL) students were restricted from participating to ensure that the participants video recordings were clear and understandable. Participants were given class credit as compensation for participating.

**Design.** A repeated measures design was used such that all participants completed all measures during phase 1. Participants completed all measures in the laboratory, and the order in which the measures were presented was randomized for each participant.

**Materials.** The materials used in this phase were a collection of cognitive and personality individual difference measures described below as well as several self-report measures. Attention check questions were included throughout the self-report measures to assess whether participants were paying attention or not.

*Machiavellianism.* Machiavellianism was assessed using the Machiavellian Personality Scale (Dahling, Whitaker, & Levy, 2009). The measure consists of sixteen items that are subcategorized into four subscales including amorality, desire for status, desire for control, and distrust of others. Participants rated the extent to which they agreed or disagreed with each statement on a 1-5 Likert scale ranging from strongly disagree to strongly agree (Appendix B). The scale has a reliability ( $\alpha$ ) of 0.84.

*Grandiose Narcissism.* Narcissism was assessed using the Narcissistic Grandiosity Scale (Crowe, Carter, Campbell, & Miller 2016). The measure consists of sixteen adjectives on which the participants rate themselves. Participants were asked to rate how well each adjective described them on a 1-9 Likert scale ranging from not at all to extremely (Appendix C). The scale has a reliability ( $\alpha$ ) of 0.96.

*Psychopathy.* Psychopathy was assessed using the Triarchic Psychopathy Measure (Patrick, Fowles, & Krueger, 2009). The measure is a 57-item questionnaire that is subcategorized into scales for meanness, boldness, and disinhibition. Participants rated the extent to which a series of statements were true or false on a Likert scale of 1-4 ranging from false to true (Appendix D). All subscales have a reliability  $> 0.8$ .

*Working Memory Capacity.* Working memory capacity was assessed with the Reading Span Task (RSPAN). This study used a short version of the RSPAN task. This was done to save time and it has been shown that a short version of the task is just as accurate as the full version (Oswald, McAbee, Redick, & Hambrick, 2015). Participants were presented with a sentence that was approximately 10-15 words in length and were asked to read the sentence out loud (sentences provided in Appendix E). The participants were instructed that they were to remember the last word in the sentence for later recall. After they finished the sentence, another was presented and the process repeated four to six times. At the end of the sentences, the participant was then asked to recall the words in correct order of presentation. Participants completed a total of six trials, two each with sets that were four, five, and six sentences in length.

*Response Inhibition.* Response inhibition was measured using the Go/No-Go task. This study used a version of the Go/No-Go task adopted from Wessel (2018). Participants completed the task on the computer. Before the trials began, participants were presented with two squares, one blue and one orange, that will serve as the cues for the task. The blue square served as the go signal and the orange square served as the no-go signal. Participants were instructed that if a blue square appeared then they were to press the space bar on the keyboard and if an orange square appeared that they were not to respond. They were also instructed to respond as quickly as possible on each trial. Each trial began with a fixation cross for 500ms and then the response cue

(colored square) appeared and remained on the screen for up to 1000ms or until the participant responded. After a response, or a duration of 1000ms, the next trial began and each trial had a total maximum time of 1500ms. Additionally, the probability of a no-go response was .2. This means that only 20% of the trials had a no-go response. Participants first completed 20 practice trials to make sure that they understood the task. They then completed four blocks of 50 trials each for a total of 200 trials.

*Task-Switching Ability.* Task-switching ability was assessed using a task switching paradigm adapted from Grange, Kowalczyk, and O’Laughlin (2017). For each trial, participants had to respond to a stimulus given a certain response rule. Each trial began with a cue indicating the rule appearing in the middle of the screen. The cue was presented 150ms before the stimulus and remained throughout the trial. Next a circle appeared in one of the four corners and the participant had to respond with the appropriate rule based upon the cue. Cue A was a square and indicated the rule of responding with the corner that was the vertical opposite. Cue B was a triangle and indicated the rule of responding with the corner that was the horizontal opposite. Cue C was a hexagon and indicated the rule of responding with the diagonal opposite. After a response was made, the screen cleared for 150ms and then the next cue appeared. The overall sequence of the trials was the same, but each participant started at a different point in the sequence. If an error was made, the word “INCORRECT” appeared on the screen for 1000ms before the screen cleared for the next trial. Participants first completed 16 practice trials to make sure that they understood the task. The main portion of the task was made up of two blocks of 96 trials each for a total of 192 trials.

*Additional Self-Report Measures.* In addition to the tasks above, participants were asked to self-report their perceived ability to lie. This included questions about how often the

participant lies, how successful those lies are, and the general content of those lies. Additionally, participants rated themselves on how honest, trustworthy, and attractive they are (Appendix F).

**Procedure.** Part 1 of the initial phase of this project took place during a 90-minute session that involved the collection of data on participants' cognitive abilities and measures of personality. Upon arrival informed consent was administered. Over the course of the session, participants completed several tests of their cognitive abilities including working memory capacity (RSPAN task), response inhibition (Go/No-Go), and task-switching ability (task switching task). They also completed various personality measures for characteristics of the dark triad (Neuroticism, Machiavellianism, and Psychopathy). Finally, participants completed a self-report survey about their perceived lying ability, trustworthiness, honesty, and attractiveness. The order of completion was randomly assigned for each participant. Upon completion of all of these tasks, session one ended. Session one took approximately 90 minutes to complete.

### ***Part 2 – Collection of Interview Statements***

In this part of the study, participants returned to the laboratory one week later to complete three different interview tasks while lying and telling the truth. Each task had been paired with a strategic interview approach and was completed using a two phased approach - participants first completed a control portion of the interview that was followed by the induction of a strategic interview approach. Thus, each interview consisted of two parts (control and strategic) and was completed twice (once lying and once telling the truth) for a total of twelve interviews from each participant. Two research assistants were used for Part 2. The experimenter introduced each task to the participant and provided instructions. The interviewer conducted each interview and was blind to participants' veracity.

**Participants.** A total of 140 of the initial 157 participants (89%) returned for session 2. Of those 140, four participants had their interviews lost due to a camera malfunction and one did not give consent for her videos to be used in Study 2. The final sample of 135 participants had a mean age of 19.5 ( $SD = 2.2$ ) and was predominantly female (60%) and Caucasian (77%).

**Design.** This study conformed to a 2 veracity (truth vs. lie) x 3 interview task (travel experience vs. alibi vs. opinion) x 2 interview phase (control vs. strategic) within subjects design. Thus, each participant completed six interviews in total, with each interview containing a control and strategic phase. The pairing of a strategic interview approach within each interview task was confounded by design, as each strategic approach was developed for use in specific situations that are represented by the three interview tasks.

**Materials.** The materials consisted of three different interview tasks described below. Each interview involved two phases and was paired with a strategic interview approach.

*Interview Phase Questionnaire.* After the completion of each phase of each interview, participants completed a brief questionnaire about their experience (Appendix G). This asked about the perceived difficulty of the task, how honest the statement that was provided was, as well as how confident the participant was that the statement would be judged as truthful.

*Travel Experience Task.* In this task, participants underwent a structured interview that asked about a recent travel experience that they had. This task was completed twice, once lying and once telling the truth. When telling the truth, participants were asked to identify a trip that they have taken within the last six months to serve as their true event. When lying, they were asked to fabricate a trip to have occurred within the same time period. The interview consisted of two phases. First, in the control portion of the interview, participants were prompted with an open-ended question asking them to describe the event in as much detail as possible. The

interviewer then prompted the participants to try and add any more detail to the event that they could. In the strategic portion of the interview, participants were interviewed using the Controlled Cognitive Engagement (CCE) interview strategy. During this portion, the interviewer had identified two specific parts about the event which they will probe the participant about (e.g., more details about who they were with, what they did, where they went). The interviewer then asked probing questions that were designed to test the participants memory and should have been easy for truth-tellers to recall, but difficult for liars to fabricate.

*Alibi Task.* In this task, participants were asked to imagine that they have been accused of a crime that had occurred the day before between the hours of 6:00pm and 7:00pm and they had to create an alibi for that time period. This task was completed twice, once lying and once telling the truth. When telling the truth, participants were instructed to recount what they were doing during the time in question. When lying, participants were instructed to create a false alibi. Each interview was completed in two phases. The first phase was the control phase and consisted of the interviewer prompting the participant to recount what they did during the time in question and to be as detailed as possible. The interviewer then prompted them to add any detail to the story that they could. Next, in the strategic phase, the interviewer attempted to induce cognitive load by asking participants to recall the event in reverse order and be as detailed as possible.

*Opinion Task.* In this task, participants were given a list of topics/opinions and asked to rate how strongly they felt about each one. The experimenter then chose the two most strongly held opinions (if there was a tie, a selection was made at random from among those eligible) to interview the participant about. The list of opinions were adapted from Leal and colleagues (2010) and can be found in Appendix H. The participants completed this task twice, once lying and once telling the truth. The interview consisted of two phases. In the control phase,

participants were asked to identify the opinion that they held and to provide supporting evidence for that belief. In the strategic phase, participants were asked to play ‘Devil’s Advocate’ and provide support for the opposite view. For example, if the participant was pro-life, then in the control phase, they were asked to provide support for that view and in the strategic phase, they were asked to play Devil’s Advocate and provide support for being pro-choice. This was the procedure for when they were telling the truth. When lying, participants were asked to provide their fake belief (in this example, being pro-choice) during the control phase and their actual opinion during the strategic phase (being pro-life).

**Procedure.** One week after Part 1, participants returned to the laboratory and completed a second informed consent process. Participants were informed that they would be giving six statements about their recent travels (travel experience task), recent activities (alibi task), and opinions (opinion task). First, a still photograph of each participant was taken for later use. Next, they rated how strongly they felt about certain opinions for use in the opinion task. They then completed each of the three interview tasks in a random order. For each interview task, the experimenter explained the task to the participant and provided them instructions about whether to lie or tell the truth. Participants were given three minutes to prepare for the interview. Next, the interviewer entered the room to conduct the interview. Interviewers were trained to follow the interview scripts and to conduct the interviews in a polite but formal manner. All interviewers were blind to participants’ veracity (i.e., they did not know beforehand if they were lying or telling the truth). Participants completed each task twice, once lying and once telling the truth. After each phase, participants completed the interview phase questionnaire that asked about their experience during that portion of the interview. They completed this after each interview phase in each task, for a total of 12 surveys. All statements were video recorded for

later use. After completion of the final survey, participants were thanked for their participation and then dismissed. Part two took approximately ninety minutes.

### *Study 2 – Observer Judgments of Veracity*

**Overview.** In this part, participants from Amazon’s Mechanical Turk were recruited to view videos of the participants and judge whether they are lying or telling the truth and to rate how confident they are in their decisions.

**Participants.** A total of 755 participant participants from Amazon’s Mechanical Turk were recruited. Participants were paid up to \$2.00 for their participation. Participants had an average age of 41.48 years ( $SD = 12.49$ ) and were predominantly female (57.5%) and Caucasian (75.9%). Participants were required to have a U.S. IP address, a hit approval rate greater than 95%, and to have more than 5000 HITs previously approved.

**Design.** This study conformed to a 2 veracity (truth vs. lie) x 3 type of interview (alibi vs. opinion vs. travel) x 2 interview phase (control vs. strategic) mixed design. Veracity was a within-subjects variable and type of event and interview phase were between subjects’ variables.

**Materials and Procedure.** This study took place during one thirty to sixty-minute session. Participants were recruited via Amazon’s Mechanical Turk to participate in a study about whether or not individuals can tell the difference between liars and truth tellers. Upon agreement to participate, informed consent was taken. Participants then completed audio and video check questions to ensure that they were not bots, and to confirm that they could properly view the videos used in this study. Participants were then instructed that they would view twelve videos of individuals lying or telling the truth about an event or opinion. Participants were not given any information about the base rate of lying (i.e., how many of the 12 videos had lies or truths). Additionally, the procedure was set so that participants would not see two videos of the

same person. Put another way, observers would not see the same person giving both a lie and a truth. Participants then viewed twelve videos (six truths and six lies) that were all of the same type of event (i.e., either all from the travel experience, alibi, or opinion tasks). Additionally, all of the videos that they viewed were from one phase of the interview (control or strategic). Videos were presented in a random order. After each video, participants were asked to judge whether the person in the video was lying or telling the truth and were also be asked to rate how confident they are in their decision on a scale from 1 (not at all confident) to 7 (very confident) in 1-point increments. After completion of the twelve trials, participants were then asked to provide their demographic information, thanked for their participation, and then dismissed. Participation took between 30 to 60 minutes depending upon condition (alibi and opinion interviews were shorter and took less time to evaluate).

### ***Study 3 – Observer Ratings of Credibility***

In this part, participants were recruited from Amazon’s Mechanical Turk to view still photographs of participants and provide ratings on a variety of characteristics.

**Participants.** 90 participants from Amazon’s Mechanical Turk were recruited. Participants had a mean age of 42.9 years ( $SD = 13.7$ ) and were predominantly female (55.6%) and Caucasian (76.7%). Participants were paid \$0.50 for their participation. As with Study 2, participants were required to have a U.S. IP address, a hit approval rate greater than 95%, and to have more than 5000 HITs previously approved.

**Design.** This study conformed to a univariate design wherein participants rated a set of photographs with respect to one of the social perception scales (honesty vs. trustworthiness vs. attractiveness).

**Materials and Procedure.** This study took place during one 15-minute session. Participants were recruited via Amazon’s Mechanical Turk to participate in a study about credibility assessment. Upon agreement to participate, informed consent was taken. Participants completed photo check questions to ensure that they were not bots, and to confirm that they would be able to view the photos used in the study. Participants then viewed 50 still photographs and be asked to rate how honest, trustworthy, or attractive the person in the photograph is on a 1-7 scale with 1-point increments. Photographs were presented in a random order. After completion of the 50 ratings, participants provided demographic information, thanked for their participation and the task ended. Participation took approximately 15 minutes.

## CHAPTER 3. RESULTS

### Morbidity Analysis

As mentioned above, of the 157 participants in Study 1 who completed the individual difference measures at Time 1, 140 returned to complete the interviews at Time 2. Analyses were performed to assess whether those who did not return were different from those who did on any of the cognitive and social individual difference measures. Correlational and regression analyses showed that none of the individual difference measures were related to a failure to return at Time 2 (all  $p$ 's > .05).

### Missing Data

A total of 15 participants were missing one of the six interviews at Time 2 (7 due to time and 8 due to experimenter error). Analyses were performed to assess whether those participants that were missing one interview differed from those that were not missing any of the predictor or outcome variables. Separate univariate ANOVAs were performed comparing participants that were missing data and those that were not. These analyses revealed no significant group differences on the predictor variables (go/no-go, task switching, RSPAN, psychopathy, narcissism, and Machiavellianism) or the primary outcome variables (truth performance, lie performance, discrimination ( $d'$ ), or response bias ( $c$ )) (all  $p$ 's > .05). Therefore, the missing truth and lie performance rates were estimated using multiple imputation. Multiple imputation involves estimating the missing data using all other available data. A data point is estimated for each missing value and a prediction error is added. This process is repeated several times and each imputed dataset contains prediction error. Analyses are then performed on the combined data sets. The type of imputation that was performed used a Markov Chain Monte Carlo (MCMC) algorithm. A total of 10 data sets were imputed and data chains were cut every 500

iterations. Additionally, it is noted that the analyses were run with the smaller sample of 120 containing complete data and the overall pattern of results did not change. The final sample consisted of 135 cases (120 from which we had all data points and 15 with missing data replaced imputation). Furthermore, it should be noted that of the 1,620 data points relating to interview performance across all participants, only 30 data points were missing and required imputation. Thus, missing data represented 1.9% of all possible values. Participants' performance on the individual difference measures (discussed below) is based upon the full sample of 157. This was done in order to give the most accurate estimate of performance (relative to their peers) and to capture a more complete range of scores.

### **Manipulation Checks**

**Perceived Difficulty.** The data from participant's interview phase questionnaires were used to confirm that the control and strategic phases of the interviews were differentially difficult. Participants responses to the questions "how difficult was the interview that you just completed," and "how hard was it to think during the interview," were strongly correlated ( $r = .78$ , 95% CI [.76, .80]) and so they were averaged to create a difficulty rating. Those ratings were then used to perform three 2 veracity (truth vs. lie) x 2 interview phase (control vs. strategic) repeated measures ANOVAs, one for each interview condition. The means and standard deviations for each condition can be seen below in Table 1.

*Alibi Interviews.* The ANOVA on alibi interviews revealed a significant main effects of veracity ( $F(1,134) = 80.76$ ,  $p < .001$ ,  $partial\ eta^2 = .38$ ) and interview phase ( $F(1,134) = 24.62$ ,  $p < .001$ ,  $partial\ eta^2 = .16$ ). The interaction was not significant. Overall, the strategic phases of the interviews were rated as more difficult than the control phases, and lies were rated as more difficult than telling the truth.

*Opinion Interviews.* The ANOVA on opinion interviews again revealed significant main effects of veracity ( $F(1,134) = 8.34, p < .005, \text{partial } \eta^2 = .06$ ) and interview phase ( $F(1,134) = 4.78, p < .030, \text{partial } \eta^2 = .03$ ) qualified by a veracity by interview phase interaction,  $F(1,134) = 112.75, p < .001, \text{partial } \eta^2 = .46$ . In those interviews, the strategic phase was seen as more difficult when telling the truth, but conversely, the control phase was actually perceived as more difficult when telling a lie. This is consistent with predictions. Specifically, when asked to play Devil's Advocate during the truthful interview, participants had to lie about their beliefs, which would have been more difficult as they had to argue for the opposite of the opinion that they actually hold. Similarly, in the lie interview, they would be presenting the opposite of the opinion that they truly hold during the control phase of the interview and when asked to play Devil's advocate, they would actually be presenting their true opinion, which should have been easier. Therefore, we expected (and found) that the phases of the interviews that involved lying (the strategic phase of the truthful interview and the control phase of the lying interview) were rated as more difficult than the phases that involved telling the truth (the control phase of the truth interview and the strategic phase of the lie interview).

*Travel Interviews.* The ANOVA on travel interviews revealed significant main effects of veracity ( $F(1,134) = 145.16, p < .001, \text{partial } \eta^2 = .52$ ) and interview phase ( $F(1,138) = 4.37, p < .038, \text{partial } \eta^2 = .03$ ), but no significant interaction. Overall, the lie was seen as more difficult than the truth, and the control phase of the interview was seen as more difficult than the strategic, counter to our predictions. Therefore, it appears that while the strategic phases of the alibi and opinion interviews produced the desired effect, the strategic element of the travel interviews was not perceived to be as difficult.

Table 1: Perceived Difficulty: Means and Standard Deviations

Interview Type	Veracity	Interview Phase	Mean	SD
Alibi	Truth	Control	1.63	.84
		Strategic	2.17	1.36
	Lie	Control	2.76	1.21
		Strategic	3.04	1.65
Opinion	Truth	Control	2.43	1.36
		Strategic	3.91	1.64
	Lie	Control	4.03	1.75
		Strategic	2.98	1.48
Travel	Truth	Control	2.01	1.11
		Strategic	1.90	1.03
	Lie	Control	3.49	1.61
		Strategic	3.28	1.59

**Truthfulness.** Participants responses to the question, “how truthful was the statement that you just made,” were used in a 2 veracity (truth vs. lie) x 3 interview type (alibi vs. opinion vs. travel) repeated measures ANOVA. The analysis revealed significant main effects of veracity ( $F(1,134) = 2245.91, p < .001, partial\ eta^2 = .94$ ) and interview type ( $F(2,268) = 3.95, p < .02, partial\ eta^2 = .03$ ), as well as a veracity by interview type interaction ( $F(2,268) = 12.21, p < .001, partial\ eta^2 = .08$ ). The means and standard deviations can be seen below in Table 2. Overall, truthful interviews were rated as more truthful than the deceptive interviews. Furthermore, the size of this difference between truthful and deceptive responses appears to be larger in the alibi and travel interviews compared to the opinion interviews. A second 2 interview phase (control vs. strategic) x 3 interview type (alibi vs. opinion vs. travel) repeated measures ANOVA was performed. This analysis revealed no significant effects and showed that there were no differences in overall truthfulness between control and strategic phases.

Table 2: Reported Truthfulness: Means and Standard Deviations

Interview Type	Veracity	Mean	SD
Alibi	Truth	6.68	1.09
	Lie	1.48	1.21
Opinion	Truth	6.48	.84
	Lie	2.05	1.37
Travel	Truth	6.83	.82
	Lie	1.54	1.06

### Data Cleaning

The data from the reaction time based individual difference measures were cleaned to remove any outliers (consistent with prior research using these measures; see Grange et al., 2017; Wessel, 2018).

**Go/No-Go Task.** All responses under 150ms were dropped from the analysis. Additionally, mean reaction times and standard deviations were computed for each participant, and these were used to identify and remove any outlier responses that were greater than 2.5 standard deviations above the mean for each participant. A total of 598 trials were removed (approximately 2% of all responses).

**Task Switching.** As with the go/no-go task, all responses under 150ms were dropped from the analysis. Additionally, the first two trials from each block were removed, as they were neither same nor switch trials. The mean reaction times and standard deviations were calculated for each participant and any responses that were more than 2.5 standard deviations above the mean were considered “outliers” and were therefore removed. A total of 891 responses (approximately 3% of all responses) were removed from the analysis.

## Composite Scores

To assess the relationships between the predictor and outcome variables, a series of composite scores were created. All standardized scores were transformed using a z-score transformation unless otherwise noted.

**Go/No-Go.** Participants' overall accuracy, percentage of commission errors (errors on no-go trials), and mean reaction time on correct go trials were calculated. The scores were negatively correlated with one another ( $r = -.39$ , 95% CI [-.52, -.25]). Faster reaction time was associated with more errors. The raw means and standard deviations can be seen in Table 3. Given that there was no basis for prioritizing commission error rate or reaction time scores as a predictor variable, these two scores were standardized and combined to create a single measure of performance on the go/no-go task.

**Task Switching.** Participants' overall accuracy and reaction time were calculated. The data were divided based upon which cue had appeared two trials before the trial cue (n-2 cues). Same trials had the same cue (e.g., a square) n-2 trials before. Switch trials had a different cue (e.g., a hexagon) n-2 trials before. Separate accuracy and reaction time estimates were calculated for same trials and switch trials. The raw means and standard deviations can be seen in Table 3. Paired sample t-test analyses revealed that participants were significantly faster ( $t(156) = -6.63$ ,  $p < .001$ ) and more accurate ( $t(156) = 5.12$ ,  $p < .001$ ) on same trials compared to switch trials. Participants average reaction time and accuracy on switch trials were standardized and combined into a single score representing performance on switch trials. The two estimates were negatively correlated ( $r = -.41$ , 95% CI [-.53, -.27]), such that faster reaction time was associated with greater accuracy on switch trials.

**RSPAN.** RSPAN scores were calculated using the partial-credit scoring method. For each response set, the proportion of correct words recalled out of the total number of items was calculated. These scores were then averaged across the six response sets to create an overall measure of RSPAN. Means and standard deviations of the four, five, and six item lists, as well the overall scores, can be seen in Table 3. Average scores were standardized for use in analyses below.

Table 3: Cognitive Composite Scores: Means and Standard Deviations

Individual Difference Measure	Performance Measure	Mean	SD
Go/No-Go	Overall Accuracy	.98	.03
	RT on Go Trials	380.50	62.55
	Percent No-Go Errors	6.51	10.19
Task Switching	Accuracy on Same Trials	.96	.08
	RT on Same Trials	898.53	268.93
	Accuracy on Switch Trials	.95	.08
	RT on Switch Trials	927.52	278.85
RSPAN	4 Sentence List	.68	.19
	5 Sentence List	.56	.18
	6 Sentence List	.58	.17
	Average Score	.60	.14

**Machiavellianism.** Responses to the Machiavellian Personality Scale were scored and divided into the four established subscales of amorality, desire for status, desire for control, and distrust of others. These subscales were then used to create a factor score for Machiavellianism. A principal axis factor analysis was performed and the data were constrained to fit into a single factor. This single factor explained 38.49% of the variance in Machiavellianism scores. All factor loadings > 0.43. The means, standard deviations, Cronbach's alpha, and factor loading for

each scale can be found in Table 4. The factor score was used as an overall measure of Machiavellianism, as there were no specific predictions relating to any of the subscales.

**Grandiose Narcissism.** Responses to the Narcissistic Grandiosity Scale were used to create a single factor score for grandiose narcissism. A principal axis factor analysis was performed and the data were constrained to fit into a single factor. That factor accounted for 46.2% of the variance in narcissism scores. All factor loadings  $> .41$ . The mean, standard deviation, and Cronbach's alpha can be seen in Table 4.

**Psychopathy.** Participants' responses to the Triarchic Psychopathy Measure were scored and divided into the appropriate subscales of boldness, disinhibition, and meanness. Those subscales were then used to create an overall factor score for psychopathy. A principal axis factor analysis was performed and the data were constrained to fit into a single factor. That factor explained 34.39% of the total variance in psychopathy scores. All factor loadings  $> .22$ . Means, standard deviations, Cronbach's alpha, and factor loadings for the scales can be found in Table 4. The factor score was used as an overall measure of psychopathy, given that there were no specific predictions relating to any of the subscales.

Table 4: Dark Triad: Means, Standard Deviations, and Cronbach's Alpha

Individual Difference Measure	Scales	Mean	SD	Cronbach's Alpha	Factor Loading
Machiavellianism	Amorality	9.19	3.12	.71	.71
	Desire for Status	9.52	2.50	.71	.71
	Desire for Control	9.26	1.95	.62	.43
	Distrust of Others	12.67	3.26	.64	.59
	Total Score	41.26	7.99	.82	
Grandiose Narcissism	Total Score	62.78	21.51	.93	
Psychopathy	Boldness	37.54	5.38	.64	.22
	Disinhibition	20.12	7.90	.82	.27
	Meanness	19.41	8.47	.81	.96
	Total Score	77.07	14.78	.82	

**Perceived Credibility.** Observer judgments of participants' perceived honesty, trustworthiness, and attractiveness from Study 3 were averaged to create an estimate of each construct. Correlational analyses were performed on the three ratings. Perceived honesty was correlated with both perceived trustworthiness ( $r = .60$ , 95% CI [0.48, 0.70]) and attractiveness ( $r = .24$ , 95% CI [0.07, 0.39]). Perceived trustworthiness was also correlated with attractiveness ( $r = .33$ , 95% CI [0.17, 0.47]). Given that all three ratings were correlated, a factor score for perceived credibility was created. A principal axis factor analysis was performed and the data were constrained to fit a single factor. That factor accounted for 45.84% of the variance in

perceived credibility scores. The means and standard deviations of the raw scores as well as the factor loadings can be found in Table 5.

Table 5: Average Scores of Perceived Honesty, Trustworthiness, and Attractiveness

Characteristic	Mean	SD	Factor Loading
Honesty	4.17	.61	.66
Trustworthiness	4.44	.62	.87
Attractiveness	3.34	.81	.36

**Overall Confidence in Lying Ability.** Correlational analyses were performed on participants' responses to the questions, "how successful of a liar do you think you are," "when you tell lies, how often are they discovered," and, "how confident are you in your lying ability." Note that for all three questions, higher scores represent more confidence (e.g., more successful, lies are discovered less often, and more confident). Results of those analyses showed that perceived success was correlated both with how often lies are discovered ( $r = .39$ , 95% CI [0.23, 0.52]) and confidence in overall ability ( $r = .77$ , 95% CI [0.70, 0.83]). Additionally, how often lies are discovered was also correlated with confidence in overall ability ( $r = .37$ , 95% CI [0.21, 0.51]). A factor score for overall confidence was created. A principal axis factor analysis was performed and the data were constrained to fit into a single factor. That factor accounted for 59.35% of the variance in responses. Means, standard deviations, and factor loadings can be seen below in Table 6.

Table 6: Overall Confidence in Lie Ability Scores

Question	Mean	SD	Factor Loading
How successful of a liar do you think you are?	4.31	1.49	.91
When you tell lies, how often are they discovered?	4.68	1.42	.46
How confident are you in your lying ability?	4.04	1.63	.86

**Statement Confidence.** Responses from the interview phase questionnaires to the question, “how confident are you that you will be judged as truthful,” were used to create average confidence scores for the videos that were collected. Answers were given on a 1-7 Likert scale ranging from not at all confident to very confident. Estimates from each interview were used to create composite confidence estimates for truths and lies, as well as for control and strategic interviews. A paired sample t-test was performed. Overall, participants were significantly more confident that their truthful statements ( $M = 5.12, SD = 1.03$ ) would be judged as truthful, compared to their deceptive statements ( $M = 3.79, SD = 0.91$ ),  $t(134) = 14.94$ ,  $Cohen's d = 1.25$ , 95% CI [1.03, 1.48]. Participants were also more confident during the control interview phases ( $M = 4.57, SD = .84$ ) than during strategic interview phases ( $M = 4.34, SD = .87$ ),  $t(134) = 4.86$ ,  $Cohen's d = 0.43$ , 95% CI [0.26, 0.61].

**Confidence Accuracy Calibration.** In order to assess the relationship between confidence and performance, estimates of calibration and over/under confidence were created (see Juslin, Olsen, & Winman, 1996, for a conceptual overview). While other estimates of the relationship between confidence and accuracy exist (e.g., gamma or point-biserial correlation), researchers have demonstrated that calibration is a more sensitive measure for assessing the relationship (see Olsson, 2000). Therefore, calibration and over/under confidence estimates were created.

Calibration reflects the relationship between a participant's confidence level and their performance on a task. Perfect calibration occurs when confidence levels and performance levels are equal. The formula for calibration was established by Jonsson and Allwood (2003) where:

$$calibration = \frac{1}{n} \sum_{t=1}^t n_t (r_{tm} - c_t)^2,$$

In the formula,  $n$  is the total number of responses,  $t$  is the number of confidence classes used,  $c_t$  is the proportion of correct answers for all responses in the confidence class  $r_t$ ,  $n_t$  is the number of times that a given confidence class ( $r_t$ ) was used, and  $r_{tm}$  represents the average confidence ratings in a given confidence class ( $r_t$ ).

Calibration estimates are an absolute value where zero represents perfect calibration. The farther away from zero an estimate is, the worse the calibration is. Over/under confidence represents the degree to which a participant's confidence judgments are greater than or less than their performance. An over/under confidence score of zero represents the absence of over or under confidence. Positive scores represent over confidence such that participants predicted level of performance was greater than their actual level of performance. Negative scores represent under confidence such that participants predicted level of performance was less than their actual level of performance. Separate calibration and over/under confidence estimates were created for truths and lies. The means, standard deviations, and correlations can be seen below in Table 7.

*Truths vs. Lies.* Paired sample t-test analyses were performed to assess any differences in calibration and over/under confidence. The first test revealed no significant difference in calibration scores between truths and lies,  $t(134) = -.54$ , *Cohen's d* =  $-.05$ , 95% CI  $[-.22, .12]$ . Participants were no better calibrated when telling the truth than when lying. However, there was a significant difference in over/under confidence,  $t(134) = 7.47$ , *Cohen's d* =  $.64$ , 95% CI  $[.46, .83]$ . Participants were significantly more over confident that their truthful statements would be judged as truths compared to their deceptive statements.

Table 7: Calibration and Over/Under Confidence Means and Standard Deviations

		Mean	SD	<i>r</i>
Calibration	Truth	.05	.06	<i>r</i> = .35
	Lie	.06	.05	[.20, .49]
	Total	.05	.04	
Over/Under Confidence	Truth	.23	.16	<i>r</i> = .28
	Lie	.11	.16	[.11, .43]
	Total	.17	.14	

**Lying Ability.** Participant performance was assessed in four ways. First, truth and lie performance were estimated. Truth performance reflected the rate at which truthful statements were judged as truths, while lie performance reflected the rate at which lies were judged as truths. In addition, hit and false alarm rates were calculated such that estimates of discrimination accuracy and response bias could be calculated. Hits were defined as the percentage of trials that lies were judged as lies, while false alarms were defined as the percentage of trials that truths were judged as lies. These percentages were then used to calculate measures of discrimination:

$$d' = Z_{\text{Hits}} - Z_{\text{FalseAlarms}},$$

and response bias:

$$c = 0.5(Z_{\text{FalseAlarms}} + Z_{\text{Hits}}).$$

Positive  $d'$  scores reflect good discrimination (i.e., lies are identified as lies and truths are identified as truths), and negative  $d'$  scores reflect poor discrimination (i.e., lies and truths are not accurately identified as such). Positive response bias scores reflect the participant being more likely to be judged as truthful, while negative response bias scores reflect the participant being more likely to be judged as lying. Mean estimates were then computed for control and strategic interviews across interview type. Means and stand deviations for truth performance, lie performance,  $d'$ , and  $c$  estimates can be seen in Table 8.

Table 8: Truth Performance, Lie Performance,  $d'$ , and  $c$  Rates for Every Interview Condition:

## Means and Standard Deviations

Interview Type	Interview Phase	Truth Performance	Lie Performance	$d'$	$c$
Alibi	Control	.61 (.24)	.59 (.22)	.09 (1.38)	.39 (.85)
	Strategic	.58 (.23)	.63 (.23)	-.22 (1.35)	.42 (.83)
Opinion	Control	.69 (.21)	.55 (.26)	.56 (1.52)	.49 (.81)
	Strategic	.43 (.27)	.56 (.25)	-.49 (1.61)	.04 (.84)
Travel	Control	.62 (.23)	.54 (.26)	.28 (1.39)	.33 (.87)
	Strategic	.59 (.23)	.39 (.25)	-.14 (1.34)	.37 (.87)

\*Note standard deviations in parentheses.

### Overview of Analyses

Analyses were divided into three sections corresponding to the three major research questions that were posed in the introduction. Relevant hypotheses are addressed where appropriate. Additional analyses for which there were no *a priori* predictions are also presented; however first, the relationships among the predictor and outcome measures are discussed.

**Relationships Among Predictors.** The correlations between the predictor variables can be seen below in Table 9. Overall, no significant relationships were observed between performance on the go/no task and either the RSPAN or task switching tasks. However, performance on the RSPAN and task switching are related such that higher RPSAN scores were associated with faster reaction time and fewer errors on the task switching tasks. With regard to

the Dark Triad traits, small positive relationships among the three constructs were evident; however, none of the correlations are significant. Lastly, perceived credibility was related to narcissism such that those that scored higher in narcissism were rated as less credible.

Table 9. Correlations Among Predictors

	Go/No-Go	Task Switching	RSPAN	Machiavellianism	Psychopathy	Narcissism	Perceived Credibility
Go/No-Go	1	.12 [-.06, .28]	-.05 [-.22, .12]	.01 [-.16, .18]	.07 [-.10, .23]	.16 [-.01, .32]	-.07 [-.24, .10]
Task Switching		1	-.26 [-.41, -.09]	.16 [-.01, .32]	-.08 [-.24, .10]	.06 [-.12, .22]	-.02 [-.18, .16]
RSPAN			1	.06 [-.11, .22]	-.06 [-.23, .11]	-.14 [-.30, .03]	.01 [-.17, .17]
Machiavellianism				1	.16 [-.01, .32]	.16 [-.01, .32]	.09 [-.08, .26]
Psychopathy					1	.13 [-.05, .29]	-.01 [-.18, .16]
Narcissism						1	-.21 [-.37, -.04]
Perceived Credibility							1

\*Note: 95% confidence intervals in brackets.

**Relationships Among Outcome Measures.** The relationships between the outcome measures can be seen below in Table 10. Overall, the data demonstrate the expected patterns of correlation. Truth and lie performance are both positively related to  $c$ . Additionally, they are also appropriately related to  $d'$ , with truth performance positively associated and lie performance negatively associated with  $d'$ . Truth and lie performance are also negatively related to calibration and over/under confidence estimates such that participants who were more often judged as truthful had better calibration and greater under confidence in their performance.

Table 10: Correlations Among Outcome Measures

	Truth Performance	Lie Performance	$d'$	$c$	Calibration	Over/Under Confidence
Truth Performance	1	.51 [.37, .62]	.44 [.29, .56]	.89 [.81, .89]	-.62 [-.71, -.50]	-.70 [-.77, -.60]
Lie Performance		1	-.55 [-.66, -.43]	.88 [.83, .91]	-.61 [-.70, -.49]	-.73 [-.80, -.64]
$d'$			1	-.09 [-.25, .09]	.04 [-.14, .20]	.09 [-.08, .25]
$c$				1	-.70 [-.77, -.50]	-.82 [-.87, -.76]
Calibration					1	.61 [.49, .71]
Over/Under Confidence						1

\*Note: Numbers in brackets represent 95% confidence intervals.

*Factor Analysis.* In addition to the correlation analyses performed above a factor analysis was done on their truth and lie performance rates. This was done to assess how much common variance occurs across the 12 interviews. In this analysis, participants 12 truth and lie performance scores were entered into a principal axis factor analysis. The data were constrained

to fit a single factor model. That factor accounted for 16.84% of the variance in scores and all factor loadings ranged from .25 to .55. This suggests the presence of common variance across the different interview conditions that could potentially be explained by the predictor variables.

**Perceptions of Credibility.** The correlation between the perceived credibility factor score and the outcome variables of truth performance, lie performance,  $d'$ , and  $c$  were examined. No significant correlations were observed, suggesting that demeanor bias may not be related to performance in these data. In fact, research has shown that demeanor bias is not always accurate (e.g., Porter et al., 2008), thus the relationship between demeanor bias and lying performance may not be as strong as initially thought. Given that there was no evidence of demeanor bias in the data, credibility was not controlled for or further examined in subsequent analyses.

### **Individual Differences in Self Report Measures**

The first set of analyses examined the relationship between the individual difference variables and self-report measures. More specifically, analyses were conducted on the relationship between the Dark Triad traits (psychopathy, Machiavellianism, and narcissism) and self-reported lie frequency, as well as overall confidence in the ability to lie well. Additionally, the relationship between the cognitive measures (inhibitory control, task switching ability, and working memory capacity) and perceived difficulty was also assessed. These analyses allowed for the examination of parts of hypotheses 2, 3, and 4.

**Lie Frequency.** Correlation analyses were performed to assess the relationship between the number of small and big lies told on a daily basis and the Dark Triad traits. The correlations can be seen below in Table 11. Psychopathy was related to the frequency of small lies, but not big lies, providing partial support for hypothesis 2. Machiavellianism was related to big lies, but not small lies, providing partial support for hypothesis 3. Finally, narcissism was not related to

either small or big lies, failing to support hypothesis 4. Overall, partial support was found for hypotheses 2 and 3, as psychopathy and Machiavellianism were related to the self-reported frequency of telling lies.

Table 11: Correlations Between Lie Frequency and Dark Triad Traits.

	Small Lies	Big Lies	Overall Confidence
Psychopathy	.20 [.03, .36]	.14 [-.03, .30]	.19 [.02, .34]
Machiavellianism	.17 [-.01, .33]	.23 [.06, .38]	.06 [-.11, .23]
Narcissism	.12 [-.05, .29]	.08 [-.09, .25]	.17 [.01, .33]

\*Note: Numbers in brackets represent 95% confidence intervals

**Overall Confidence in Lie Ability.** Correlations between the overall confidence factor score and the Dark Triad traits were examined and can be seen in Table 8 above. Both psychopathy and narcissism were related to overall confidence, supporting hypotheses 2 and 4. However, there was no relationship between Machiavellianism and overall confidence. These results suggest that those with higher scores in psychopathy and narcissism are generally more confident in their overall ability as liars.

**Perceived Difficulty.** Correlations were examined to assess whether any of the cognitive abilities assessed (inhibition, task switching, or working memory capacity) were related to the perceived difficulty of the control and strategic interviews. Those correlations can be seen below in Table 12. No significant relationships were observed. Performance on the cognitive tasks was unrelated to the perceived difficulty of either the control or strategic portions of the interviews.

Table 12: Correlations Between Perceived Difficulty and Cognitive Tasks.

	Control Difficulty	Strategic Difficulty
RSPAN	-.08 [-.25, .09]	.03 [-.14, .19]
Task Switching	.17 [-.01, .33]	.14 [-.04, .30]
Go/No-Go	-.02 [-.19, .15]	-.05 [-.22, .12]

\*Note: Numbers in brackets represent 95% confidence intervals

### **Research Question #1: Can Individuals' Self-Assessments Objectively Predict How Effective They Are at Deceiving Others?**

The first major goal of this project was to assess the relationship between participants self-assessments and their interview performance. In this section, a set of predictors related to participants' self-assessments (overall confidence in ability, self-reported lie frequency, and perceived difficulty) were analyzed in relation to a set of outcome variables related to interview performance (truth performance, lie performance,  $d'$ ,  $c$ , calibration and over/under confidence). These analyses allowed us to examine hypothesis 1.

**Overall Confidence in Ability.** Recall that for hypothesis 1, overall high confidence in lying ability was predicted. No support for this hypothesis was observed, as the average confidence composite score was 4.35 out of 7, suggesting that people are on average only marginally confident in their lying ability. Next, the correlation between the overall confidence factor score and the outcome measures of truth performance, lie performance,  $d'$ ,  $c$ , calibration and over/under confidence was examined. The correlations can be seen below in Table 13. Overall confidence was unrelated to all of the outcome measures. Thus, it appears that participants overall confidence in their lie ability is not related to their performance.

Table 13: Correlations Among Self-Assessments and Outcome Measures

	Truth Performance	Lie Performance	$d'$	$c$	Calibration	Over/Under Confidence
Overall	-.01	.02	-.03	.01	-.04	.08
Confidence	[-.18, .16]	[-.15, .19]	[-.20, .14]	[-.16, .18]	[-.21, .13]	[-.09, .25]
Small Lies	-.10	.08	-.18	-.01	.07	.05
	[-.26, .07]	[-.09, .25]	[-.34, -.01]	[-.17, .17]	[-.10, .24]	[-.12, .22]
Big Lies	-.08	.08	-.15	.01	.02	.04
	[-.24, .09]	[-.09, .25]	[-.31, .02]	[-.16, .18]	[-.15, .19]	[-.14, .20]

\*Note: Numbers in brackets represent 95% confidence intervals

**Lying Frequency.** The correlations between participants self-reported frequency of lying and the outcome measures were calculated and can be seen in Table 10 above. A significant relationship was found between  $d'$  and frequency of small lies. Participants who reported telling more small lies were not discriminated as well as those that reported telling fewer lies. In other words, observers had greater difficulty discriminating between the lies and truths of those who reported lying more often. However, as stated above, a lower  $d'$  value is not necessarily indicative of good lie performance. There were no relationships between lie frequency and any other outcome measures.

**Perceived Difficulty.** Participants' average perceived difficulty (perceived difficulty composite score) during the control and strategic phases of the interviews was correlated with their corresponding lie performance, truth performance,  $d'$ , and  $c$  estimates from the control and strategic phases (respectively). The results can be seen below in Table 14.

For control interviews, two relationships were found. Difficulty was negatively related to lie performance and positively related to  $d'$  (discrimination). Participants who found the control

interviews more difficult were judged as truthful less often when lying, and that led to increased discrimination.

Conversely, for strategic interviews, a different pattern of results was observed. Perceived difficulty was found to be negatively related to truth performance, as well as  $d'$ . Thus, it appears that greater perceived difficulty was related to worse performance during truthful interviews. Participants who found the interview more difficult struggled to appear as truthful and as such were more often judged as deceptive (as noted by lower truth performance rate). This decrease in truth performance also led to poorer discrimination between lies and truths (lower  $d'$ ).

Table 14: Correlations Between Perceived Difficulty and Outcome Measures During Control and Strategic Interview Phases

	Truth Performance	Lie Performance	$d'$	$c$
Control	.10	-.20	.26	-.03
Difficulty	[-.07, .26]	[-.35, -.03]	[.10, .41]	[-.20, .14]
Strategic	-.18	.05	-.18	-.08
Difficulty	[-.34, -.01]	[-.12, .22]	[-.34, -.02]	[-.24, .09]

\*Note: Numbers in brackets represent 95% confidence intervals

**Performance Calibration.** The second part of hypothesis 1 was that more skilled liars would have better calibration than less skilled liars. To assess this relationship, correlation and ANOVA analyses were performed. First, participants' lie calibration estimates were regressed onto their average lie performance. The analysis revealed that those with greater lie performance had better calibration than those with worse lie performance, ( $r = -.68$ , 95% CI [-.76, -.57]). However, it should be noted that lie performance is used to calculate calibration scores and it can be problematic to use one variable to predict another variable that is calculated, at least in part, by that predictor (i.e., calibration estimate). In an effort to address this, participants were divided

into three groups based upon their average performance on lie interviews. Participants' average lie performance across all three deceptive interviews was standardized and then percentile rank (33<sup>rd</sup> and 66<sup>th</sup>) was used to divide the participants into three groups based upon performance. A univariate ANOVA was then performed. A significant main effect of group was found,  $F(2,132) = 35.52, p < .001, partial\ eta^2 = .35$ . Post-hoc tests revealed that high performers ( $M = .03, 95\% CI [.02, .04], Cohen's\ d = 1.65$ ) and medium performers ( $M = .05, 95\% CI [.03, .06], Cohen's\ d = 1.11$ ) had significantly better calibration than low performers ( $M = .10, 95\% CI [.08, .11]$ ). However, high and medium performers were not significantly different from one another. Taken together, these analyses provide support for hypothesis 1 in that those that were more skilled in deception demonstrated better calibration between perceived performance and actual lying ability, which is consistent with the Dunning-Kruger effect.

### **Research Question #2: Can We Identify Individual Differences That Clearly Distinguish Good Liars and Bad Liars?**

The second major goal of this dissertation was to identify individual difference measures that may be related to lying performance. In the analyses below, the individual difference measures of psychopathy, narcissism, Machiavellianism, inhibitory control (as assessed using the go/no-go task), task switching ability (assessed from the task switching task), and working memory capacity (assessed from RSPAN) were used to predict the outcome measures of truth performance, lie performance,  $d'$ , and  $c$ . These analyses allowed us to examine hypotheses 2-7.

**Correlation Analyses.** First, the correlations between the predictor and outcome variables were examined. Those correlations can be seen below in Table 15.

*Truth Performance.* Truth performance was positively correlated with RSPAN scores and negatively correlated with psychopathy scores. Participants that scored higher in the RSPAN task

and lower on the psychopathy measure were more likely to be judged as truthful. None of the other predictors were significantly related.

*Lie Performance.* A similar pattern was found in the lie performance data wherein psychopathy was negatively correlated with lie performance while RSPAN scores were positively correlated. Participants that had higher RSPAN scores and lower psychopathy scores were judged as truthful more often. None of the other predictors were related to lie performance.

*Discrimination ( $d'$ ).* None of the six individual difference predictors were related to  $d'$ . There was no relationship between any of the individual difference variables and the likelihood of being correctly discriminated.

*Response Bias ( $c$ ).* In terms of response bias, psychopathy and RSPAN scores were again related. Additionally, task switching scores were also marginally related. More specifically, Psychopathy scores were negatively correlated with  $c$ , while RSPAN scores were positively correlated. Participants who scored lower in psychopathy and higher on the RSPAN were seen as more truthful overall. Additionally, task switching was also related to response bias. Individuals with better task switching scores (as indexed by a faster reaction time and fewer errors on switch trials) were more likely to be judged as truthful.

*Summary.* Overall, both psychopathy scores and RSPAN performance were related to how likely participants were judged as truthful. Additionally, task switching was marginally related performance. However, these correlations do not allow for the assessment of the specific contribution of each predictor variable, nor how much of the variance in scores can be accounted for by the predictors as a whole. In light of that, the next analysis details a series of path models that examine the role of these predictors in a multivariate context.

Table 15: Correlations Among Predictor and Outcome Variables

	Truth Performance	Lie Performance	$d'$	$c$
Psychopathy	-.20 [-.36, -.03]	-.19 [-.35, -.02]	.01 [-.16, .17]	-.22 [-.38, -.05]
Machiavellianism	-.13 [-.29, .05]	-.02 [-.19, .15]	-.10 [-.26, .08]	-.08 [-.25, .09]
Grandiose Narcissism	.01 [-.16, .18]	-.10 [-.27, .07]	.12 [-.05, .29]	-.06 [-.22, .11]
Go/No-Go	.07 [-.10, .23]	-.07 [-.23, .10]	.13 [-.04, .30]	-.01 [-.18, .16]
Task Switching	-.15 [-.31, .02]	-.15 [-.31, .02]	.01 [-.16, .18]	-.17 [-.33, 0]
RSPAN	.24 [.07, .39]	.24 [.08, .39]	-.02 [-.19, .15]	.28 [.12, .43]

\*Note: Brackets represent 95% confidence intervals

**Path Modeling.** In order to assess the unique contribution of each individual difference predictor, a series of path models were performed. In each analysis, the three Dark Triad traits were set to correlate with one another and the three cognitive measures were set to correlate with one another. The six individual difference variables were then used to predict the outcome measures. Additionally, these models allow for the total variance explained by all of the predictor variables together. Due to that, there are no model fit statistics include. In each of the analyses below, all of the predicted paths were estimated to evaluate the total predictive utility of the individual difference variables. The results of those analyses can be seen below in Table 16.

*Truth Performance.* In the truth performance path model, only RSPAN scores were significantly related to performance. Participants that had higher RSPAN scores were judged as truthful more often than those with lower RSPAN scores. None of the other predictors were

significantly related to truth performance. Taken together, the six individual difference variables accounted for 13% of the variance in truth performance scores.

*Lie Performance.* In the lie performance model, both psychopathy and RSPAN scores were related to performance, albeit in different directions. More specifically, as with the truth performance analysis, RSPAN scores were positive related to lie performance. Participants that had a higher RSPAN score were seen as truthful more often. Conversely, psychopathy was negatively associated with performance. Participants that scored higher in psychopathy were less successful liars as they were judged as lying more often. No other individual difference measures were significant. Together, the six predictors accounted for 10% of the variance in lie performance scores.

*Discrimination ( $d'$ ).* In the discrimination path model, none of the individual difference predictors were related to discrimination. Taken together, the six predictors accounted for 4% of the variance in  $d'$  scores.

*Response Bias ( $c$ ).* In the response bias path model, again psychopathy and RSPAN were significantly related response bias. Psychopathy was negatively associated with response bias such that higher scores in psychopathy were associated with being judged as lying more often overall. Conversely, RSPAN scores were positively associated with response bias such that participants with higher RSPAN scores were judged as telling the truth more often. The six predictor variables accounted for 14% of the variance in response bias.

*Summary.* Overall, only psychopathy and RSPAN scores were related to performance when lying and telling the truth. Machiavellianism, grandiose narcissism, go/no-go scores, and task-switching scores were all unrelated to performance failing to support hypotheses 3, 4, 5, and 6. Additionally, psychopathy was related to performance, but in the opposite of the expected

direction. Higher scores in psychopathy resulted in being judged as lying more often. This finding fails to support hypothesis 2. Lastly, RSPAN scores were found to be related to performance overall. Higher RSPAN scores were associated with being judged as truthful more often, supporting hypothesis 7.

Table 16: Standardized Beta Weights from Path Model Analyses

	Truth Performance	Lie Performance	$d'$	$c$
Psychopathy	-.19 [-.35, -.03]	-.18 [-.34, -.02]	.01 [-.06, .06]	-.21 [-.37, -.05]
Machiavellianism	-.10 [-.27, .06]	.02 [-.15, .19]	-.05 [-.12, .02]	-.05 [-.21, .12]
Grandiose Narcissism	.07 [-.09, .24]	-.05 [-.21, .12]	.04 [-.02, .11]	.01 [-.15, .18]
Go/No-Go	.09 [-.07, .25]	-.03 [-.19, .14]	.08 [-.04, .19]	.03 [-.29, .05]
Task Switching	-.11 [-.27, .06]	-.11 [-.28, .06]	.01 [-.07, .08]	-.12 [-.29, .05]
RSPAN	.22 [.06, .38]	.19 [.03, .36]	.01 [-.06, .07]	.24 [.08, .40]
Total Variance Accounted For	$R^2 = .13$	$R^2 = .10$	$R^2 = .04$	$R^2 = .14$

\*Note: Number in brackets represent 95% confidence intervals around the estimate

### Research Question #3: How Might More vs. Less Skilled Liars Fare Against Evidence Based Interview Techniques That Are Designed to Make Lying More Difficult?

The third goal of this project was to assess how more vs. less skilled liars perform when interviewed using strategic interview approaches. In these analyses, performance during the control phases of the interviews were used to assess performance during the strategic phases.

More specifically, truth performance, lie performance,  $d'$ , and  $c$  (response bias) estimates during control interviews were used to predict their corresponding rates during strategic interviews. This was done using both linear regression and ANOVA analyses. For the ANOVA analysis, participants were divided into three groups based upon percentile rank performance. These analyses were conducted for overall performance, and then separately for each specific interview condition to will allow investigation of hypotheses 8, 9 and 10. The standardized beta weights and 95% confidence intervals from the regression analyses can be seen below in Table 17.

Table 17: Correlations Between Control and Strategic Performance

Interview Type	Truth Performance	Lie Performance	$d'$	$c$
Alibi	.16 [-.01, .32]	.24 [.07, .39]	.03 [-.14, .20]	.28 [.12, .43]
Travel	.09 [-.09, .25]	.46 [.13, .44]	.03 [-.14, .20]	.29 [.13, .44]
Opinion	.06 [-.11, .23]	-.03 [-.20, .14]	-.14 [-.30, .03]	.10 [-.07, .27]
Overall	.29 [.12, .43]	.45 [.31, .58]	-.05 [-.21, .12]	.52 [.38, .63]

\*Note: Number in brackets represent 95% confidence intervals around the estimate

**Overall Performance.** Before investigating performance in each interview type, an analysis of overall performance was done. Overall, lie performance during the control phase was positively related to lie performance during the strategic phase ( $r = .45$ ). Liars who were judged as truthful during the control phases were also judged as truthful during the strategic phases. Similarly, truth performance during control was positively correlated with truth performance during strategic ( $r = .24$ ). However, for  $d'$ , there was no significant relationship between control and strategic performance ( $r = -.05$ ). Discrimination accuracy was not related across the two

phases of the interviews. Lastly, control response bias was positively correlated to strategic response bias ( $r = .52$ , see Figure 1 below). These analyses demonstrate that those who were judged as truthful during the control phases were also judged as truthful during the strategic phases.

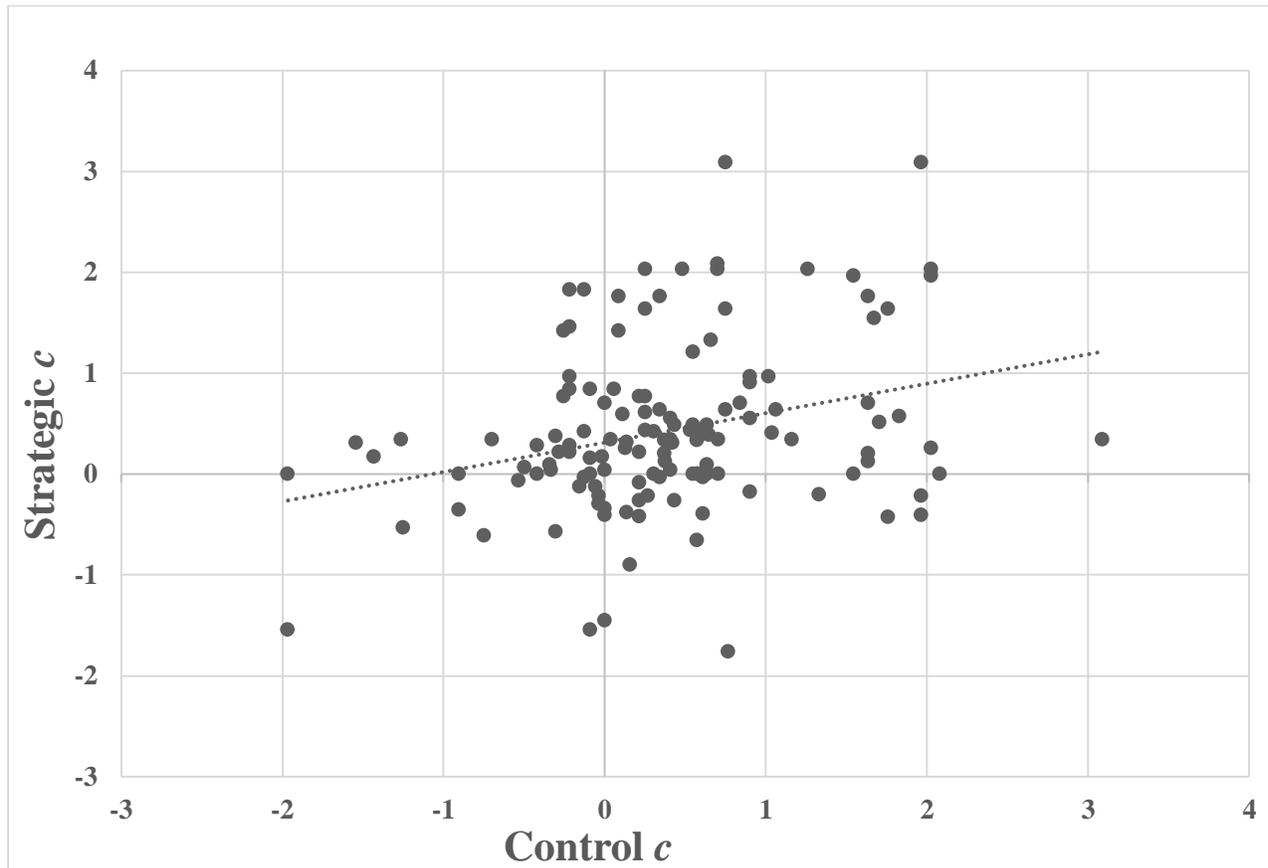


Figure 1: Scatterplot of Response Bias During Control and Strategic Phases of the Interviews

Similar results can be seen in the ANOVA analyses. For lie performance, there was a significant main effect of group,  $F(2,132) = 13.52, p < .001, partial\ eta^2 = .17$ . Estimated marginal means revealed that high performers ( $M = .66, 95\% CI [.62, .70], Cohen's\ d = 1.18$ ) were significantly better than low performers ( $M = .52, 95\% CI [.48, .56]$ ), but not medium performers ( $M = .62, 95\% CI [.58, .67]$ ). Medium and low performers were also significantly different from one another ( $Cohen's\ d = .73$ ). For truth performance, there was also a main effect of group,  $F(2,132) = 4.57, p < .01, partial\ eta^2 = .07$ . Estimated marginal means showed that

high ( $M = .58$ , 95% CI [.54, .62], *Cohen's d* = .68) performers were significantly different from low performers ( $M = .49$ , 95% CI [.44, .53]), but not from medium performers ( $M = .53$ , 95% CI [.49, .57]). Medium and low performers were not significantly different from one another. There was no main effect of group on discrimination accuracy,  $F(2,132) = .02$ ,  $p > .97$ . That analysis showed that  $d'$  estimates from the control phases were not related to estimates from the strategic phases. Lastly, for response bias, there was a significant main effect of group,  $F(2,132) = 18.94$ ,  $p < .001$ , *partial eta*<sup>2</sup> = .22. Estimated marginal means revealed that high performers ( $M = .38$ , 95% CI [.28, .47]) were significantly different from medium ( $M = .22$ , 95% CI [.12, .31], *Cohen's d* = .49) and low ( $M = -.03$ , 95% CI [-.12, .06], *Cohen's d* = 1.33) performers. Additionally, medium and low performers were also significantly different from one another (*Cohen's d* = .78). Figure 2 below presents the means of each group. Taken together, these results suggest that performance during the control phases is indicative of performance during the strategic phases of the interviews.

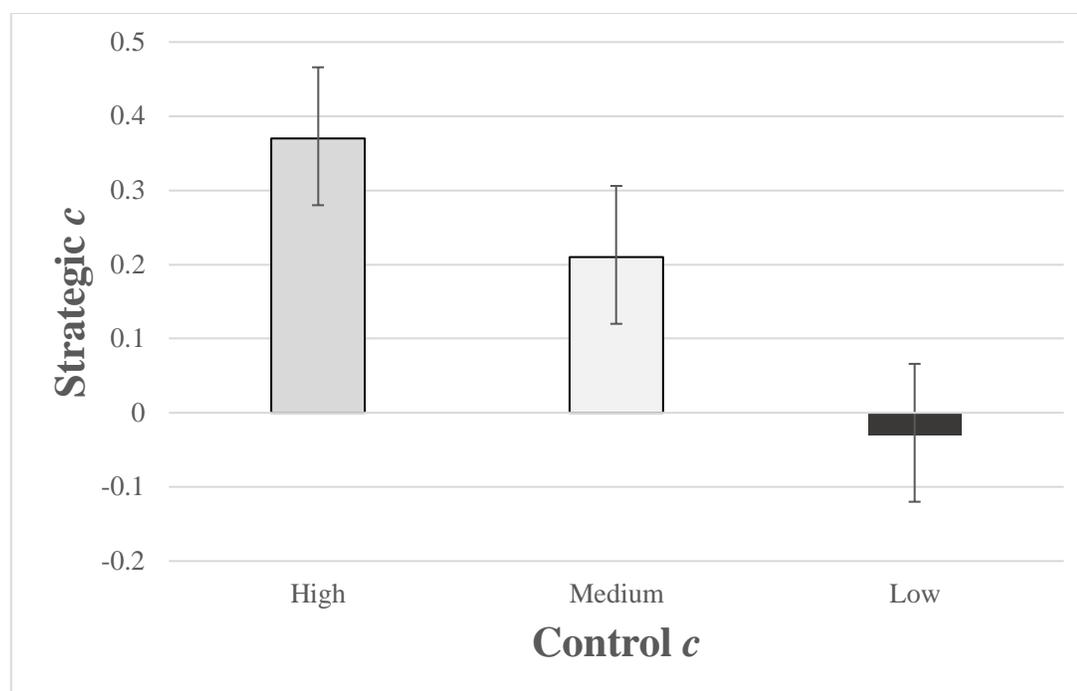


Figure 2: Mean Strategic *c* by Control *c* Performance

\*Note: Bars represent 95% confidence intervals

**Alibi Interviews.** Regression analyses were performed to assess how performance during control phases of the alibi interview predicted performance during strategic phases. First, it was found that participants' lie performance during control was positively associated with their lie performance during strategic ( $r = .24$ ). For truth performance, there was a marginally significant positive effect ( $r = .16$ ). Additionally, control response bias was found to be predictive of strategic response bias ( $r = .28$ ). There was no significant relationship between control and strategic  $d'$  estimates ( $r = .03$ ).

In the ANOVA analyses, participants were divided into three groups based upon control performance. Analyses were then run to see if the groups differed on performance during strategic interviews. On truthful trials, there were no significant differences between groups,  $F(2,132) = 1.35, p > .26$ . High performers ( $M = .62, 95\% \text{ CI } [.56, .69]$ ) were no better during the strategic interview than medium ( $M = .55, 95\% \text{ CI } [.48, .62]$ ) or low performers ( $M = .57, 95\%$

CI [.49, .62]). On deceptive trials, there was a main effect of group,  $F(2,132) = 3.61, p < .03$ ,  $partial\ eta^2 = .05$ . However, post hoc analyses revealed that high performers ( $M = .68$ , 95% CI [.60, .75]) were no different from medium ( $M = .67$ , 95% CI [.60, .74]) or low ( $M = .56$ , 95% CI [.50, .63]) performers. There was no main effect of group on  $d'$  estimates ( $F(2,132) = .52, p > .59$ ). However, there was a main effect of group on estimates of  $c$ ,  $F(2,132) = 5.35, p < .001$ ,  $partial\ eta^2 = .08$ . Estimated marginal means demonstrated that high performers ( $M = .74$ , 95% CI [.50, .99]) were significantly better than low performers ( $M = .20$ , 95% CI [-.05, .44], *Cohen's*  $d = .64$ ) but not better than medium performers ( $M = .34$ , 95% CI [.11, .57]). Medium and low performers were not significantly different from one another.

Taken together, these analyses provide support for hypothesis 8. Individuals that performed well under control conditions also performed well under strategic conditions and the use of the reverse order recall tactic did not aid in the discrimination of good liars.

**Travel Interviews.** Regression analyses were used to predict performance under strategic conditions from performance under control conditions. Overall, there was no significant relationship between truth performance ( $r = .09$ ) or  $d'$  ( $r = .03$ ) on control and strategic interviews. However, there was a significant positive relationship between lie performance during strategic and control, ( $r = .46$ ). Additionally, response bias during control was also positively related to response bias during strategic, ( $r = .29$ ).

Similar results were found in the ANOVA analyses, where there were no group differences on truth performance ( $F(2,132) = .58, p > .56$ ) or  $d'$  ( $F(2,132) = .44, p > .64$ ). However, there was a main effect of group on lie performance,  $F(2,132) = 20.15, p < .001$ ,  $partial\ eta^2 = .23$ . Estimated marginal means demonstrated that high performers ( $M = .73$ , 95% CI [.66, .80]) were significantly better than low performers ( $M = .46$ , 95% CI [.39, .52], *Cohen's*

$d = 1.34$ ) but not better than medium performers ( $M = .69$ , 95% CI [.61, .75]). Furthermore, medium performers were significantly better than low performers *Cohen's d* = .95. A main effect of group was also found for response bias,  $F(2,132) = 4.55$ ,  $p < .01$ , *partial eta*<sup>2</sup> = .07).

Estimated marginal means showed that high performers ( $M = .65$ , 95% CI [.40, .90]) were significantly better than low performers ( $M = .11$ , 95% CI [-.14, .36], *Cohen's d* = .62), but not medium performers ( $M = .37$ , 95% CI [.11, .62]). There was also no difference between medium and low performers.

Taken together, these results support hypothesis 9 in that lying ability (as assessed by performance on control trials) was related to performance in the CCE approach.

**Opinion Interviews.** As with the alibi and travel interviews, regression analyses were performed to see how performance during control conditions related to performance during strategic conditions. Results of those analyses revealed that performance during the control section was not related to performance during the strategic section. There was no relationship between truth performance ( $r = .06$ ), lie performance ( $r = -.03$ ),  $d'$  ( $r = -.14$ ), or  $c$  ( $r = .10$ ), on the control and strategic phases of the interviews. Similar results were found in the ANOVA analyses as there were no main effects of group for truth performance ( $F(2,132) = .24$ ,  $p > .79$ ), lie performance ( $F(2,132) = 2.12$ ,  $p > .12$ ),  $d'$  ( $F(2,132) = 1.61$ ,  $p > .20$ ), or  $c$  ( $F(2,132) = 1.10$ ,  $p > .34$ ). Taken together, these results fail to support hypothesis 10 as performance during the control phase of the interviews did not relate to performance during the strategic phase of the interviews.

## CHAPTER 4. DISCUSSION

The current dissertation sought to answer three primary research questions. First, are individuals able to accurately predict their own lying performance? Second, are there specific cognitive and personality traits that are related to the ability to lie well? Third, how will good and bad liars fare against newer interview techniques that are designed to make lying more difficult? The results and broader implications of these questions are discussed in detail below. However, before discussing those results, the question at the heart of this research is discussed, namely what does good lying look like?

### Perception Is Reality

In prior research on lying and deception, performance on lying tasks has been measured in overall performance accuracy, as well as discrimination between lies and truths. Can observers tell the difference between a truth and a lie and under what conditions is this easier or more difficult? Judges of deception seek to be able to accurately call a truth a truth and a lie a lie. They seek not to be biased towards one outcome or the other (i.e., not always see truth or lie), but rather to be able to accurately discriminate between the two. With that in mind, the goal of the liar is not to affect discrimination accuracy (at least not directly), but rather to induce the bias that judges are seeking to avoid. *Good liars want to be seen as truthful in all contexts.* If someone is always perceived as truthful, you have no cause to believe that they may be lying. Coming into this project, good lie performance had been viewed as having an outcome on discrimination accuracy. However, over the course of conducting the experiment and analyses this position has changed and it was discovered that good liars effect response bias, not discrimination accuracy. They do not want their lies to be called truths and their truths to be called lies, but rather seek to have every statement, both truthful and deceptive, be judged as true.

Their lies must be indistinguishable from their truths so that observers and judges believe that they are always telling the truth. It is with this in mind that the findings are discussed with respect to lying ability.

### **Self-Calibration**

In regards to the first major research question, little empirical support was found for the notion that individuals are able to accurately predict their own lying performance. There was no relationship between overall confidence in one's own ability or any of the interview outcome measures. Additionally, self-reported lie frequency was only related to overall discrimination, and not to response bias. Telling more lies (and by extension being a more experienced liar) does not necessarily make one better at lying. This is evidenced by the fact that lie frequency only affected  $d'$  and not  $c$ . As previously stated, a low  $d'$  is not necessarily indicative of good lie performance as someone who is always judged as telling the truth would have the same  $d'$  as someone who was always judged as lying. If lie frequency were related to lie performance we would expect it to affect response bias, not discrimination accuracy. Additionally, only partial support was found for the hypothesis that lying ability exhibits a Dunning-Kruger effect. While there was no evidence of high confidence overall, performance on deceptive trials was related to better calibration scores. Individuals that were detected as lying less often were better calibrated to their own performance compared to those that were detected more often. Nevertheless, the data suggest that individuals are generally unable to accurately predict their own performance when lying.

### **Individual Predictors**

The current dissertation found evidence that some of the individual difference measures collected were related to lying ability. However, it should be noted that the factor analysis on all

twelve interviews resulted in only 16% of the variance explained. While it is promising that some of the variance was able to be explained. Those results show that the ability to tell truths and lies may not be a consistent trait. Put another way, performance during one interview was not strongly predictive of performance during another interview. Therefore, while some evidence was found to support the idea that there are individual differences in lying ability, overall lying ability in itself may be a difficult trait to explain due to its inconsistent nature. That being said, the results identify some traits that were related to overall ability.

This research found some evidence that the Dark Triad traits of psychopathy, Machiavellianism, or narcissism are related to overall lying ability. Of the three, only Psychopathy was predictive of the outcome measures relating to interview performance, however it was in the opposite of the expected direction. High scores in psychopathy were associated with being judged as a liar more often. One possible explanation for this is that the callous and anti-social nature of psychopaths was on display during the interviews and they may have had a harder time appearing credible. Additionally, some evidence was found for the relationship between those traits and overall confidence in the ability to lie or self-reported lie frequency, which is consistent with previous research. Prior research (e.g., Jonasen et al., 2014) has found that individuals who score high in the Dark Triad traits report lying more frequently and report more confidence in their ability to do so. These data support some of those findings as psychopathy and Machiavellianism were associated with telling more small and big lies (respectively). Additionally, both psychopathy and narcissism were associated with overall higher confidence in the ability to lie well.

Conversely, only one of the cognitive measures was related to overall performance: RSPAN performance. Individuals who scored higher on that task were detected as lying less

often and were judged as more truthful overall. Additionally, marginally significant effects were found for performance on the task switching task. These findings were in line with predictions in that such executive functions were hypothesized to be positively related to overall lying ability. Theoretically, these findings support the recent focus on the role of cognitive processes in lying (e.g., Vrij 2015). Greater executive function did result in better performance, and future studies should further assess the role of cognitive performance in effective lie presentation.

### **Strategic Performance**

Despite finding that cognitive function is related to lie performance, we did not observe any evidence that the newer strategic interview techniques, such as controlled cognitive engagement or reverse order recall, were particularly effective against more skilled liars. Performance under control conditions was related to performance under strategic conditions, suggesting that good liars are not affected by the techniques that are designed to make their lying more difficult. Similar results were found when participants were grouped based upon their performance during control the control phase. Future research should seek to further test this in order to better understand the effects that these techniques have against those that are better and worse at lying. However, there was variation in this finding as control and strategic performance were related in the alibi and travel interviews, but not in the opinion interviews. One possible cause of this is the nature of the opinion interviews themselves. While the alibi and travel interviews are primarily about autobiographical events, the opinion interviews related to statements of fact and arguments that support a position. Observers may have greater difficulty discerning whether a person truly holds an opinion compared to judging if an autobiographical story is truthful or not.

## Implications

**Understanding Processes Related to Lying.** The results of this study can be used to better understand the processes related to lying ability. These data offer little support for affective or impression management perspectives on lying. The only personality predictor that was related to performance was psychopathy, and it was in the opposite of the predicted direction. Individuals scoring high in psychopathy were judged as truthful less often when lying. One possible explanation of this may lay in the trait itself. Recall that those high in Machiavellianism tend to be more callous and anti-social (Jones & Paulhus, 2014) and those traits may have led them to not try as hard to appear truthful. Prior research had found that Psychopathy was related to the probability of lying for self-gain (Rose & Wilson, 2014), but given that nothing was to be gained from a good performance in the current study, individuals may not have been motivated to appear truthful when lying, leading them to be being discovered more often.

The current results also demonstrate the importance of cognitive processes in lying, as working memory capacity and (to a lesser extent) task switching ability were related to lie and truth performance. Participants who scored better in those tasks were seen as truthful more often, suggesting that they are paramount to being able to lie well. Theoretically, higher task switching ability and working memory capacity would allow participants to tell their lies with greater ease and would also allow them to better handle the strategic phases of the interviews. Future research should continue to investigate the role of these processes in successful lying.

**Applications.** One potential application of this research is in the development of selection tools for jobs that would require lying (e.g., undercover law enforcement). This research demonstrates the relationship of the cognitive processes of task switching and working

memory to effective lying, and thus individuals for such jobs may need to demonstrate high scores in such executive functions in order to succeed. Furthermore, these data could also be used to continue to aid in the detection of deception by law enforcement. This could be done in two ways. First, new strategic interview approaches could be designed to put added strain on task switching and working memory systems to further increase the difficulty of lying (e.g., cognitive load). Additionally, the knowledge that good liars likely influence the response bias of an observer could be used to attempt to keep observers from falling victim to that bias. Law enforcement professionals could be trained to keep their biases in check and potentially improve discrimination accuracy. However, that may prove difficult as law enforcement officers have been shown to have a lie bias (Meissner & Kassin, 2002). Researchers would need to develop training approaches designed to overcome that specific lie bias.

### **Limitations**

This research has several limitations which could hinder the generalization of its findings. First, the truths and lies that were told were low-stakes in that there were no real outcomes (e.g., getting charged with a crime) associated with telling a good or bad lie. The fact that the deception was low stakes could have minimized the role that some of the cognitive and personality traits may have played in lying performance. Using high stakes deception in future studies could help to further discriminate between good and bad liars. Furthermore, truths and lies in the current study could not be verified, which may have influenced the strategies that participants used to create their lies. If participants knew that the veracity of their story would be checked, it could lead them to both adopt different strategies and take greater care with respect to the plausibility of the narrative. Additionally, situations in which lies could be assessed may require greater use of the executive functions examined here – that is, skills such as inhibitory

control, task switching, and working memory capacity may play an even more important role in such situations.

**Type I Error.** Due to the exploratory nature of this project, a large number of statistical tests performed. More precisely, approximately 213 tests including correlations, t-tests, ANOVAs, and regression analyses were performed. This was necessary due to the large number of hypotheses and the overall exploratory nature of the design. However, one potential problem with that many analyses is the presence of type I error. Type I error refers to rejecting the null hypothesis when it is actually true, also known as a false positive. Due to the higher number of statistical tests performed, it is possible that some of analyses were significant only by chance. Overall, of the 213 tests performed, it would be expected that 10.7 of those tests would be significant by chance alone. However, the analyses above revealed 88 significant effects. That suggests that while type I error potentially may have led to some of the significant findings, it cannot account for all of them. In fact, the most that type I error can account for is approximately 12% of the significant results. Therefore, it is unlikely that statistical error can account for all of the significant findings above. Future research should seek to address this issue by following up on the above findings in a less exploratory design.

### **Future Directions**

The current studies represent only the beginning of a much-needed line of research examining factors that predict objective lie performance. With regard to the current data, there are several additional analyses that we would like to do. First, the interview videos could be coded using objective coding schemes such as the Psychologically Based Credibility Assessment Tool (PBCAT) (see Evans et al., 2015) or Criteria Based Content Analysis (CBCA, see Vrij & Mann, 2007). The PBCAT is an eleven-item measure that assesses cues that have been found to

be related to deception or truthfulness. These items include: auditory details, spatial details, temporal details, admitted lack of memory, spontaneous corrections, overall quantity of details/talking time, contradictions/plausibility, whether the participant appeared to think hard about the event, nervousness, negativity/complaints, and the participants' rate of speech. CBCA involves the coding of nineteen cues/elements that have been found to be related to veracity.

Relationships between the current set of individual difference measures and statement analysis or verbal cue coding of the interviews should be examined. Additionally, correspondence between observer ratings and the coding of verbal cues can be assessed to identify whether any cues may be related to outcome variables of truth and lie performance, as well as  $d'$  and response bias.

Additionally, as noted by Vrij (2015), many of the new strategic interview approaches are designed to be used to assess credibility within subjects. In other words, a strategic approach such as reverse order recall is designed to be used in conjunction with control interview phase. The idea is that the interviewer (or observer/judge) would be able to see participants' performance under both control and strategic phases and that a comparison of the two would yield the best discrimination accuracy. This could be assessed by having observers watch both the control and strategic portions of an interview before making a judgment. Additionally, coding using the PBCAT could be done for each interview part independently (control vs. strategic vs. both) to assess how well the coding of the individual parts (control or strategic) align with coding of the entire interview.

Furthermore, new approaches to analyzing observer data have recently been explored (see Smith & Leach, 2019). Briefly, that research has focused on the importance of confidence judgments in observers and found that high confidence judgements have been found to be more accurate than low confidence judgements. With that in mind, a re-analysis of this data could be

done factoring in the confidence judgments of the observers. If high confidence is related to accuracy in observers, can senders (i.e., participants) be identified who were more often judged with high or low confidence? If so, do any of the individual difference measures collected predict the confidence with which the senders were judged? Furthermore, differences between interview type and control vs. strategic phases can be examined. In addition to that, comparisons can also be made to examine the correspondence between sender confidence (how confident the statement was to be believed) and observer confidence (how confident they were in their judgment).

Future research can also examine the relationships between other executive function tasks and lie performance. It has been demonstrated that many executive function tasks are related to one another (see Miyake & Friedman, 2014), and future studies could examine the role of other executive function tasks. In line with that, researchers should assess executive tasks that focus on a specific executive function. Over the course of this project, it was noted that that the task switching task is possibly a measure of both task switching and inhibition, and may even use some working memory resources. Furthermore, the paradigm that was used was originally used to study inhibition in task switching and thus, the task switching measure here is likely not a clean measure of true task-switching performance. Therefore, it would be best to use the cleanest executive function tasks in the future.

Lastly, future research can build upon these findings and seek to better understand the role that personality traits and cognitive functions play in lying ability. One potential approach is to examine the influence of cognitive functions when the interviewees have no time to prepare for the lie. Might these abilities play a more important role when one has to lie quickly? Furthermore, the effects of other strategic interview approaches (e.g., the model statement, or

other forms of cognitive load induction such as maintaining eye contact) can also be explored with respect to how well they function on good vs. poor liars.

## **Conclusion**

In conclusion, this project was the first to attempt to identify individual differences in lying ability as demonstrated by observer ratings of truthful and deceptive statements. We found that individuals overall were not good at accurately predicting their own performance. However, we also found that certain cognitive abilities such as task switching ability and working memory capacity and the personality trait of Machiavellianism were related to lying performance. Additionally, new strategic interview approaches such as reverse order recall and controlled cognitive engagement did not appear to be effective against good liars. Lastly, we end by speaking to the importance of understanding what it means to be a good liar. Lying well is not done by influencing overall discrimination between lies and truths, but rather is done by inducing a truth bias in the observers such that all statements, both truthful and deceptive, are consistently categorized as the truth.

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## APPENDIX A: IRB APPROVAL LETTER

**IOWA STATE UNIVERSITY**  
OF SCIENCE AND TECHNOLOGY

Institutional Review Board  
Office for Responsible  
Research Vice President for  
Research 2420 Lincoln Way,  
Suite 202  
Ames, Iowa 50014  
515 294-4566

**Date:** 11/26/2018  
**To:** Dominick Atkinson Christian A Meissner  
**From:** Office for Responsible Research

**Title:** What makes a good liar? The relationship between cognitive and personality assessments and lying ability using traditional and strategic interview approaches.

**IRB ID:** 18-449

**Submission Type:** Initial Submission

**Review Type:** Full Committee

**Approval Date:** 11/26/2018

**Date for Continuing Review:** 11/25/2020

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

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

- **Use only the approved study materials** in your research, including the **recruitment materials and informed consent documents that have the IRB approval stamp.**
- **[Retain signed informed consent documents](#) for 3 years after the close of the study,** when documented consent is required.
- **Obtain IRB approval prior to implementing any changes** to the study.
- **Inform the IRB if the Principal Investigator and/or Supervising Investigator end their role or involvement with the project** with sufficient time to allow an alternate PI/Supervising Investigator to assume oversight responsibility. Projects must have **an [eligible PI](#)** to remain open.
- **Immediately inform the IRB of (1) all serious and/or unexpected [adverse experiences](#)** involving risks to subjects or others; and (2) **any other [unanticipated problems](#) involving risks** to subjects or others.

- **Stop all human subjects research activity if IRB approval lapses**, unless continuation is necessary to prevent harm to research participants. Human subjects research activity can resume once IRB approval is re-established.
- **Submit an application for Continuing Review** at least three to four weeks prior to the **date for continuing review** as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.
- Please be aware that IRB approval means that you have met the requirements of federal regulations and ISU policies governing human subjects research. **Approval from other entities may also be needed.** For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **IRB approval in no way implies or guarantees that permission from these other entities will be granted.**
- Please be advised that your research study may be subject to [post-approval monitoring](#) by **Iowa State University's Office for Responsible Research**. In some cases, it may also be subject to formal audit or inspection by federal agencies and study sponsors.
- Upon completion of the project, transfer of IRB oversight to another IRB, or departure of the PI and/or Supervising Investigator, please initiate a Project Closure to officially close the project. For information on instances when a study may be closed, please refer to the [IRB Study Closure Policy](#).

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or [IRB@iastate.edu](mailto:IRB@iastate.edu).

## APPENDIX B: MACHIAVELLIANISM PERSONALITY SCALE

Responses are on a 5 point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree).

1. I believe that lying is necessary to maintain a competitive advantage over others (A)
2. The only good reason to talk to others is to get information that I can use to my own benefit (A)
3. I am willing to be unethical if I believe it will help me succeed (A)
4. I am willing to sabotage the efforts of other people if they threaten my own goals (A)
5. I would cheat if there was a low chance of getting caught (A)
6. I like to give the orders in interpersonal situations (DC)
7. I enjoy having control over other people (DC)
8. I enjoy being able to control the situation (DC)
9. Status is a good sign of success in life (DS)
10. Accumulating wealth is an important goal for me (DS)
11. I want to be rich and powerful someday (DS)
12. People are only motivated by personal gain (DO)
13. I dislike committing to groups because I don't trust others (DO)
14. Team members backstab each other all the time to get ahead (DO)
15. If I show any weakness at work, other people will take advantage of it (DO)
16. Other people are always planning ways to take advantage of the situation at my expense (D)

Subscales: A: Amorality, DC: Desire for Control, DS: Desire for Status, DO: Distrust of Others.

**APPENDIX C: NARCISSISTIC GRANDIOSITY SCALE**

Narcissistic Grandiosity Scale (Crowe et al. 2016)

Rate yourself on the following adjectives on a scale of 1 (not at all) to 9 (extremely)

1. Perfect
2. Extraordinary
3. Superior
4. Heroic
5. Omnipotent
6. Unrivalled
7. Authoritative
8. Glorious
9. Prestigious
10. Acclaimed
11. Prominent
12. High-Status
13. Brilliant
14. Dominant
15. Envied
16. Powerful

**APPENDIX D: TRIARCHIC PSYCHOPATHY MEASURE**

(Patrick, Fowles, &amp; Krueger, 2009)

This questionnaire contains statements that different people might use to describe themselves. For each statement, select the choice that describes you best. There are no right or wrong answers; just choose the answer that best describes you (Items are responded to on a 4-point Likert scale).

1. I'm optimistic more often than not.
2. How other people feel is important to me.
3. I often act on immediate needs.
4. I have no strong desire to parachute out of an airplane.
5. I've often missed things I promised to attend.
6. I would enjoy being in a high-speed chase.
7. I am well equipped to deal with stress.
8. I don't mind if someone I dislike gets hurt.
9. My impulsive decisions have caused problems with loved ones.
10. I get scared easily.
11. I sympathize with others' problems.
12. I have missed work without bothering to call in.
13. I'm a born leader.
14. I enjoy of good physical fight.
15. I jump into things without thinking.
16. I have a hard time making things turn out the way that I want.
17. I return insults.
18. I've gotten in trouble because I missed too much school.
19. I have a knack for influencing people.
20. It doesn't bother me to see someone else in pain.
21. I have good control over myself.
22. I function well in new situations, even when unprepared.
23. I enjoy pushing people around sometimes.
24. I have taken money from someone's purse or wallet without asking.
25. I don't think of myself as talented.
26. I taunt people just to stir things up.
27. People often abuse my trust.
28. I'm afraid of far fewer things than most people.
29. I don't any point in worrying if what I do hurts someone else.
30. I keep appointments that I make.
31. I often get bored quickly and lose interest.
32. I can get over things that would traumatize others.
33. I am sensitive to the feelings of others.
34. I have conned people to get money from them.
35. It worries me to go into an unfamiliar situation without knowing all the details.
36. I don't have much sympathy for people.
37. I get in trouble for not considering the consequences of my actions.
38. I can convince people to do what I want.

39. For me, honesty really is the best policy.
40. I've injured people to see them in pain.
41. I don't like to take the lead in groups.
42. I sometimes insult people on purpose to get a reaction from them.
43. I have taken items from a store without paying for them.
44. It's easy to embarrass me.
45. Things are more fun if a little danger is involved.
46. I have a hard time waiting patiently for things I want.
47. I stay away from physical danger as much as I can.
48. I don't care much if what I do hurts others.
49. I have lost a friend because of irresponsible things I've done.
50. I don't stack up well against most others.
51. Others have told me they are concerned about my lack of self-control.
52. It's easy for me to relate to other people's emotions.
53. I have robbed someone.
54. I never worry about making a fool of myself with others.
55. It doesn't bother me when people around me are hurting.
56. I have had problems at work because I was irresponsible.
57. I'm not very good at influencing people.
58. I have stolen something out of a vehicle.

**APPENDIX E: RSPAN SENTENCES**

(from Notre Dame SPQR Memory Lab)

The lieutenant sat beside the man with the walkie-talkie and stared at the muddy ground.  
 I will not shock my readers with a description of the cold-blooded butchery that followed.  
 The courses are designed as much for professional engineers as for amateur enthusiasts  
 The taxi turned up Michigan Avenue, where they had a clear view of the lake.  
 The words of human love have been used by the saints to describe their vision of God.  
 It was shortly after this that an unusual pressure of business called me out of town.  
 He pursued this theme, still pretending to seek for information to quiet his own doubts.  
 I was so surprised at this unaccountable apparition, that I was speechless for a while.  
 When at last his eyes opened, there was no gleam of triumph, no shade of anger.  
 Filled with these dreary forebodings, I fearfully opened the heavy wooden door.  
 I'm not certain what went wrong but I think it was my cruel and bad temper.  
 I imagine that you have a shrewd suspicion of the object of my early visit.  
 I turned my memories over at random like pictures in a photograph album. .  
 It was your belief in the significance of my suffering that kept me going.  
 When in trouble, children naturally hope for a miraculous intervention by a superhuman.  
 With shocked amazement and appalled fascination Marion looked at the pictures.  
 There are days when the city where I live wakes in the morning with a strange look.  
 He stood there at the edge of the crowd while they were singing, and he looked bitter.  
 John became annoyed with Brad's bad habits of biting his nails and chewing gum.  
 Due to his gross inadequacies, his position as director was terminated abruptly.  
 It is possible, of course, that life did not arise on the earth at all.  
 The poor lady was thoroughly persuaded that she was not long to survive this vision.  
 After all he had not gone far, and some of his walking had been circular.  
 The announcement of it would resound throughout the world, penetrate to the remotest land.  
 To do so in directions that are adaptive for mankind would be a realistic objective.  
 Slicing it out carefully with his knife, he folded it without creasing the face.  
 He laughed sarcastically and looked as if he could have poisoned me for my errors.  
 He tolerated another intrusion and thought himself a paragon of patience for doing so.  
 The reader may suppose that I had other motives, besides the desire to escape the law.  
 On the desk where she wrote her letters was a clutter of objects coated in dust.  
 He stuffed his denim jacket into his pants and fastened the stiff, new snaps securely.  
 He had an odd elongated skull which sat on his shoulders like a pear on a dish.  
 The basic characteristic of the heroes in the preceding stories is their sensitivity.  
 He listened carefully because he had the weird impression that he knew the voices.  
 The rain and howling wind kept beating against the rattling window panes.  
 He covered his heart with both hands to keep anyone from hearing the noise it made.  
 The stories all deal with a middle-aged protagonist who attempts to withdraw from society.  
 Without tension there could be no balance either in nature or in mechanical design.  
 I wish there existed someone to whom I could say that I felt very sorry.  
 Here, as elsewhere, the empirical patterns are important and abundantly documented.  
 The intervals of silence grew progressively longer; the delays became very maddening.  
 Two or three substantial pieces of wood smoldered on the hearth, for the night was cold.  
 I imagined that he had been thinking things over while the secretary was with us.  
 There was still more than an hour before breakfast, and the house was silent and asleep.  
 He leant on the parapet of the bridge and the two policemen watched him from a distance.

## APPENDIX F: SELF-REPORT QUESTIONS

1. On average, how many times a day do you tell a little white lie?  
(0, 1, 2, 3, 4, 5, 10, 15, 20, 25+)
2. On average, how many times a day do you tell a big lie?  
(0, 1, 2, 3, 4, 5, 10, 15, 20, 25+)
3. How successful of a liar do you think you are?  

1	2	3	4	5	6	7
Not at all Successful			Somewhat Successful			Very Successful
4. When you tell lies, how often are they discovered?  

1	2	3	4	5	6	7
Always Discovered			Sometimes Discovered			Never Discovered
5. How confident are you in your lying ability?  

1	2	3	4	5	6	7
Not At All Confident			Somewhat Confident			Very Confident
6. How honest of a person do you think you are?  

1	2	3	4	5	6	7
Not at all Honest			Somewhat Honest			Very Honest
7. How trustworthy of a person do you think you are?  

1	2	3	4	5	6	7
Not at all Trustworthy			Somewhat Trustworthy			Very Trustworthy
8. How attractive of a person do you think you are?  

1	2	3	4	5	6	7
Not at all Attractive			Somewhat Attractive			Very Attractive

## APENDIX G: INTERVIEW PHASE QUESTIONNAIRE

1. How difficult was the interview that you just completed?

1	2	3	4	5	6	7
Not at all Difficult		Somewhat Difficult				Very Difficult

2. How hard was it to think during the interview?

1	2	3	4	5	6	7
Not at all Hard		Somewhat Hard				Very hard

3. How much effort did you put into controlling your behavior to appear credible?

1	2	3	4	5	6	7
No Effort At All		Some Effort				A Lot Of Effort

4. How truthful was the statement that you just made?

1	2	3	4	5	6	7
Not at all Truthful		Somewhat Truthful				Completely Truthful

5. How confident are you that you will be judged as truthful?

1	2	3	4	5	6	7
Not at all Confident		Somewhat Confident				Very Confident

**APPENDIX G: LIST OF OPINIONS FOR OPINION TASK**  
(from Deeb et al. 2018)

In this next task you will be asked to argue both for and against an opinion that you hold. First, please take a moment to rate how much you agree with the following statements:

1. Women should have the right to have an abortion.
2. Capital punishment (i.e., the death penalty) should be a legal option in judicial systems for serious crimes.
3. CCTV cameras in streets and public areas is a good thing.
4. The US immigration laws should be much tougher for anyone wanting to live in the US.
5. I am firmly atheist (don't believe in God).
6. Banning smoking in public places is a good thing.
7. Euthanasia should be a lawful option in the terminally ill.
8. Obese people should pay for their own healthcare.
9. It is right that animals are used for experimentation in medical research.
10. Governments should allow polygamy (marriage to more than one spouse).
11. Sex before marriage is morally wrong.
12. Couple should not live together before being married.
13. I support the Democratic Party.
14. Arranged marriages should not be allowed.
15. Telling your children that Santa Claus exists is wrong.
16. I generally agree with Donald Trump's remarks.
17. I would not mind if the President of my country was female.
18. It is okay for the minimum age for purchasing alcohol to be 18 years.
19. The inclusion policy at schools, wherein children with behavioral problems are kept in mainstream school classrooms, is a good thing.
20. I support the Republican Party.
21. Governments should allow the use of marijuana for personal use.
22. The refugees' crisis will have an increased negative influence on the United States.

Note: Ratings will be on a 1-7 Likert Scale ranging from strongly disagree to strongly agree.