Lie to Me: Can Training Improve Social Deception Detection Abilities in Neurotypical Adults?

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Dedication

Ultimately, this work and its follow-on efforts are dedicated to all of us who seem a little "off" or "not quite right" – regardless of the injury. It is my hope that continued related research will chip away at the challenges of reintegrating those who have experienced brain injury to their personal, social, and professional circles.

Dedicated also to my Editors for their tireless efforts over the last *few* decades (and, with a new ranking member, for the next several). This accomplishment was only possible with their unconditional love and reality checks ("just think about it"). Thank you for being proud – even when I have trouble "just getting started".

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Abstract

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Social lies are integral to communication; people deceive others an average of one to two times a day during social interactions. This study investigated whether training using the Psychologically-Based Credibility Assessment Tool (PBCAT) improved detection of social lies. Twenty neurotypical participants were randomly assigned to either a training or no training condition. Those in the training condition received information about truth and lie detection based on cues in the PBCAT. The untrained group did not receive any training. Participants in both conditions viewed videos of social interactions in which people were either telling the truth or lying. The results indicate that the PBCAT training did not significantly improve neurotypical adults' abilities to identify social lies, which is in line with previous research findings of an approximately 54% rate of detection accuracy. All participants – with or without training – showed a bias toward believing communication partners were telling the truth in social contexts and all were more accurate at identifying true statements than lies.

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Chapter 1: Introduction

Everybody Lies

Everybody lies – people routinely admit to deceiving others at an average rate of one to two times a day during social interactions (Frank & Svetieva, 2013; DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996). The media is rife with claims about how 'anyone' can learn to detect deception (Frank & Svetieva, 2013). However, the ability to accurately distinguish lies from truth is much more nuanced and complicated than popular culture suggests. People cannot see into the thoughts, feelings, or intentions of others, so "we make our best-guess, estimate about what others are thinking, feeling, or intending by listening to their words and observing their actions and… taking them at face value" (Frank & Svetieva, 2013, p. 121; Grice, 1991). Often, this results in the expectation that communication is truthful during daily interpersonal interactions, a phenomenon referred to as the *truth bias* (Burgoon & Levine, 2010; Levine, Kim, Park, & Hughes, 2006; Levine, Park & McCornack, 1999).

What is a lie?

Deception is defined as a message "knowingly and intentionally transmitted to mislead another person" (Burgoon & Levine, 2010, p. 202). Lying, which is a subset under deception, is characterized as requiring deliberateness and prior notification. Deliberateness means that lies are conscious attempts to mislead a listener, whereas other forms of deception may be unintentional (Ekman, 2001; Frank & Ekman, 2004a; Frank & Svetieva, 2013). A lie does not include contexts in which the speaker believes what they are saying (Frank & Ekman, 2004a). If a speaker knows their message is inaccurate and

misleading, then their message is a lie (Ekman, 2001; Frank & Ekman, 2004a; Frank & Svetieva, 2013).

The absence of advanced notice, called prior notification, that a speaker will mislead a listener further distinguishes lies. Prior notification exists in cases where listeners permit themselves to be misled – as in cases of reading novels or watching fictional movies – where the speaker is expected to mislead for the sake of story-telling (Ekman, 2001; Frank & Ekman, 2004a; Frank & Svetieva, 2013). There is no prior warning in lying, leaving the listener without expectation that he will be misled. With these definitions outlined, this study specifically investigates the ability to discern lies told in social context.

Lying in Social Contexts

The parameters of social interaction force communicators into a challenging dilemma: speakers sometimes have a social need to lie and listeners need to be able to believe the messages they hear. Frank and Svetieva (2013) suggest there are certain requirements of lies told in social context, hereafter referred to as "lies". They propose that some polite exchanges do not require that the speaker tells the outright truth, and that the listener does not use significant energy or attention to decode the speaker's message to seek out potential deceit (Frank & Svetieva, 2013; Bond & DePaulo, 2006). Instead, to communicate within the bounds of these social standards, speakers and their conversation partners compromise to find a balance between sharing exactly what speakers think and dissecting messages for hints of deception (Frank & Svetieva, 2013; Remland, 2000; Bond & DePaulo, 2006).

Research suggests that lies are quite pervasive across social interactions – so much so that, "as much as one quarter to one third of all conversations entail some form of deception" (Burgoon & Levine, 2010, p. 201). A meta-analysis conducted by DePaulo, Lindsay, Malone, Muhlenbruck, Charlton, and Cooper (2003) found that diary studies indicated that individuals average one to two lies per day. Most frequently, lies are told about feelings, preferences, attitudes, and opinions as well as about achievements and failures; less frequently, people lie about their actions, plans, and whereabouts (DePaulo et al., 2003).

The magnitude of lies told in social interactions can vary. Telling more serious lies results in higher consequences for the teller and the listener if the lies are discovered and can detrimentally impact the communication exchange and interpersonal relationship. These types of lies include those told to attempt self-preservation or to hide misdeeds, as in the cases of infidelity, crime, cheating, forms of betrayal, or other immorality (Bond & DePaulo, 2006; DePaulo et al., 2003). The most serious lies are attempts to hide transgressions, which, if found out, may gravely impact the teller (Bond & DePaulo, 2006; DePaulo et al., 2003).

Although serious lies are sometimes part of social interactions, lies that are told for the liar's own psychological reward are more common (DePaulo et al, 2003). Bond and DePaulo suggest that "most lies are little" and that tellers of these lies "have no reason to appear tormented" (2006, p. 216). DePaulo et al.'s (2003) meta-analysis suggests that these social lies are told to make liars "appear more sophisticated or more virtuous….to protect themselves, and sometimes others, from disapproval and disagreements and from getting their feelings hurt" (p. 76). Lying in social contexts is

aimed at managing impressions and claiming identities to ultimately monitor one's self-presentation (DePaulo et al., 2003). Although truth tellers may similarly monitor their messages to save face, they are honest in doing so; liars manage their self-presentation while choosing to deceive (DePaulo et al., 2003).

A few studies have asked liars to reflect on their feelings about everyday acts of social lying, and the results indicate that these lies are viewed as small and inconsequential (DePaulo et al., 2003). Tellers of these lies do not invest time planning their lies or worrying about being caught (DePaulo et al., 2003). Though participants who report telling these types of lies do not report feeling distressed about having lied, they do report feeling uncomfortable during and immediately following the act (DePaulo et al, 2003). Social situations in which these little lies were told were viewed as "more superficial and less pleasant" (DePaulo et al., 2003, p. 76).

In summary, deception in social contexts can include outright lies, omissions, acts of withholding information, and equivocation (Burgoon & Levine, 2010). Some lies are common and socially acceptable, such as those that attempt to protect the emotional well-being of a conversation partner or to protect how the speaker feels about himself (Saarni & Lewis, 1993). These small acts of deception, or white lies, are seen as polite and socially acceptable and necessary to the fabric of socialization (Bond & DePaulo, 2006; Frank & Svetieva, 2013). Saarni and Lewis (1993) conclude that strongly felt emotions relate closely with deciding to lie. In fact, these strong emotions may lead to the teller exhibiting signs of deception, such as evidence of feeling guilty, anxious, or ashamed and increasing speaking pitch or appearing nervous or tense (Bond & Depaulo, 2006; DePaulo, et al., 2003).

Deception Detection Accuracy Rates

Bond and DePaulo (2006) suggest that, "signs of deception are subtle, and social norms encourage people to accept others' representations at face value" (p. 215). Given the potential consequences associated with lying to a conversational partner, the human bias to think that our conversational partner is being truthful, and the implicit social need to strike a balance between these, it is reasonable to presume that people should be relatively good at detecting lies. Surprisingly however, individuals detect deception at a rate only slightly above chance. Under experimental conditions, accuracy rates of 54% have been identified, which are statistically above chance (Bond & DePaulo, 2006). The literature identifies accuracy rates that range from 45% to 65% (Burgoon & Levine, 2010; Bond & DePaulo, 2006). Of note, this accuracy rate is deduced from studies that have sought to identify both truth detection (where participants are asked to identify true statements) and deception detection (where participants are asked to identify lies). When only deception detection rates are considered, the accuracy rate falls to 47%, with better performance when participants are asked to detect truth (Burgoon & Levine, 2010). Thus, although critical to social interaction, the general population is relatively poor (about as good as chance) at detecting deception.

Identifying the verbal and nonverbal cues to lying is a challenge to researchers. At a minimum, studies have concluded that there is no "Pinocchio's nose" to lying (Frank & Svetieva, 2013, p. 124). That is to say, research indicates that there is no unique behavior or pattern of behaviors that occur only during instances of lying (Frank & Svetieva, 2013; Zuckerman, DePaulo, & Rosenthal, 1981).

Demonstrative of how pervasive the lie detection challenge is, research indicates that professionals (law enforcement, federal polygraphers, criminal investigators, judges, etc.) are not appreciably more accurate than laypersons (Sporer & Schwandt, 2007; Bond & DePaulo, 2006; Ekman & O'Sullivan, 1991). Training programs provided to these experts have failed and, in some cases, have resulted in decreased accuracy rates (Sporer & Schwandt, 2007; Meissner & Kassin, 2002). These failures may relate to the challenges of identifying nonverbal cues consistently associated with lying, biases, and heuristics that lead observers to seek deception indicators that are not associated with lying (Sporer & Schwandt, 2007; Vrij, 2000; Meissner & Kassin, 2002).

A summary of relevant cues to lying

For decades, researchers have studied the verbal and nonverbal cues that distinguish telling lies from truth-telling (DePaulo et al., 2003). Much of the research on social lies has looked at lies told about feelings, facts, and attitudes by eliciting emotions using video clips wherein participants attempt to conceal or override their feelings (DePaulo et al., 2003). At its date of publication, the most current meta-analysis that investigated these cues leveraged all published research and examined more than 158 proposed behaviors identified in the research as associated with lying (DePaulo et al., 2003; Frank & Svetieva, 2013). The DePaulo et al. (2003) study concludes that liars demonstrate behaviors that make them appear more tense and less forthcoming than individuals telling the truth (DePaulo et al, 2003; Frank & Svetieva, 2013).

DePaulo et al. (2003) define social lies as lies where the speaker has a low level of motivation, is not lying about a transgression, and does not interact with the listener.

In their meta-analysis, they identify several cues that correlate with these types of lies (DePaulo et al., 2003). Of the cues found to be associated with telling a social lie, the following have been found to show a small to large effect size (d>|.20)| and to be statistically significant:

Table 1.
Cues to Deception from DePaulo et al., 2003

Category from DePaulo et al	Cue	Cue Definition (from DePaulo et al)	Direction
Are Liars Less Forthcoming than Truth Tellers?	*Details provided as a component of a complex response	Amount of detail included in the message, to include descriptions about elements of the story or timing and whether the message seemed complete	Speaker shared fewer details when telling a lie
Do Liars Tell Less Compelling Tales than Truth Tellers?	*Logical structure	Statements provided were characterized as a consistent and coherent series of events	Lies followed a less logical structure than true accounts
	*Discrepant, ambivalent	Accounts were discrepant; "information from different sources (e.g., face vs. voice) seems contradictory; speaker appears ambivalent" (p.113)	Liars were more discrepant or ambivalent than truth tellers
	Verbal and vocal involvement	Accounts shared were personal experiences or stories were told in a personal way; speaker is vocally expressive	Liars were less vocally expressive than truth tellers; Liars' included fewer descriptions of personal experiences; Liars' descriptions of events were less personal than truth tellers'

	Verbal and vocal uncertainty	"Speakers seem to be uncertain, insecure, or not very dominant, assertive, or empathetic; … seem to have difficulty answering the question" (p.114)	Liars were more verbally and vocally uncertain than truth tellers
Are Liars Less Positive and Pleasant Than Truth Tellers?	*Negative statements and complaints	How negative the message seems or whether the message includes negative statements or complaints	Liars make more negative statements and complaints than truth tellers
Are Liars More Tense Than Truth Tellers?	*Overall nervous or tense	Speaker appears nervous or tense or exhibits body movements associated with nervousness or tension	Liars exhibit more characteristics of nervousness or tension than truth tellers
	Frequency, pitch	Pitch sounds high	Liars' voices sound higher-pitched than truth tellers'

Note. *Denotes characteristics used in the Psychologically-Based Credibility Assessment Tool (PBCAT)

This meta-analysis identified several other characteristics that are associated with lies across contexts (not just social lies). Characteristics that align with the PBCAT training tool (explained in the next section) are described in Table 2 on the next page.

Table 2.
Additional Cues to Deception Seen in the PBCAT from DePaulo et al. (2003)

Category from DePaulo et al	Cue	Cue Definition (from DePaulo et al)	Direction
Are Liars Less Forthcoming than Truth Tellers?	Sensory Information	Speakers describe sensory details to include sounds, color	Liars share less sensory information than truth tellers
	Talking Time	How talkative the speaker seems; how much of the allotted time they use for talking	Liars used less talking time than truth tellers
	Rate of Speaking	Syllables or words spoken per unit of time	Liars speak more rapidly than truth tellers
Do Liars Tell Less Compelling Tales Than Truth Tellers?	Plausibility	How plausible the story seems	Liars' stories were less plausible than those told by truth tellers
Do Lies Include Fewer Ordinary Imperfections and Unusual Contents Than Truths?	Spontaneous Corrections	Spontaneously correct elements of the story told	Liars make fewer spontaneous corrections than truth tellers
	Admitted Lack of Memory	Speaker admits that they do not remember facts	Liars less frequently admit to lack of memory than truth tellers
	Verbal and Vocal Immediacy (Impressions)**	"Speakers respond in ways that seem direct, relevant, clear, and personal rather than indirect, distancing, evasive, irrelevant, unclear, or impersonal" (p.114)	Liars demonstrate less verbal and vocal immediacy than truth tellers, suggesting they respond in ways that are more "indirect, distancing, evasive, irrelevant, unclear, or impersonal"

**Note: Found to correlate most closely with "thought hard" in the PBCAT; "thought hard" does not directly appear as a characteristic of lying in the meta-analysis

In the greater context of telling lies – both social and more serious lies – this meta-analysis confirmed that liars provide fewer details than truth tellers and identified a trend that there is less sensory information in lies than in true statements (though the latter is a nonsignificant trend) (DePaulo et al., 2003). DePaulo et al. (2003) found that the most reliable indicator associated with the finding that liars are less forthcoming is that they provide fewer details in their accounts. They found that lies make less sense than truths because they are less plausible, less likely to be logically structured, and are more likely to demonstrate internal discrepancies or suggest ambivalence (DePaulo et al., 2003). Across social and more significant lying contexts, liars appeared less verbally and vocally involved in their story-telling and displayed fewer gestures during speech than truth tellers (DePaulo et al., 2003). Liars were found to be less immediate than those telling the truth and liars used more linguistic constructions that distanced them from listeners or from their spoken content, resulting in appearing evasive, unclear, and impersonal (DePaulo et al., 2003). Additionally, liars in social contexts, as well as all contexts, sounded more uncertain than truth tellers (DePaulo et al., 2003).

Interestingly, liars were found to raise their chins, which is a facial manipulation typically associated with certainty and one that is characteristic of winning in conflict situations (DePaulo et al., 2003). The only type of speech disturbance found to be statistically reliably associated with deception stories was the repetition of words and phrases (DePaulo et al. 2003). Overall, lies were less compelling, made less sense, and the stories were told in less engaging and less immediate ways than truths (DePaulo et al. 2003). Liars sounded more uncertain and less involved in their stories than those telling the truth (DePaulo et al., 2003).

With regard to positivity and pleasantness of liars in all contexts, DePaulo et al. (2003) found that liars were less cooperative and made more negative statements and complaints. They also had less pleasant facial expressions than truth tellers (DePaulo et al., 2003). Across lying contexts, liars were also more nervous and tense, spoke at a higher pitch, and had more dilated pupils (DePaulo et al., 2003). Liars in all contexts were less likely to spontaneously correct their stories to avoid admitting imperfections, though liars mentioned events tangential to the key story more frequently than those telling the truth (DePaulo et al, 2003). In summary, cues to detection are multiple and vary by context (social vs. serious lies), making deception detection difficult.

Improving lie detection ability

Researchers have attempted to develop tools to assist adults in accurately detecting deception. The Psychologically-Based Credibility Assessment Tool (PBCAT) was initially tested in the evaluation of true and false alibi statements presented under different levels of cognitive load (Evans, Michael, Meissner, & Brandon, 2013). The tool was developed with the intent to be an easy-to-train and easy-to-use tool for veracity assessment (Evans, Michael, Meissner, & Brandon, 2013). It integrates research on the emotional theory, which links feelings of guilt, fear, and excitement to the experience of telling a lie (Evans, Michael, Meissner, & Brandon, 2013; Ekman, 1989; Ekman, 2001). As explained by Evans et al. (2013), liars may demonstrate characteristics of guilt, which, "may result in behavioral cues, such as gaze aversion". Liars also may demonstrate characteristics of fear, as relates to the fear of being caught; fear may lead to appearance of arousal, which could manifest in increased "fidgeting, speech errors, and speech

hesitations" (Evans, Michael, Meissner, & Brandon, 2013, p. 34). The correlates with arousal may also result from feelings of "excitement from the challenges of trying to "trick" the detector" (Evans, Michael, Meissner, & Brandon, 2013, p. 34). The PBCAT includes these behaviors and adds negativity and uncertainty, cues identified in the DePaulo et al. (2003) meta-analysis.

The PBCAT focuses users' evaluation of eleven behavioral cues to render a credibility assessment (Evans, Michael, Meissner, & Brandon, 2013; Evans & Michael, 2014). It asks raters to evaluate seven cues to truth: sensory details (auditory, spatial, and temporal), admitted lack of memory, spontaneous corrections, overall quantity of details/talking time, whether the story makes sense (considering contradictions and plausibility) (Evans & Michael, 2014). This tool also asks raters to evaluate four cues to deception: how hard the speaker is thinking, whether the speaker seems nervous (presence of tenseness or fidgeting), negativity or complaints, and overall rate of speech (Evans & Michael, 2014).

This tool has been proven to successfully guide the rater to make veracity judgements with increased accuracy, finding that accuracy in truth detection (i.e. identifying that a true statement has been given) improves to 72% when judging liars under high, moderate, and low cognitive load and that accuracy in lie detection (i.e. identifying that a lie has been told) remains at 50% when judging liars under high, moderate, and low cognitive load (Evans & Michael, 2014). This study found an increase in overall accuracy (truth and lie detection) of 60% (up from 54%) across levels of cognitive load, with the highest overall accuracy noted when judging speakers under moderate cognitive burden (68% overall accuracy) (Evans & Michael, 2014).

Participants in this study were university students who were asked to judge speakers in videos who were also university students (Evans & Michael, 2014).

Research suggests that the PBCAT improves accuracy rates in cases where the speaker is under a higher cognitive load while presenting their story and that the PBCAT more effectively increases accuracy of truth detection than lie detection (Evans, Michael, Meissner, & Brandon, 2013). Consistent with research on the broad spectrum of cues associated with deception, a unique strength of the PBCAT is that it asks the user to integrate multiple cues to predict deception rather than focusing on isolated components.

Purpose of the current study

This study aims to replicate the findings of Evans and colleagues by extending the use of the PBCAT to a new set of videos with a particular investigation into low stakes, low cognitive burden lying, which replicates social context. This study is the first in a series of studies that will 1) evaluate the effects of PBCAT training on the detection abilities of neurotypical adults [current study]; 2) compare the deception detection abilities of neurotypical adults to those with brain injury; and 3) evaluate the effects of PBCAT training in adults with brain injury.

This study focuses on detecting small stakes, 'little lies' that occur frequently in everyday social interactions as a critical component of pragmatic communication and social cognition. Social cognition is defined as the ability to accurately perceive and appreciate affective information from facial expressions, emotional prosody, body posture, and contextual parameters" (Bornhofen & McDonald, 2008, p. 512). Pragmatic deficits are especially long-lasting and detrimental to future success and are shown not to

improve – and even to worsen – without treatment (Prigatano, 1987). Up to 65% of patients with moderate to severe traumatic brain injury (TBI) report long-term cognitive functioning deficits, which impact life in personal and professional settings (Rabinowitz & Levin, 2014). The current study investigates a specific area of pragmatics – social lying – which may contribute to the reduced social functioning abilities suffered by individuals who have experienced TBI. Although patients with TBI demonstrate the ability to comprehend indirect speech, they demonstrate deficits in comprehending irony and distinguishing sincere speech from that which is deceitful (Channon & Watts, 2003; Bara, Tirassa, & Zettin, 1997).

The independent variable in the current study is PBCAT training (+training/-training). The dependent variable is lie detection accuracy. The research questions are:

1) Does the lie detection accuracy rate differ for the trained and untrained groups of neurotypical adults?
2) Does the PBCAT improve neurotypical performance in deception detection above the approximately 50% accuracy reported in research for the untrained neurotypical population?

Chapter 2: Method

Participants

A total of 20 neurotypical males aged 25-35 years old (median age = 30.8 years) were recruited. For the purposes of this study, "neurotypical adults" were defined as adult individuals who self-identified as having typical brain health, no neuropathology, and who have no documented history of TBI. Recruitment was conducted through flyers posted in academic and recreational buildings of The George Washington University, through electronic distribution of flyers, and through direct recruiting of the researchers' personal and professional contacts. Participants must have never had training or experience in deception detection through speech-language services, academic coursework, or professional activity. Participants were not incentivized or compensated in any way for their participation. Informed consent was obtained and patients were debriefed following participation in the study in accordance with procedures set forth by The George Washington University Institutional Review Board (IRB).

Participants were randomly assigned to one of two groups: one that received training using the PBCAT and one that did not receive training.

Materials

Rating sheets: Trained Group

The trained group used a rating sheet based on the PBCAT to make veracity judgments. The PBCAT (Appendix A) integrates raters' evaluations of eleven behavioral cues to assist them in making a credibility assessment (Evans, Michael, Meissner, & Brandon, 2013; Evans & Michael, 2014). As outlined in the Introduction, the PBCAT

asks raters to assess seven cues to truth and four cues to deception (Evans & Michael, 2014). The PBCAT rating sheet contained prompts for raters to judge each area, and had a box labeled "judgement," where the participant was asked to enter a determination of "true" or "false" after completing the PBCAT form (Appendix A). In a previous study, the PBCAT was found to be successful at guiding the user who is otherwise inexperienced in lie detection toward making veracity judgements with increased accuracy, especially when the liar is under a higher cognitive load (Evans & Michael, 2014).

Rating Sheets: Untrained Group

Participants in the untrained group were given a 10-page packet containing 10 rating sheets, one sheet for each video they viewed (Appendix B). Each rating sheet had the word "judgment" written on it with two checkboxes, one for true and one for false. Each sheet was clearly marked to indicate which video of the sequence corresponded to each page in the packet.

Video Stimuli

Researchers created a total of eight videos of persons recounting either a truthful story or creating a completely fabricated account of an event from the previous Saturday night. Four videos contained persons telling the truth and four videos contained persons telling lies. These videos became the stimuli that were viewed and evaluated by the neurotypical adults in this study.

Three male and five female adults were recorded in the video vignettes. They ranged in age from 27 to 68 years old (median = 41). These adults, here referred to as "actors", were recruited through posting of flyers, electronic distribution of flyers, and through direct recruitment of researchers' professional and personal contacts. Recruitment expanded beyond the university population to broaden the age and diversity of participants in an attempt to increase the variation of stories, personalities/background, speech styles, and appearance. This was done in an attempt to simulate the breadth of individuals encountered during daily life activities. Selection criteria for the actor group required participants to be native English-speaking adults ages 18-70. Participation was not incentivized by the research team in any way; actors were not compensated, and their participation was strictly voluntary. Actors were offered the opportunity to withdraw from the study at any time. Informed consent was obtained prior to filming in accordance with IRB requirements.

The creation of the videos followed the procedures detailed in Evans and Michael (2014). Actors were assigned to a veracity condition so that there were a total of four true alibi videos and four false alibi videos. Actors assigned to the false condition were given one of four activities to incorporate in their alibi. Activities were randomly selected by assigning a number to each option and using an online randomizer to determine the order in which they would be assigned to actor participants in the false alibi condition. Actors were prompted to deliver their statements using the same prompt used in the Evans and Michael (2014) study with minor modifications. A copy of the instructions provided to actors in the true alibi condition is included in Appendix C; instructions provided to actors in the false alibi conditions are included in Appendix D.

Actors who were instructed to provide a true alibi were given no specific instructions other than to tell the truth regarding their whereabouts on the previous Saturday night between the hours of 7:00pm and 10:00pm. They were asked to be as detailed as possible in telling their stories (Appendix C).

The actors in the false condition were instructed to give a false alibi regarding their whereabouts on the previous Saturday night from 7:00pm to 10:00pm. They were asked to present an entirely false experience – not just to retell a true story of something that occurred on a different night. False alibi actors were instructed to fabricate an alibi statement that corresponded with a scenario/activity that was randomly assigned to them by the researchers (stayed home, went out for dinner and drinks, attended a Washington, D.C. cultural event, or went bowling) (Appendix D).

Both sets of actors were asked to be as detailed as possible in their scenarios and to focus on the details of who they were with, what they were doing, and where they were when providing their stories.

Immediately following presentation of the prompts (Appendices C and D), actors were permitted to ask any questions related to potential misunderstanding or misinterpretation of the prompt, which were answered by the researchers. Actor participants were also asked to repeat back to the researchers the condition they were assigned (both true alibi and false alibi conditions) and to repeat the instructions back to the researchers in their own words. Further instructions were provided to offer clarification, if necessary. Finally, the actor participants were asked to restate the three critical elements sought by the instructions (who they were with, what they were doing, and where they were). The actor participants were then given up to five minutes to

mentally prepare their statements (no materials were provided or permitted to allow actors to take notes on their alibis to reduce rehearsal effects). Following the planning period, actors were given a Sudoku puzzle to work on for fifteen minutes prior to being recorded to reduce potential rehearsal effects.

After the planning period and the distraction period, the researchers read the prompt, "where were you on the night in question between the hours of 7:00pm and 10:00pm?". After the prompt was read, the researcher pressed the record button on the Canon Vixia HF R42 video camera and the actor participants were recorded providing their alibi statements.

After each actor provided their alibi, the researcher asked 3 questions specifically related to the actor participant's presented alibi to which the actor responded spontaneously. The first two questions were broadly varied across participants but were relevant to details presented by the actors; the third question always related to asking the actor to reflect on an emotional component of their experience or the experience of someone they reported being with on the night in question (e.g. What did you have for dinner at the restaurant?; you mentioned you didn't have popcorn, why not?; did you enjoy the evening with your friends?). These questions were asked to add an element of spontaneity to the prepared responses presented in each alibi.

The eight video stimuli were collected using a Canon Vixia HF R42 video camera mounted on a tripod. For consistency, all videos were recorded in the same windowless room of the GWU Speech and Hearing Clinic using the same background and furniture. The same researcher interacted with all participants during video recording. Filming was scheduled at the convenience of the participants, with only one participant and one

researcher in the room at a time to minimize distractions or variability. The eight videos ranged in length from 58 seconds to 4 minutes and 47 seconds (M=1 minute 28 seconds).

Videos were randomized into three randomization orders (randomization 1, randomization 2, and randomization 3) and were merged together in the stated order. Each video reel included two extra videos, which were replays of two previously viewed videos (selected at random) for reliability ratings; identical videos did not appear subsequent to each other. This resulted in a total of three randomizations each with a total of 10 videos, featuring all eight actor participants.

Procedures

Participants were randomly assigned to the "untrained" and "trained" groups. If participants viewed the videos in groups, everyone in that group received the same instructions. Informed consent was collected from each participant. For efficiency of data collection and due to time constraints, participants in the trained and untrained conditions were run in small groups of up to four participants. If run in groups, groups consisted of either trained or untrained participants, never both.

Untrained Group

Participants in the Untrained group were given a 10-page packet containing 10 rating sheets, one sheet for each video they viewed (Appendix B).

Through scripted verbal instructions (Appendix E), they were informed that they would watch ten short videos in which speakers reported on their activities on the previous Saturday night. They were told that they would be asked to make a judgment

regarding the veracity of the speaker's statement (whether the presented alibi was true or false) after watching each video.

Participants were permitted to ask any questions about the process or to clarify the task before the videos were displayed. Researchers responded to these questions to ensure participants understood the procedures. Videos were displayed in one of three randomized orders. Videos were displayed on a laptop screen in quiet rooms with minimal distractions. Viewing locations were varied in accordance with what was most convenient for the participants. Participants were instructed to view the entire video before making their judgment.

Following each video segment, participants had up to three minutes to mark their rating. A thirty second warning was given before the end of each three-minute period. When three minutes passed, participants were told to put pencils down, and the next video segment began.

Each participant watched a total of 10 videos. Two of these were repeat videos that were randomly chosen to be viewed again for reliability purposes. Following completion, participants were asked to complete a brief demographic form regarding their age, gender, race, native language, and history of TBI or other neuropathology.

Trained Group

As with the instructions for the untrained group (described above), the participants in the PBCAT-trained group were informed that they would be watching ten videos in which speakers reported on their activities on the previous Saturday night.

Participants were presented with a hardcopy of the training materials and a packet with 10 copies of the PBCAT (one for each video, Appendix A). Each PBCAT rating sheet had a box labeled "judgement," where the participant was asked to enter a determination of "true" or "false" after completing the PBCAT form. Each sheet was clearly marked to indicate which video of the viewing sequence matched with each page in the packet.

The trained group then listened to scripted verbal instructions to introduce the PBCAT to them (Appendix F) and to assist them in identifying the cues used in the PBCAT. The participants were also given a hard copy of the training materials and the PBCAT (Appendices A and G). The training materials described each item to be rated using the PBCAT and separated them into those which are indicators of truth (sensory details, admitted lack of memory, spontaneous corrections, quantity of details/talking time, whether the story makes sense) and indicators of deception (whether the speaker thought hard, tension/nervousness, negativity/complaints, and rate of speech). Training materials were available for participants to reference throughout the experiment.

The trained participants used the PBCAT to rate aspects of the alibis heard in each video and assist them in making a veracity judgment. Participants rated instances of sensory details (to include auditory details, spatial details, and temporal details, each rated independently), admitted lack of memory, and spontaneous corrections as either not present (score = 0), occasional (score = 1) or frequent (score = 2). Participants rated six additional aspects of the alibis using a 9-point Likert scale. Each scale had different anchor points depending upon the aspect being reviewed (see Appendix B). The following aspects were rated using these scales: overall detail/talking time; whether the

content makes sense with considerations of whether there were contradictions or whether it was plausible; whether the speaker thought hard; whether the speaker seemed nervous, to include considerations of tenseness and fidgeting; whether there was negativity or complaints; and rate of speech.

Participants were instructed to complete the PBCAT for each video. They were advised to use their responses to the PBCAT to guide their interpretation of each video to ultimately make a judgment on the veracity of the alibi. Questions aimed at clarifying understanding of the task or materials were permitted and answered.

Videos were administered one at a time. Videos were displayed on a laptop screen in quiet rooms with minimal distractions. Similar to the untrained group, following each video segment, participants had up to three minutes to complete their PBCAT scoring and veracity rating. A verbal thirty second warning was given before the end of each three-minute period. When three minutes passed, participants were told to put pencils down and the next video would begin.

As with the untrained group, each participant watched a total of 10 videos. Two of these were repeated videos that were randomly chosen to be viewed again for reliability purposes. After each participant in the trained group rated the final video, they were asked to complete a brief demographic form regarding their age, race, native language, and history of TBI or other neuropathology.

Chapter 3: Results

Descriptive statistics for total accuracy, truth detection accuracy, and lie detection accuracy for the Trained and Untrained groups are in Table 1. Two-tailed, independent-samples t-tests revealed no significant differences between trained and untrained groups in overall deception detection accuracy [t (18) = .140, p =.96], in truth detection accuracy [t (18) = -.849, p =.09], or in lie detection accuracy [t (18) = 1.21, p =.70]. All alphas values were Bonferroni-adjusted to p = 0.0125 to account for multiple comparisons. These findings suggest that administration of the PBCAT training made no statistically significant difference in the accuracy of detection of true statements, or lie statements, or of both types of statements combined. These results are summarized below in Figure 1 and Tables 3 and 4:

Figure 1. Detection Accuracy in Trained and Untrained Conditions

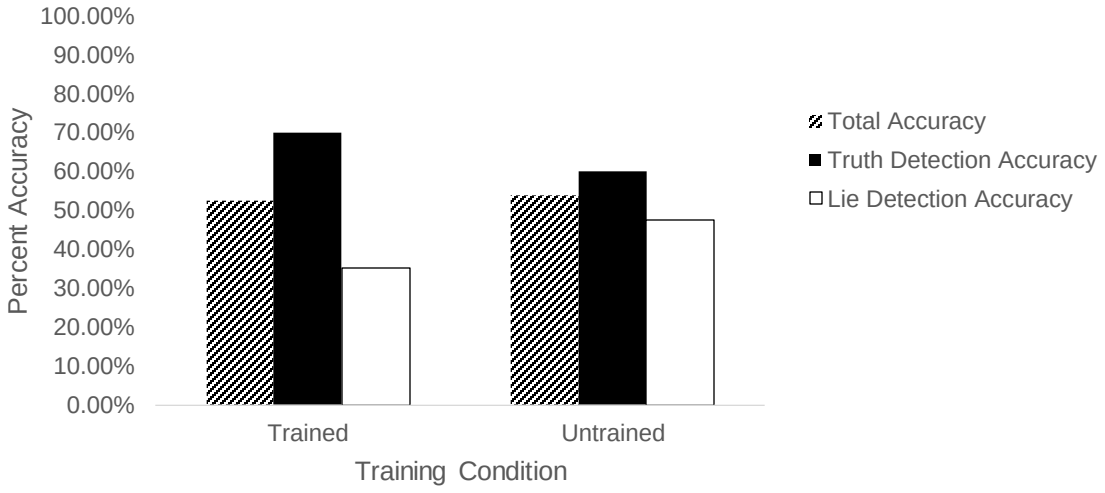

Figure 1. Percentage accuracy of trained (n=10) and untrained (n=10) groups in total accuracy, truth detection accuracy, and lie detection accuracy.

Descriptive statistics outlining the performance of the individual groups for each condition are outlined in the table below:

Table 3
Percentage Accuracy Statistics

Training Condition	Detection Condition	Mean	Standard Deviation	Range
Trained	Total Accuracy	52.50%	21.08	25%-87.5%
	Truth Accuracy	70.00%	32.91	0%-100%
	Lie Accuracy	35.00%	24.15	0%-75%
Untrained	Total Accuracy	53.75%	18.68	25%-75%
	Truth Accuracy	60.00%	17.48	25%-75%
	Lie Accuracy	47.50%	21.89	25%-75%

Regarding total accuracy (combined truth detection accuracy and lie detection accuracy), participants in both the trained and untrained conditions appeared about as accurate as chance (52.5% and 53.75%, respectively). In both groups, there is indication of better accuracy when detecting true statements than detecting lie statements. The trained group accurately identified 70% of true statements and 35% of lie statements; the untrained group accurately identified 60% of true statements and 47.5% of lie statements.

Interestingly, this study found that, when the untrained and trained groups were combined, the accuracy rate of truth detection was statistically higher than that for deception detection. Using a two-tailed t-test ($t(18) = 3.44$, $p=.003$) with Bonferroni adjustments, the rate of truth detection accuracy was significantly higher than that of lie detection accuracy. These results are presented below:

Table 4
Percentage Accuracy Statistics Across Both Training Conditions (n=20)

Detection Condition	Mean	Standard Deviation
Truth Accuracy	65.00%	26.16
Lie Accuracy	41.25%	23.33

These findings suggest that with and without training, neurotypical individuals are about as good as chance at detecting deception in social contexts. Consistent with the

research, there is a statistically higher rate of accuracy at correctly identifying true statements than lie statements.

This study found that there is a failure to reject both null hypotheses:

1) Lie detection accuracy rate did not significantly differ between the trained and untrained groups.

2) The PBCAT did not significantly improve performance in deception detection above the approximately 50% accuracy reported in research for the untrained neurotypical population.

Chapter 4: Discussion

This study confirms that neurotypical adults are relatively poor at detecting deception in social contexts – even with training designed to teach them to assess a battery of cues associated with lying. This is a complicated problem. Social lies are deeply woven into the fabric of social interaction, yet individuals are poor at detecting them. The current findings support previous research that adults are about as good as chance at detecting lies, with higher accuracy rates when tasked with identifying true statements over lie statements, regardless of training (Burgoon & Levine, 2010; Bond & DePaulo, 2006). There is an implicit agreement between conversation partners that speakers are sometimes permitted to lie and that listeners will trust the messages they hear. The findings here suggest that lower levels of accuracy at deception detection, and a tendency to be better at identifying and expecting a communication partner to tell the truth rather than lie, may be a critical component to successful social communication.

Researchers have attempted to explain lying, and multiple studies attempt to characterize the verbal and nonverbal cues associated with lying to improve detection abilities. Three principles may explain the results seen here. The first is that the low-stakes nature and low cognitive burden of social lying results in the less salient emergence of deception cues, which impacts the ability to accurately detect this type of lie. Second, there are global stereotypes of what cues are believed to betray a liar, but these do not match the cues actually seen when lies are told (Global Detection Research Team, 2006; Sporer & Schwandt, 2007). Third, because of the balance required by social environments between the acceptability of lying and listeners' trust, there is a bias –

possibly a default – of believing a speaking partner is telling the truth, especially in instances with low consequence or involvement of the listener.

Liars in the present study displayed less prominent cues to deception because they told lies under low-stakes conditions, mimicking conditions of social interactions. The emotional theory of deception suggests that liars exhibit characteristics associated with negative emotions and that there is an increased experience of excitement, fear, and guilt when lying (Global Deception Research Team, 2006; Ekman, 1989). This theory proposes that higher stakes lies elicit a stronger portrayal of emotions; liars must attempt to conceal this nonverbal leakage of their lies by hiding negative affect related to telling a lie (Bond & DePaulo, 2006). Additionally, Ekman suggests that nonverbal cues to deception are relatively subtle and fluid and that there is no formula that can be taught to detect deception (2001; Bond & DePaulo, 2006). Certain conditions, which are not consistent with social lying, are seen to induce leakage at higher rates (Bond & DePaulo, 2006). Consistent with this theory, the reduced prominence of cues, though more representative of social interactions, may have impacted participants' ability to accurately detect deception in the present study.

Another possible explanation for the findings presented here may be found in the cognitive complexity theory. The cognitive complexity theory suggests that lying imposes an increased cognitive burden on a speaker who is telling a lie compared to a speaker telling the truth (Evans, 2013; Vrij & Granhang, 2012). This is due to the additional pressures inherent in remembering a falsified story (Evans, 2013; Vrij & Granhang, 2012). This increased cognitive burden taxes the liar above their natural, truth-telling state. When the liar's cognitive load is further increased (e.g. by an

investigator's tactics during interrogation), the liar reveals deception cues more overtly (Evans, Michael, Meissner, & Brandon, 2013; Vrij, Mann, Fisher, Leal, Milne, & Bull, 2008; Vrij & Granhang, 2012). The cognitive complexity theory suggests that telling high-stakes and spontaneous lies increases cognitive load and demands on working memory (Vrij, Mann, Fisher, Leal, Milne & Bull, 2008). The increased cognitive demand leads to behaviors that betray the lie, such as reduced eye contact, reduced ability to handle additional cognitive demands, speech hesitation, decreased speech rate, and the provision of fewer details (Evans, Michael, Meissner, & Brandon, 2013).

In the present study, researchers did not manipulate actor participants' cognitive load in order to preserve the ecological validity of the actors' social lies. This study intended to establish controlled conditions to evaluate the effectiveness of the PBCAT training tool in assisting identification of social lies. As such, although increasing actors' cognitive loads may have increased the presence of cues to deception, this would have artificially altered the naturalistic parameters of the social context of the research. While increased cognitive burden may impact the accuracy of deception detection, doing so would remove the lie from the realm of social lying. The confines of telling lies in social context, where cognitive burden and emotion associated with being caught are relatively low, there is a reduced presentation of cues associated with lying. Notably, the initial validation of the effectiveness of the PBCAT tool showed it to be effective at improving detection accuracy when the liar was under conditions of moderate cognitive load (Evans & Michael, 2014). By placing the actors under lower stakes, more social-type conditions, this study may have reduced the presence of their leaked cues to deception, making them too difficult to discern even with use of the PBCAT training.

Beyond the theoretical underpinnings of lying, in interpreting the findings of this study, it is important to consider the layperson's approach to deception detection, which includes a heavy reliance on faulty stereotypes. Raters tend to rely on stereotypes, shortcuts, or heuristics, in rendering a truth or lie judgment (Global Deception Research Team, 2006). And yet, these beliefs are disjointed from what is actually associated with a liar sending his false message. The Global Deception Research Team (2006) conducted two comprehensive studies in 75 countries with speakers of 43 languages to collect data on how participants report to know a speaking partner is lying. They found that, cross-culturally, the dominant stereotype associated with the belief that a speaking partner is lying is gaze aversion, but this is not found to be associated with telling lies (Global Deception Research Team, 2006, DePaulo, 2003; Sporer and Schwandt, 2007). Global stereotypes found in the Global Deception Research Team (2006) study are the belief that liars are nervous, demonstrate speech disturbances, exhibit torso movements, and that liars touch and scratch themselves. Additional research indicates that there are other components of telling lies that may be more useful in detecting a lie such as pitch changes as compared to inconsistently present nonverbal indicators (Sporer and Schwandt, 2007).

This pattern of relying on faulty stereotypes to identify a lie may further explain the low accuracy rates, despite use of training. The training provided in the present study attempts to override these heuristics by teaching participants to target cues associated with lying (i.e. in the PBCAT), but the results here indicate that this attempt was not appreciably successful. Although heuristics mitigate detection accuracy (even after training), it is important to consider their value. Relying on flawed beliefs of how a liar

may betray his lie helps stitch together the fabric of social interaction. Social lies are prevalent; believing them through misguided techniques allows for continuity of social interaction.

Finally, the results of this study showed a significantly higher rate of accuracy in detecting true statements when results for the trained and untrained condition were combined. This is consistent with previous research showing higher accuracy rates when participants are asked to identify true statements compared to when they are asked to identify lies (Burgoon & Levine, 2010). This also mirrors Evans's and Michael's (2014) findings when validating the PBCAT that there is a higher rate of accuracy in detecting truth than in detecting lies.

Many studies have found that participants are biased toward believing that those whom they are rating are honest even when they are not, hence the concept of the truth bias and the Veracity Effect (Burgoon & Levine, 2010; Levine, Kim, Park, & Hughes, 2006; Levine, Park & McCornack, 1999; Levine, 2014; McCornack & Parks, 1986; Zuckerman, DePaulo, & Rosenthal, 1981). Levine (2014) differentiates the truth bias (seen under experimental conditions) from the truth-default state, which he suggests is seen in non-experimental, social conditions, similar to those mirrored in this study (Levine, 2014). The Truth-Default Theory (TDT) states that the truth-default is "adaptive" and improves successful communication (Levine, 2014, p. 378). This aligns with Grice's (1991) proposal that conversation is meant to be cooperative and that social lies often facilitate smooth communication (Levine, 2014).

Overall, because this study investigates social lies told in social contexts, the TDT may provide plausible explanations for why accuracy rates were low and why there was a

skew toward improved accuracy of truth detection than lie detection. Other theories suggest that lie detection accuracy is improved when the speaker is under more taxing, stressful, higher-stakes conditions. Eliciting these cues may make deception detection easier, but it would have stripped this experiment of its ecological validity and application to social contexts. The TDT instead suggests that individuals have a tendency to assuming that communication partners are truthful, which this allows for "efficient communication and cooperation" (Levine, 2014, p. 390), making a case for why people are benefitted by being poor at detecting social lies.

Chapter 5: Limitations and Future Directions

This study was under powered. The effects of the study could be more broadly interpreted if additional participants were included. Additionally, the nature of the study itself as a study focused on social lying was limiting for reasons analyzed in the Discussion section. For the purposes of this study, it was necessary to balance the goal of having lies identified with the need to maintain environmental conditions that mimic social lying in a controlled environment (ecological validity). By straining the stories told by the actor participants, their lies may have been more evident because of the increased prevalence of cues. This may have made the PBCAT training more effective. However, this type of adjustment would have mitigated attempts to maintain conditions that were as close to real life as possible.

The intent of this study was to mirror daily interpersonal interactions between individuals to gather additional data on the performance of neurotypical adults in detecting this type of deception. Removing the actor participants' stories from a low-stakes social context would have tampered with this replication. Furthermore, because this study is intended to aid the development of social communication intervention for individuals experiencing pragmatic deficits following TBI, the need to recreate ecologically valid situations and presentation of cues was more relevant than creating stories where the deception was more likely to be detected.

To expand upon the application and interpretation of this research, it would be useful to collect data to understand what neurotypical adults in the same demographic group (i.e. neurotypical English-speaking males ages 18-35 years old) report that they use to determine if a speaking partner is lying or telling the truth in social situations. A

similar qualitative study was conducted by this research team using open-ended interviews that asked, "What alerts you that a speaking partner may be lying". Interviews were transcribed and analyzed using the qualitative methodology presented in Braun & Clarke (2006) for conducting thematic analysis. This analysis revealed that all responses (n=8 participants) could be categorized into the following codes: body, voice, language, prior knowledge, and eyes.

It would be beneficial to include additional participants for this study and to reframe the question to focus on social lying to create a wider breadth of information for the types of cues individuals in this demographic reportedly use for this particular type of lie. It would then be useful to have those same participants videotaped telling a 'social lie' and have another group identify the cues observed. This would experimentally assess whether liars in a semi-controlled environment demonstrate the same cues when lying that they report to use to discern social lies.

Lastly, it would be informative to collect qualitative data on opinions about social lies. By providing participants an explanation of what a social lie is and then collecting information on their feelings about telling and hearing social lies, the clinical implications (and interpretation for intervention) could be refined. With the findings presented here that deception detection accuracy rates are poor, even with training, it would be beneficial to understand how neurotypical adults react to and feel about social lies. Because social communication is necessarily fluid (dependent on environments, communication partners, content, etc.), a broader understanding of personal accounts of the usefulness and interpretation of social lies would help drive functional, effective intervention.

Chapter 6: Clinical Implications

This study supports existing research on the complicated and difficult nature of identifying lying in social contexts. Although this study found that PBCAT training does not appreciably improve neurotypical adults' ability to accurately detect deception in social contexts (or distinguish truth from deception), this is clinically useful information. Detection accuracy rates are about as good as chance in neuotypical adults – i.e. those have been screened for typical brain health. Performance is not aided by a validated training tool that uses a comprehensive assessment of multiple cues that are associated with deception. This suggests that individuals who present with impaired social cognition following TBI are also likely to be unaided by using this type of training to improve their base rates of social deception detection. Using this and related studies to offer informational counseling to patients and caregivers may be an effective intervention approach and one to consider for future research.

In developing effective assessment and intervention techniques for TBI survivors with deficits in social communication, it will be useful to address the following:

1) Social lying is a prominent and necessary feature of communication;

2) Neurotyipcal adults have difficulty in detecting deception; and

3) This difficulty aids the success of social communication.

These points can be addressed in the context of the fact that neurotypical adults tend to believe their conversation partners and are in fact aided by erring on the side of honesty. The truth default results in higher accuracy because social communication partners are more frequently telling the truth than lying.

Related informational counseling may allow clinicians to improve these patients' abilities to socially interact in appropriate, functional ways. Rather than devising treatment protocols intended to improve the ability to interpret (and tell) social lies, it may be most beneficial to help individuals with TBI develop a foundational understanding of the purpose of social lying in communication and communication strategies to use in situations where lies may be told. Better understanding of facilitative communication strategies (like social lying) may help develop improved social communication, driving improved pragmatics and quality of life post-TBI.

Chapter 7: Conclusion

Social lies are nuanced and difficult to characterize given their varied presentation across speakers, the subtle nature of the cues to lying, and misbeliefs about what cues are associated with lying. This study finds that training neurotypical adults to detect social lies is not effective, but that nuerotypical adults default to believe social communication partners are telling the truth. This default results in higher accuracy rates of detecting true statements, regardless of training condition. It remains to be seen if PBCAT training will aid TBI survivors to identify social lies. The current study suggests that subtle deception cues will need to be more conspicuous when training TBI survivors to detect social lies. Informational counseling regarding the prevalence of social lying and its integral nature to the fabric of social communication may be a beneficial approach to intervention with this population.

Appendix A: Trained Rating Sheet (PBCAT)

(Please note: Formatting modified from original for printing purposes. 10-paged packet included 10 identical rating sheets numbered in sequence for videos 1-10)

Video #1

Participant Code: _____Date: _____

Sensory Details	Not Present	Occasional	Frequent
Auditory Details	☐	☐	☐
Spatial Details	☐	☐	☐
Temporal Details	☐	☐	☐

	Not Present	Occasional (1 or 2 times)	Frequent (3 or more times)
Admitted Lack of Memory	☐	☐	☐
Spontaneous Corrections	☐	☐	☐

Overall Quantity of Details/Talking Time
Very Few Details/ Very Vague — Unsure — Numerous Details /Complete
|---------|---------|---------|---------|---------|---------|---------|---------|

Does it Make Sense (Contradictions? Plausible)
Not at all — Unsure — Completely
|---------|---------|---------|---------|---------|---------|---------|---------|

Thought Hard
Did Not Think Hard — Unsure — Thought Extremely Hard
|---------|---------|---------|---------|---------|---------|---------|---------|

Nervousness (Tense? Fidgeting?)
Extremely Relaxed/Comfortable — Unsure — Extremely Tense/Nervous
|---------|---------|---------|---------|---------|---------|---------|---------|

Negativity/complaints
Extremely Positive — Neutral/Unsure — Extremely Negative
|---------|---------|---------|---------|---------|---------|---------|---------|

Rate of Speech
Extremely Fast — Unsure — Extremely Slow
|---------|---------|---------|---------|---------|---------|---------|---------|

Judgment (True/False)
☐

Appendix B: Untrained Rating Sheet

(Please note: each row appeared on a separate page in the rating packet)

Video 1 → Judgment? True ☐ False ☐
V***ideo 2*** → Judgment? True ☐ False ☐
Video 3 → Judgment? True ☐ False ☐
Video 4 → Judgment? True ☐ False ☐
Video 5 → Judgment? True ☐ False ☐
Video 6 → Judgment? True ☐ False ☐
Video 7 → Judgment? True ☐ False ☐
Video 8 → Judgment? True ☐ False ☐
Video 9 → Judgment? True ☐ False ☐
Video 10 → Judgment? True ☐ False ☐

Appendix C: Instructions for Actor Participants – True Condition

Adapted from Evans & Michael (2014).

Prompting Statement for True Alibis:

On Saturday night a crime took place between the hours of 6:00PM and 10:00pm. The police have targeted you as a suspect for this crime. You will be asked to provide a detailed **true** alibi of where you were and what you were doing at the time of the crime. You want to tell your story in a convincing way, so they believe you are innocent. You will have 5 minutes to **remember** as many details as you can about your whereabouts. Try to focus on the following details of the night in question:

On the night in question from 7:00pm to 10:00pm:

1) Who were you with?
2) What were you doing?
3) Where were you?

Try to be as detailed as you possibly can.

Once you have had 5 minutes to **remember your alibi,** we will interview you regarding your statement on camera. The interview will begin with the question: where were you on the night in question between the hours of 7:00 PM and 10:00pm? You will then give your statement. Try to make your statement as detailed as you possibly can. It needs to last at least a few minutes, so don't be brief.

Do you have any questions about what you are supposed to do?

You will now have 5 minutes to remember your alibi.

Appendix D: Instructions for Actor Participants – False Condition

Adapted from Evans & Michael (2014).

Prompting Statement for False Alibis:

On Saturday night a crime took place between the hours of 7:00PM and 10:00pm. The police have targeted you as a suspect for this crime. You will be asked to provide a detailed **false** alibi of where you were and what you were doing at the time of the crime. You want to tell your story in a convincing way, so they believe you are innocent. **We will give you a scenario for what you were doing.** You will have 5 minutes to **remember/create** as many details as you can about your whereabouts. Try to focus on the following details of the night in question:

On the night in question from 7:00pm to 10:00pm:

1) Who were you with?
2) What were you doing?
3) Where were you?

Try to be as detailed as you possibly can.

*****Researchers assigned a scenario: stayed home, dinner and drinks out, D.C. cultural event, bowling**** For your statement, you can include other activities, but you should include the activity we have provided as part of your night. Remember this is a false alibi, so don't simply say what you actually did on another night. Make your story a totally false experience. For example, DO NOT just tell us what you did Thursday night instead of Saturday night. Make this a new false experience. (False only.)**

Once you have had 5 minutes to **create your false alibi**, we will interview you regarding your **false alibi** statement on camera. The interview will begin with the question: where were you on the night in question between the hours of 7:00 PM and 10:00pm? You will then give your **false alibi** statement. Try to make your statement as detailed as you possibly can. It needs to last at least a few minutes, so don't be brief.

Do you have any questions about what you are supposed to do?

You will now have 5 minutes to **create** your alibi.

Appendix E: Scripted Instructions for Untrained Group

My name is _____ (insert researcher's name here), and I am a master's student here at GW. I am working with Dr. Shelley Brundage, Professor Michael Bamdad, and Professor Andy Clare from the Department of Speech and Hearing Sciences. I will be administering short research study with you today that will inform our investigation in neurotypical adults' ability to detect deception. Participation in this study is completely voluntary. If at any point you wish to quit and leave the study, please let me know. Ending your participation in this study will not impact your academic or professional standing in any way. Additionally, as we proceed, if you do not understand any component of this study please let me know and I will do my best to provide clarification. During the administration of this study, I may occasionally interject with reminders to complete your responses, however I will mostly be silent throughout this process.

I have provided you (each of you) with a packet that contains 10 scoring rubrics. In a moment, I will administer a series of 10 videos; two videos will be repeated, this is an intentional part of our research process.

After each video recording concludes, there will be a 3-minute period of silence. During this period, please complete the form in front of you associated with the video you have just viewed. As you see on the form, you are asked to make a veracity judgment and determine whether the story told in the video is "true" or "false". This judgment is based on your interpretation of the content presented in the video.

When you have thirty seconds remaining during each response period, I will give you a thirty second warning. Please turn the page in your packet when you have made your judgement. \When the 3-minute period expires, the next video will begin.

Each speaker in each video was presented with a prompt asking them to recount their activities on the previous Saturday. After preparing their response, they responding to the following question:

Where were you on the night in question between the hours of 7:00PM and 10:00PM?

Do you have any questions? (Wait for confirmation of understanding)

Are you ready to begin? (Wait for confirmation of readiness)

******After all responses are collected******

That is all I have for you today. Do you have any questions? Is there anything you would like to add?

Thank you so much for your participation in our study. We appreciate your input and your contribution to the speech-language community. At any point in the future you have any questions regarding this study or its outcome, feel free to contact us at TBIpragmatics@gmail.com.

Appendix F: Scripted Instructions for Trained Group

My name is _____ (insert researcher's name here), and I am a master's student here at GW. I am working with Dr. Shelley Brundage, Professor Michael Bamdad, and Professor Andy Clare from the Department of Speech and Hearing Sciences. I will be administering short research study with you today that will inform our investigation in neurotypical adults' ability to detect deception. Participation in this study is completely voluntary. If at any point you wish to quit and leave the study, please let me know. Ending your participation in this study will not impact your academic or professional standing in any way. Additionally, as we proceed, if you do not understand any component of this study please let me know and I will do my best to provide clarification. During the administration of this study, I may occasionally interject with reminders to complete your responses, however I will mostly be silent throughout this process.

I have provided you (each of you) with a packet that contains training materials and 10 scoring rubrics. In a moment, I will administer a series of 10 videos; two videos will be repeated, this is an intentional part of our research process.

After each video recording concludes, there will be a 3-minute period of silence. During this period, please complete the form in front of you associated with the video you have just viewed. As you see on the form, you are asked to make rating of different elements of the video based on the training you will read. After this process, you will make a veracity judgment and determine whether the story told in the video is "true" or "false". This judgment is based on your interpretation of the content presented in the video, based

on the training you will review and your judgments of the elements described in that training.

When you have thirty seconds remaining during each response period, I will give you a thirty second warning. Please turn the page in your packet when you have made your judgement. When the 3-minute period expires, the next video will begin.

Please take a few moments to review the training packet, which looks like this (hold up form). You are welcome to reference this packet throughout each judgment period. Please let me know if you have any questions.

Each speaker in each video was presented with a prompt asking them to recount their activities on the previous Saturday. After preparing their response, they responding to the following question:

Where were you on the night in question between the hours of 7:00PM and 10:00PM?

Do you have any questions? (Wait for confirmation of understanding)

Are you ready to begin? (Wait for confirmation of readiness)

******After all responses are collected******

That is all I have for you today. Do you have any questions? Is there anything you would like to add?

Thank you so much for your participation in our study. We appreciate your input and your contribution to the speech-language community. At any point in the future you have any questions regarding this study or its outcome, feel free to contact us at TBIpragmatics@gmail.com.

Appendix G: Training Materials for Trained Condition

TRUTH Indicators

(a) Sensory Details

Auditory Details:

- Are details provided regarding the *sounds* heard?
- More auditory details generally indicate the story is true.
- e.g., “It was really loud” “I heard a door slam shut” “Her dog was barking”

Please indicate whether there are no auditory details provided (“Not Present”), there were several auditory details provided (“Occasional”), or whether there were many auditory details provided (“Frequent”).

Spatial Details:

- Are details provided regarding *spatial* locations?
- More spatial details generally indicate the story is true.
- e.g., “The table was next to a window” “I turned right onto the highway” “I was sitting between Scott and Mike”

Please indicate whether there no spatial details provided (“Not Present”), there were several spatial details provided (“Occasional”), or whether there were many spatial details provided (“Frequent”).

Temporal Details:

- Are details provided regarding *time*?
- More temporal details generally indicate the story is true.

- e.g., “I got there about 5 minutes later” “That was at about 10:25” “It was really late when I left”

- *Please indicate whether there no temporal details provided (“Not Present”), there were several temporal details provided (“Occasional”), or whether there were many temporal details provided (“Frequent”).*

(b) Admitted Lack of Memory:

- At any point does s/he respond “I’m not sure” or “I don’t remember,” etc?

- Admitting to a lack of memory is generally associated with truth.

e.g., “I don’t remember what my mom ordered for dinner” “I don’t know when, but it was late”

Please indicate whether there was no admitted lack of memory (“Not Present”), lack of memory was admitted once or twice, or lack of memory was admitted three or more times.

(c) Spontaneous Corrections:

- At any point does s/he change his/her response or indicate a previous answer was wrong.

- Spontaneous corrections are generally associated with truth.

e.g., “Oh wait, Dave drove, not Eddie” “I said it started at 9, but I don’t think that’s right - it was earlier.”

Please indicate whether there were no spontaneous corrections (“Not Present”), there were one or two spontaneous corrections, there were three or more spontaneous corrections.

(d) Quantity of Details/Talking Time:

- How complete was the account of what happened overall? Were lots of details provided or were you left feeling that the story was vague? This is likely related to how long s/he spent speaking before reaching the end of the story. This also includes how long and detailed responses were when answering a specific question.

- Highly detailed stories generally indicate the story is true.

- e.g., “I drove my car to the party with my brother. There were lots of cars outside when I got there so I had to park a block away” is more detailed than: “I went to the party”

Please indicate on a scale from “Very few details/Very vague” to” Numerous details/complete” how detailed the story

was. If you are unsure, please mark “Unsure” in the middle of the scale.

(e) Does it Make sense?

- Does the story make sense? Is it plausible? Is it believable? Does it have a logical structure? Or, are there any contradictions/discrepancies? Are you left feeling that something is off about the story?

- Stories that make more sense are generally associated with truth.

Please indicate on a scale from “Not at all” to “Completely” how much sense the story made. If you are unsure, please mark “Unsure” in the middle of the scale.

DECEPTION Indicators

(a) Thought hard:

- Overall, how hard did s/he have to think to tell his/her story and answer the questions? Use verbal and non-verbal information.

-Thinking hard is generally associated with lying.

Please indicate on a scale from “Did not think hard” to “Thought extremely hard” how hard the story-teller had to think.

If you are unsure, please mark “Unsure” in the middle of the scale.

(b) Tension/Nervousness:

- Overall to you, does s/he appear anxious or is s/he comfortable? Consider both vocal and behavioral cues.

-Tension is generally associated with deception.

e.g., Is his voice tense? Is his posture rigid? Does he appear to be uncomfortable or nervous in the situation? Is he fidgeting? Does he avoid eye contact?

Please indicate on a scale from "Extremely relaxed/comfortable" to "Extremely tense/nervous" how nervous or tense the story-teller appeared. If you are unsure, please mark "Unsure" in the middle of the scale.

(c) Negativity/Complaints:

- Overall, does s/he leave you with a positive or negative impression? Consider his/her words and facial expressions.

- Negativity is generally associated with deception.

e.g., If he complains, is difficult, or has a hostile tone of voice, this is more negative than if he is smiling, friendly and cooperative.

Please indicate on a scale from "Extremely positive" to "Extremely negative" what your impression of the story-teller was. If you are unsure, please mark "Unsure" in the middle of the scale.

(d) Rate of Speech:

- How quickly did s/he speak?

- Speaking slowly is generally a sign of lying.

Please indicate on a scale from "Extremely fast" to "Extremely slow" how quickly the story-teller spoke. If you are unsure, please mark "Unsure" in the middle of the scale.

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