The Effect of Target Language Proficiency on Deception Detection among Undergraduate Students

by

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Abstract

I examined the impact of targets' language proficiency on observers' lie detection accuracy, discrimination, bias, and confidence. Observers (N = 132) were randomly assigned to make deception judgments about targets (N = 56) from four proficiency groups (i.e., native, advanced, intermediate, and beginner English speakers). Overall, observers' accuracy differed based on targets' level of proficiency. Specifically, accuracy and discrimination were poorest when observers judged beginner English speakers compared to targets from any other proficiency group. Moreover, observers exhibited a truth bias only when they judged native English speakers. They were also more confident when detecting targets who were lie-tellers than truth-tellers. Implications and directions for future research were discussed in light of these results.

Keywords: deception detection, language proficiency, discrimination, bias

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Chapter 1: Introduction

The Effect of Target Language Proficiency on Deception Detection among Undergraduate Students

Statistics Canada's (2012) census revealed that 17.5% of Canadians spoke at least two languages at home. This accounts for 5.8 million Canadians with whom customs officers might interact, but does not even include the numerous visitors (i.e., non-citizens) they encounter who might not be native English speakers. More than 200 languages are spoken in Canada (Statistics Canada, 2012) and for this reason it is simply improbable that there will be enough border agents or law enforcement officers who will speak all of these languages. In 2008, Robert Dziekanski, a non-English speaking, new immigrant, travelled from Poland to Vancouver International airport. A Ministry of Justice report (2008) revealed that Royal Canadian Mounted Police officers attempted to communicate with Mr. Dziekanski using hand signals, but when he raised his hand, an officer deployed his taser several times. Mr. Dziekanski went into cardiac arrest and was pronounced dead at the scene. This tragic case demonstrates the consequences that can arise from an individuals' inability to communicate with law enforcement officials. In this study, I examined the impact of a language barrier on people's judgments, particularly their abilities to detect deceit.

Deception Detection

The prominent queries surrounding deception detection are observers' confidence, accuracy, bias, and discrimination. Within lie detection, confidence refers to observers' abilities to accurately assess their deception detection decisions. This ability to identify lie-tellers changes depending on deception detection training (e.g., Ekman & O'Sullivan,

1991). For example, police officers have been found to be overly confident in their abilities to detect deceit (Kassin et al., 2007). In fact, accuracy and confidence are not highly correlated across many research areas, including deception detection (e.g., DePaulo et al., 1997).

Observers' inability to assess their decision-making might not be a concern if they were accurate lie detectors; however, average accuracy is only slightly higher than chance (Bond & DePaulo, 2006). Even observers' levels of expertise in lie detection might not affect performance. For example, Ekman and O'Sullivan (1991) tested employees from various law enforcement agencies (e.g., United States Secret Service, Central Intelligence Agency, Federal Bureau of Investigation) and found that the majority of the groups were no more accurate than laypersons. Aamodt and Custer (2006) have affirmed that, in fact, several groups (i.e., teachers, social workers, criminals, secret service agents, psychologists, judges) have performed better than laypersons in only a small number of studies. They assert that no specific population is more accurate than another at detecting deception.

Furthermore, deception detection is not free from bias. Laypersons are more accurate when detecting truth-tellers (i.e., 61% accurate) than lie-tellers (i.e., 47% accurate; Bond & DePaulo, 2006). It is not that laypersons are only effective at detecting the truth; instead, they appear to exhibit a truth bias (Bond & DePaulo, 2008). That is, observers are more likely to assume that an individual is telling the truth than lying. Conversely, Meissner and Kassin (2002) discovered that police officers are more likely to assume that an individual is lying than telling the truth (i.e., a lie-bias). Overall, decision-making appears to be biased and may vary with expertise.

Cognitive Load and Deception Detection

Deception detection researchers have found that the characteristics of lie- and truth-tellers are affected by cognitive load (Zuckerman, DePaulo, & Rosenthal, 1981). For instance, a meta-analysis by DePaulo et al. (2003) revealed that lie-tellers appeared to be more preoccupied and exhibited higher cognitive load than truth-tellers. Vrij, Fisher, Mann, and Leal (2008) suggested that this pattern may be due to the fact that lying (vs. telling the truth) taxes cognitive resources, such as memory. Truthful accounts are simply recalled from memory, whereas lies are fabricated and may need to be compared to memory in order to be deemed plausible (Spence, Farrow, Herford, Wilkinson, Zheng, & Woodruff, 2001). Interestingly, Vrij (2007) found that as cognitive load increased, so did lie-tellers' propensity to be detected.

Language Proficiency and Deception Detection

Researchers are now speculating that lying in a non-native language places additional demands on cognitive resources (e.g., Evans, Michael, Meissner, & Brandon, 2013). To date, only five studies have been conducted on this topic. In a study by Cheng and Broadhurst (2005), undergraduate students (henceforth referred to as "targets") were randomly assigned to lie or tell the truth, in either their native or non-native languages, while providing their opinions about a moral issue. Observers made judgments regarding whether they believed that these targets were telling the truth or lying. No differences were found in terms of their abilities to detect non-native and native speakers' deception.

Two additional studies were conducted to explicitly examine the effects of language proficiency and judges' expertise on deception detection (Da Silva & Leach, 2013; Leach & Da Silva, 2013). Both studies utilized the same video stimuli featuring

targets who were interviewed about a transgression (i.e., cheating). Half of the targets in the videos were native English speakers, whereas the other half were non-native English speakers. Laypersons and police officers were better able to detect deception in native speakers than in non-native speakers. Da Silva and Leach (2013) also found that laypersons' confidence was higher when they judged native than with non-native truth-tellers. In addition, these studies revealed that observers had a truth bias towards the native speakers (Da Silva & Leach, 2013; Leach & Da Silva, 2013). Interestingly, there were conflicting results in regards to the lie bias among observers. Da Silva and Leach (2013) found that there was a lie bias towards non-native English speakers; however, Leach and Da Silva (2013) were unable to find any bias towards this group. These findings suggest that observers perceived native speakers more positively than non-native speakers.

Evans and Michael (2014) examined language proficiency effects in a different context (i.e., alibis). Undergraduate students watched alibi statements made by targets who were either lying or telling the truth. Observers were more accurate when judging truth-telling native speakers than non-native speakers, whereas lie-telling non-native speakers were judged more accurately than native speakers.

In these four studies, only two levels of proficiency (i.e., native and non-native speakers) were examined. Evans et al. (2013) further differentiated between proficiencies by using an alibi paradigm. Targets were categorized as native English speakers, non-English speakers with high levels of proficiency (i.e., intermediate speakers), and non-native English speakers with low levels of proficiency (i.e., basic speakers). Observers were equally accurate at detecting the deception of individuals who had high and low

non-native English proficiencies; however, accuracy was significantly lower when observers viewed native English speakers than non-native English speakers.

Differences between Language Proficiency Studies

These mixed findings may be due to a number of factors. First, each set of researchers tested different levels of language proficiency. Cheng and Broadhurst (2005) and Evans and Michael (2014) interviewed intermediate and native speakers, whereas Evans et al. (2013) examined low proficiency non-native speakers, high proficiency non-native speakers, and native speakers. Finally, Da Silva and Leach (2013) and Leach and Da Silva (2013) compared basic and native English speakers. Although both Evans et al. (2013) and Da Silva and Leach (2013) studied low proficiency targets, the latter's participants were significantly less proficient in English: Evans et al.'s (2013) sample attended university in English, whereas Da Silva and Leach's targets could not. Thus, researchers have yet to examine participants across a full range of proficiencies.

Second, targets' language use was not uniform in all studies. In the Cheng and Broadhurst (2005) study, targets were allowed to alternate between speaking their non-native and native languages. This practice - known as code-switching (Gumperz & Hymes, 1986) - might have allowed non-native (vs. native) speakers to lower their cognitive loads (i.e., they could switch to a less demanding language when they were exposed to a difficult task, such as lying). Cheng and Broadhurst (2005) may have not been able to find language proficiency-related differences between native and non-native speakers because participants were permitted to code-switch.

Third, the type of paradigm that was used to elicit deceptive behaviour differed between studies. Evans et al. (2013) and Evans and Michael (2014) used alibi statements,

Leach and Da Silva (2013) and Leach and Da Silva (2013) used a cheating paradigm, and Cheng and Broadhurst (2005) used opinion surveys. Each of the paradigms had different demands (e.g., memorization) which, in turn, could have affected native versus non-native targets' abilities to deceive. For example, targets who lied about their opinions simply provided a perspective which opposed their own, whereas targets who fabricated alibis were required to invent entirely novel and plausible events. Thus, the different pattern of results across studies might have been due to the underlying demands of the deception paradigms.

Finally, the researchers used different methods to establish language proficiency. For example, targets were either allowed to self-rate their levels of language proficiency (Cheng & Broadhurst, 2005), were assessed using standardized measures (Da Silva & Leach, 2013; Leach & Da Silva, 2013), or were ranked based on responses to a language history questionnaire (Evans et al., 2013; Evans & Michael, 2014). The accuracy of subjective methods of measuring language proficiency is unknown. There might not have been differences between observers' judgments because non-native and native speakers were not able to accurately rate their own proficiencies (e.g., Cheng & Broadhurst, 2005). For these reasons, standardized measures of proficiency might be more conservative and ensure that the true effect of language proficiency is examined.

The Present Experiment

I examined whether language proficiency affected deception detection by addressing the methodological variations in previous research. In this study, the interviewer only spoke English; therefore, targets were not able to code-switch. A single, naturalistic, high-stakes paradigm was used to ensure that results would generalize to real-life forensic situations and the same demands were placed on all targets. In addition,

targets' language proficiencies were determined using standardized tests to ensure objectivity. Finally, four proficiency levels were tested to see how accuracy and bias varied across the full range of proficiencies.

Hypotheses

Discrimination. Based on previous studies (e.g., Da Silva & Leach, 2013), I hypothesized that deception would be easier to detect in targets with the highest level of proficiency (i.e., native English speakers) compared to targets that were in beginner English speakers. Observers were expected to be better at detecting deception in intermediate versus native English speakers based on Evans et al.'s (2013) findings. There have not been any studies conducted on deception detection in speakers with advanced English proficiency. However, I hypothesized that advanced English speakers would be judged similarly to native English speakers.

Bias. I hypothesized that targets with lower English proficiency levels (i.e., beginner and intermediate speakers) would be more likely to be judged as lie-tellers than native English speakers. This hypothesis was consistent with previous findings (e.g., Bond & DePaulo, 2008; Da Silva & Leach, 2013).

Confidence. Based on Da Silva and Leach's (2013) results, I hypothesized that confidence levels would differ depending on language proficiency. More specifically, I hypothesized that observers would be more confident when judging native English speakers than speakers with lower proficiencies (e.g., beginner, intermediate, and advanced speakers).

Chapter 2: Phase 1 – Deception Paradigm

Method

Research Design. Targets with beginner, intermediate, advanced, or native English proficiencies were randomly assigned to lie or tell the truth in a 2 (Veracity: lie vs. truth) x 4 (Proficiency: beginner English vs. intermediate English vs. advanced English vs. native English) between-subjects factorial design.

Participants. A total of 110 participants (Females = 76, Males = 34, M_{age}= 29.38, SD_{age}= 12.917) were recruited for this phase. They self-identified as Arab/ West Asian (6.3%), Black (18.9%), Chinese (7.2%), Filipino (3.6%), Hispanic (7.2%), Japanese (1.8%), Latin American (19.8%), South Asian (11.7%), South East Asian (4.5%), White (13.5%), or Other (4.5%).

Prior to data collection, I decided to collect as many targets as necessary to create a heterogeneous sample of 14 videos. I aimed to match targets across proficiency groups according to age, gender, and race. Sixty-eight targets were recruited from two established centres that provide language training services to prospective university students (i.e., CultureWorks) and new Canadian immigrants (i.e., Language Instruction for Newcomers to Canada; LINC). The centres used standardized English tests to assign students to language proficiency groups. I recruited targets from within each of these groups: beginner, intermediate, advanced. An additional 43 targets who self-identified as native English speakers were recruited from undergraduate courses at the University of Ontario Institute of Technology (UOIT). As an incentive to participate, LINC and CultureWorks participants were each paid $10, whereas UOIT students were compensated with course credit.

Materials

Videos. Two videos were used in this phase: the *Innocuous* video was shown to truth-tellers, whereas the *Suspicious* video was viewed by lie-tellers. The focal point of both videos was a computer desk that was covered with office supplies and personal belongings. During each video, the camera zoomed into the background of the scene and revealed a wall decorated with pictures, a map, and newspaper clippings. The items in the *Innocuous* video were meant to replicate a typical office setting, whereas the items in the *Suspicious* video were intended to suggest that a terrorist act was being planned. Table 1 provides a comparison of the items that were visible in the each videos.

Demographics Questionnaire. This questionnaire (Appendix A) was used to obtain demographic information from the targets and included items related to age, gender, and race. Additionally, the targets were asked ten questions pertaining to their language proficiency (e.g., "What language(s) do you consider your native (or first) language(s)?" "What language (s) do you speak at home?").

Experimental Questionnaire. I used a manipulation check to confirm that targets watched the video, understood its contents, and were aware of the instructions throughout the experiment. Targets were asked to answer questions regarding their comprehension of the interview questions and the video (Appendix B). This questionnaire featured a checklist on which the target was required to indicate the items that were present in the video. The checklist included both items that were not present in the video (e.g., a plant) and items that were featured in the video (e.g., a calendar).

This questionnaire also included 19 questions related to cognitive load (e.g., "How hard did you have to think about your answers?") and emotion (e.g., "How nervous

were you when answering the interview's questions?"). These questions were created to assess the cognitive state of the target during the interview and were based on the existing literature pertaining to cues to deception (DePaulo et al., 2003).

Interview Questions. Targets were asked closed and open-ended questions regarding the video that they watched (Appendix C). The questions were increasingly more specific as the interview progressed (e.g., "What did you see on the wall?" vs. "What was marked on the calendar?"). Both lie and truth-tellers were asked the same questions in the same order.

Procedure

Each target arrived at a laboratory at UOIT or at an empty room in one of the LINC or CultureWorks centres. A female experimenter greeted the target and explained that he or she must closely watch a short video clip on a laptop and follow the instructions that were to be provided on the screen. The experimenter set up the computer, entered a randomly assigned participant number into MediaLab, and exited the room. The preprogrammed MediaLab file randomly assigned the target to view either the *Innocuous* or *Suspicious* video. The video was delayed for a minute to ensure that the experimenter had left the room before the video started. During the delay, text on the computer screen prompted targets to remember details from the video because the remainder of the experiment would involve a memory task. At the end of the video, targets read instructions regarding how to act during the upcoming interview with the experimenter. The instructions varied based on condition: targets who viewed the *Innocuous* video were primed to answer all of the experimenter's questions honestly and accurately, whereas the targets who viewed the *Suspicious* video were instructed to lie to

the experimenter about the items in the video. The targets were also informed that they had two minutes to prepare for the interview. In order to motivate the targets in both conditions, the instructions stated that a $50 reward would be offered to a target if the experimenter was convinced that he or she was telling the truth. In fact, all targets were entered into a draw for the money.

The experimenter, who was blind to condition, re-entered the room, turned on the camera, and asked the *Interview Questions*. These questions were asked in English and code-switching was not permitted. Finally, the experimenter provided the target with the *Demographics Questionnaire* and the *Experimental Questionnaire*. Once the questionnaires were completed, the target was debriefed and entered into a draw to win the reward. The experimenter also obtained consent from the target to utilize the video footage of the interview in the next phase of the study. Each session took approximately 30 minutes.

Chapter 3: Phase 1 Results

The following analyses were conducted on targets' responses to various items on the Experimental Questionnaire (Appendix B). Targets who confessed (i.e., revealed that they were instructed to lie) during the interview were excluded from this analysis (n = 15).

Self-Reported Proficiency

I conducted a one-way ANOVA on targets' responses to the question "What is your English proficiency?" There was a significant main effect of Proficiency, $F(3, 94) = 89.433$, $p < .001$, $\eta_p^2 = .74$, 95% CI [.64, .79]. Post hoc Tukey's tests revealed that native English speakers ($M = 4.95$, $SD = .22$) were the most proficient, $p < .001$, followed by advanced English speakers ($M = 3.73$, $SD = .63$), who were more proficient than intermediate English ($M = 3.25$, $SD = .55$), $p = .009$ and beginner English speakers ($M = 3.24$, $SD = .56$), $p = .008$. However, beginner English speakers' responses did not differ significantly from intermediate English speakers, $p = 1.00$.

I also conducted a one-way ANOVA on targets' responses to the question "How many years have you been speaking English?" Again, there was a significant main effect of Proficiency, $F(3, 94) = 26.363$, $p < .001$, $\eta_p^2 = .457$, 95% CI [.29, .56]. Post-hoc analyses revealed that beginners ($M = 2.78$, $SD = 2.73$) had been speaking English for fewer years than intermediate speakers ($M = 4.59$, $SD = 9.15$), who had fewer years speaking English than advanced ($M = 8.18$, $SD = 13.42$) and, finally, native English speakers ($M = 19.12$, $SD = 2.91$).

Manipulation Check

At the end of the Experimental Questionnaire, targets were required to identify the items that they saw in the video. The questionnaire featured 20 items, nine of which were present in the Suspicious or the Innocuous video. I conducted one-sample *t*-tests to compare the number of items that targets circled on the questionnaire to the correct number of items (i.e., 9). The results revealed that there were no significant differences between the number of selected responses and the correct number of responses for beginner (M = 8.88, SD = .33), p = .163, intermediate (M = 8.89, SD = .33), p = .163, advanced (M = 8.91, SD = .29), p = .162, and native English speakers (M = 8.89, SD = .16), p = .323. These results indicated that all targets were aware of the video's contents.

Motivation

I examined whether targets were invested in their responses during the interview by analyzing their responses to the question, "How motivated were you to convince the interviewer that you were telling the truth?" Responses were on a 10-point Likert scale (i.e., 1 = not at all motivated, 10 = extremely motivated). A 4 (Proficiency: native English vs. advanced English vs. intermediate English vs. beginner English) X 2 (Veracity: lie-teller vs. truth-teller) MANOVA revealed that there were no significant differences in targets' motivation across proficiency groups, $F(3, 95) = 1.307$, $p = .277$ $\eta_p^2 = .042$, 95% CI [.00, .11]. Additionally, a significant difference was found when the average motivation score (i.e., 6.79) was compared to a score of 5, $t(98) = 6.578$, $p < .001$. Thus, targets were motivated (M = 6.79, SD = 2.69) to convince the interviewer that they were telling the truth. There were no other main effects or interactions.

Exploratory Analysis

Emotion. I conducted a Proficiency x Veracity MANOVA on targets' responses to the 9 items on the Experimental Questionnaire. However, there was no statistically significant effect of Proficiency, $F(3, 36) = 1.271$, $p = .206$, ; Pillai's Trace = .92, $\eta_p^2 = .096$, 95% CI [.00, .24], or Veracity, $F(1, 38) = .665$, $p = .731$, ; Pillai's Trace = .20,$\eta_p^2 = .053$, 95% CI [.00, .17], on the combined dependent variables. There were no significant interaction between Proficiency and Veracity, $F(3, 36) = .457$, $p = .988$, ; Pillai's Trace = .410, $\eta_p^2 = .037$, 95% CI [.00, .14].

Cognitive Load. I conducted a Proficiency x Veracity MANOVA on targets' responses to the 9 items pertaining to cognitive load. There was a statistically significant effect of Proficiency, $F(3, 36) = 2.310$, $p = .002$, Pillai's Trace = 1.33, $\eta_p^2 = .161$, 95% CI [.00, .32] on the combined dependent variables. I examined the univariate effects more closely using a Bonferroni adjusted alpha level of .006. One difference that reached statistical significance was targets' difficulty understanding the interview's questions, $F(3,36) = 7.565.$, $p = .001$, $\eta_p^2 = .387$, 95% CI [.11, .54]. Post hoc Tukey's tests revealed that beginner English speakers ($M = 3.75$, $SD = 2.99$) had a harder time understanding the interviewer's questions than native English speakers ($M = 1.35$, $SD = .67$), $p = .039$, whereas intermediate English speakers ($M = 4.29$, $SD = 2.81$) had more difficulty understand the questions than advanced ($M = 1.89$, $SD = 1.27$), $p = .022$, or native English speakers ($M = 1.35$, $SD = .67$), $p = .001$. There were no other differences between the dependent variables. There was also no significant interaction between Veracity and Proficiency, $F(3,36) = 1.235.$, $p = .234$, $\eta_p^2 = .093$, 95% CI [.00, .24].

Chapter 4: Phase 2 - Evaluating Deception Detection

Method

Research Design. I used a 2 (Veracity: lie vs. truth) x 4 (Proficiency: beginner English vs. intermediate English vs. advanced English vs. native English) mixed-factors design. Observers were randomly assigned to view a compilation of videos of targets who were lying and telling the truth, and who spoke English at a beginner, intermediate, advanced, or native level of proficiency.

Participants. An a priori power analysis using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) and previously detected effect sizes (i.e., Da Silva & Leach, 2014) revealed that 132 participants were required to achieve sufficient power (i.e., .95) for the second phase of the study. Overall, I recruited 132 undergraduates from UOIT (Females = 80, Males = 52, M_{age} = 19.21 years, SD_{age} = 1.85) who participated in the study in exchange for course credit. These observers self-identified as Arab/ West Asian (6.8%), Black (9.1%), Chinese (6.1%), Latin American (.8%), South Asian (32.6%), South East Asian (6.1%), White (34.1%), or Other (4.5%).

Materials

Demographics Questionnaire. The same questionnaire that was used to collect demographic information (i.e., race, age, gender) in Phase 1 was used during this phase.

Video Footage. I compiled 14 videos (i.e., seven truth-tellers and seven lie-tellers) for each level of English proficiency (i.e., beginner, intermediate, advanced, and native) from Phase 2. The average length of each video was 187.50 seconds (*SD* = 83.10). I randomized the order in which the videos within each condition (i.e., proficiency group) were shown. The targets' facial features and upper bodies were visible

throughout the videos. Overall, videos of 56 targets (Females = 37, Males = 19, M_{age} = 28.07, SD_{age} = 10.12) were used in this phase. The targets self-identified as Arab/ West Asian (10.7%), Black (23.2%), Chinese (8.9%), Filipino (5.4%), Hispanic (7.1%), Japanese (3.6%), Latin American (25.0%), South Asian (3.6%), South East Asian (7.1%), White (1.8%), or Other (3.6%).

Judgment Questionnaire. Using this questionnaire, observers indicated whether each target was lying or telling the truth (see Appendix D). Additionally, observers were asked to indicate, on a scale from 0% (not at all confident) to 100% (extremely confident), the degree to which they were confident in each of their decisions.

Procedure

The observers were tested individually in a quiet room. Upon arrival to the experimental session, an experimenter asked observers to sign a consent form. Each observer was instructed to sit at a computer and watch the randomly assigned *Video Footage* of targets from one of the four language proficiency conditions (i.e., beginner, intermediate, advanced, or native). Following each video, observers were prompted to complete the corresponding item on the *Judgment Questionnaire*. Once all of the videos were viewed, observers were instructed to complete the *Demographics Questionnaire* and then they were debriefed. Each session lasted approximately one hour.

Chapter 5: Phase 2 Results

In order to eliminate covariates, preliminary analyses were conducted on observers' gender and race. Effects were non-significant; therefore, the following analyses collapsed across those variables.

Accuracy

Accuracy was calculated by assigning a "0" to each inaccurate decision and a "1" to each accurate decision, and then averaging each observers' scores. Overall accuracy (M = .57, SD = .14) ranged from a minimum of .21 to a maximum of .93. A Proficiency (native English vs. advanced English vs. intermediate English vs. beginner English) x Veracity (lie vs. truth) mixed-factors ANOVA was conducted on observers' accuracy. Observers were significantly more accurate when judging truth-tellers (M = .64, SD = .20) than lie-tellers (M = .50, SD = .22), $F(1, 131) = 24.846$, $p < .001$, $\eta_p^2 = .163$, 95% CI [.06, .27]. I also found a main effect of Proficiency (see Figure 1), $F(3, 129) = 5.549$, p = .001, $\eta_p^2 = .115$, 95% CI [.02, .71]. Post hoc Tukey's tests revealed that observers were less accurate when they judged beginner English speakers than when they judged native English speakers, $t(63) = 3.087$, $p = .003$, $d = .39$, 95% CI [.13, .64], advanced English speakers, $t(63) = 2.231$, $p = .029$, $d = .28$, 95% CI [.03, .53], or intermediate English speakers, $t(66) = 3.985$, $p < .001$, $d = .49$, 95% CI [.23, .74]. However, there were no significant differences between any of these other groups. There was no significant interaction between Veracity and Proficiency, $F(3, 129) = 1.458$, $p = .229$, $\eta_p^2 = .033$, 95% CI [.00, .09].

Signal Detection Theory

I used Signal Detection Theory (SDT; Green & Swets, 1966) to analyze observers' response biases (i.e., β) and their abilities to discriminate between lie- and truth-tellers (i.e., d'). In SDT, discrimination is described as an individual's ability to correctly detect the presence of a signal or hit (e.g., a lie) and make a correct rejection in the absence of a signal (e.g., the truth). A false alarm occurs when a hit is registered in the absence of a signal (i.e., detected lie but truth was told). Bias refers to the probability of an individual to choose one response over another (i.e., likelihood to assume the truth will be told).

I used Wixted and Lee's (n.d.) formula to calculate discrimination and bias. A standard correction was performed on all hit rates of "1" or false alarms of "0". That is, false alarms of "0" were changed to the equivalent of one divided by two times the maximum number of false alarms (i.e., 7). Hits were changed to the equivalent of one subtracted by the product of one divided by two times the maximum number of false alarms (i.e., 7). Therefore, false alarms were changed from "0" to ".07" and hits were changed from "1" to ".93", as per Wixted and Lee's (n.d.) suggestion.

Discrimination. I conducted a one-way ANOVA on observers' discrimination between lie- and truth-tellers to examine the hypotheses that deception would be easier to detect in native speakers than beginner English speakers, and in intermediate than native English speakers. Deception detection was expected to be similar for advanced and native English speakers. There was a significant main effect of Proficiency, $F(3, 129) = 5.500$, $p = .001$, $\eta_p^2 = .114$, 95% CI [.02, .21]. Post hoc Tukey's tests revealed that observers were less able to discriminate between lie- and truth-tellers (see Table 2) who

were beginner English speakers (M = -.00, SD = .51) than those who were native English speakers (M = .41, SD = .59), p = .009, or intermediate English speakers (M = .47, SD = .50), p = .001. There were no significant differences between any of the other proficiency groups (i.e., ps > .05).

One-sample t-tests were used to compare observers' discrimination scores to "0" (i.e., no discrimination). Observers were able to discriminate between truth- and lie-tellers with native English proficiency, $t(31) = 3.994$, $p < .001$, d = .71, 95% CI [.31, 1.01], advanced English proficiency, $t(31) = 3.147$, p = .004, d = .56, 95% CI [.18, .93] and intermediate English proficiency, $t(34) = 5.562$, $p < .001$, d = .94, 95% CI [.54, 1.33]. However, observers were unable to discriminate between liars and truth-tellers who had beginner English proficiency, $t(32) = -.038$, p = .970, d = .01, 95% CI [-.27, -.28].

Bias

To examine the hypothesis that beginner and intermediate English speakers would be more likely to be judged as lie-tellers than native English speakers, I conducted a one-way ANOVA on observers' biases. The results revealed that there was no significant difference between proficiency groups (see Table 2), $F(3, 129) = 1.239$, p = .298, η_p^2 = .028, 95% CI [.00, .08].

One-sample t-tests were used to compare observers' bias to "1" (i.e., no bias). There was a significant truth bias when observers judged native English speakers, $t(31)$ = 2.215, p = .034, d = .39, 95% CI [.03, .75]. However, there was no indication of bias when observers judged advanced English speakers, $t(31)$ = .159, p = .874, d = .03, 95% CI [-.32, .37], intermediate English speakers, $t(34)$ = 1.690, p = .100, d = .29, 95% CI [-

.05, .62], or beginner English speakers, $t(32) = 1.921$, $p = .064$, $d = .33$, 95% CI [-.02, .68].

Confidence

A Proficiency x Veracity mixed-factors ANOVA was conducted on observers' confidence scores to examine whether observers would be more confident when judging native English speakers than any other levels of English proficiency (i.e., beginner, intermediate, and advanced). Observers were more confident when viewing lie-tellers ($M = 74.59$, $SD = 9.53$) than truth-tellers ($M = 72.54$, $SD = 11.29$), $F(1, 131) = 6.881$, $p = .010$, $\eta_p^2 = .051$, 95% CI [.00, .14]. There was no significant main effect of Proficiency (see table2), $F(3, 129) = 1.381$, $p = .251$, $\eta_p^2 = .031$, 95% CI [.00, .09], nor a significant interaction between Proficiency and Veracity, $F(3, 129) = .679$, $p = .566$, $\eta_p^2 = .016$, 95% CI [.00, .06].

Exploratory Analyses

Accuracy and Confidence. A Pearson's correlation was performed on observers' accuracy and confidence within each language proficiency condition. There were no significant correlations between accuracy and confidence when observers judged native English speakers, $r(32) = .13$, $p = .464$, advanced English speakers, $r(32) = .05$, $p = .769$, intermediate English speakers, $r(35) = -.21$, $p = .227$, or beginner English speakers, $r(33) = .26$, $p = .142$.

Chapter 6: Discussion

In this study, I analyzed the impact of targets' language proficiencies on lie detection. Overall, observers' accuracy was slightly higher than chance (i.e., 50%); in addition, they were more accurate when they judged truth-tellers than lie-tellers. As discussed below, these results were consistent with previous literature (e.g., Bond & DePaulo, 2006). More importantly, there were also promising findings that suggested avenues for future research.

Accuracy and Discrimination

I hypothesized that observers' accuracy would be highest when they viewed native and intermediate English speakers than beginner English speakers. These hypotheses were partially supported. Observers' accuracy was poorest when they were making decisions regarding beginner English speakers compared to all other proficiencies (i.e., native, advanced, and intermediate English speakers). Observers were also worse at differentiating between liars and truth-tellers who were beginner English speakers than those in any other proficiency level. Thus, I replicated previous findings in our laboratory that compared native and beginner English speakers (i.e., Da Silva & Leach, 2013; Leach & Da Silva, 2013), and extended them to other levels of proficiency. There are several explanations for this pattern of results.

Although I did not examine the cues that observers used to make their decisions, it is plausible that they were relying on misleading information. For example, Bond and DePaulo (2006) reported that observers were more accurate when they heard (vs. watched) lie-tellers than truth-tellers. It is possible that, in my study, observers' accuracy was lower because they were distracted by visual stimuli instead of focusing on auditory

stimuli. Observers are known to expect lie-tellers to avoid eye contact (Akehurst, Kohnken, Vrij, & Bull, 1996) and self-manipulate (fidget; Vrij, 2008). However, this behavior is more common with non-native speakers than native speakers, especially when they are nervous (Gregerson, 2005). Thus, non-native speakers may have appeared as though they were lie-tellers, reducing observers' accuracy.

With regards to observer expectations, Lev-Ari and Keysar (2012) examined native speakers as they listened to, and interacted with, non-native speakers. Their findings revealed that observers (i.e., native speakers) paid attention to fewer details because they expected non-native speakers to communicate poorly. Vrij, Evans, Akehurst, & Mann (2004) have found that details are an important aspect of lie detection decisions. Thus, observers' discrimination between lie- and truth-telling beginner English speakers may have been compromised by their expectations (i.e., that non-native speakers' English would be poor and details could be ignored).

Researchers have also indicated that non-native speakers (i.e., beginners) themselves are ultimately different from the other proficiency groups due to their emotionality. Caldwell-Harris and Aycicegi-Dinn (2009) analyzed the association between emotionality and language proficiency. Their findings revealed that non-native speakers (vs. native speakers) were less likely to react emotionally to words in their non-native languages. However, emotional theory suggests that lying is accompanied by feelings of guilty, fear, and excitement (Ekman, 1989). My results suggest that the beginner English speakers were less emotionally involved than advanced English speakers and, thus, it may have been more difficult for observers to discern liars from truth-tellers in the former group.

Finally, the findings may also be explained by the speakers' intelligibility. Bent and Bradlow (2003) revealed that native English listeners found native English speakers most intelligible (vs. non-native English speakers). As speakers' accents increased, their intelligibility decreased (Wasserman, 2008). Perhaps observers' discrimination in my study was affected by beginner English speakers' intelligibility. That is, observers' accuracy might have been poor when they judged beginners because they were unable to understand what was being said.

Bias

I hypothesized that targets in the non-native proficiency groups (i.e., advanced, intermediate, and beginners) would be more likely to be judged as lie-tellers. This hypothesis was not supported and I was unable to replicate the lie bias that was found by Da Silva and Leach (2013). However, other studies have also been unable to replicate this bias (e.g., Evans et al., 2013). Leach and Da Silva (2013) attributed these conflicting results to methodological differences: a lie bias has only been found when language proficiency was a within-participant factor (i.e., Da Silva & Leach, 2013). Observers in that study likely compared targets of differing proficiencies against one another when making their decisions. In my study, such comparisons were not possible and the lie bias was not found. Yet, observers still judged non-native English speakers differently compared to native English speakers. Interestingly, observers who judged native English speakers were more likely to label them as truth-tellers, indicating the presence of a truth bias, whereas observers did not exhibit biases toward advanced, intermediate, or beginner English speakers. This finding replicates Da Silva and Leach's (2013) and Leach and Da Silva's (2013) results and extends them to other proficiency groups. Observers continue

to be viewed less positively than non-native speakers. Brennan and Brennan (1981) found that speakers with accents were found to be less credible than speakers without an accent. Perhaps observers viewed English speakers in lower proficiency groups (i.e., beginner, intermediate, and advanced speakers) as less credible than native English speakers. Thus, the lack of truth bias towards non-native English speakers was likely due to their accents.

Confidence

I hypothesized that observers' confidence levels would differ depending on speakers' proficiency, however, this notion was not supported. Previous studies (i.e., Da Silva & Leach, 2013; Leach & Da Silva, 2013) reported that speakers' proficiencies impacted observers' confidence such that it was higher when they judged native than non-native English truth-tellers, but not when they judged native and non-native English speakers who were lying. Da Silva and Leach (2013) reported that their results may have been due to native English observers' familiarity with native English targets. If that were true, then observers in my study should have also been highly confident when they judged native English targets; it is unclear why this was not the case.

Unexpectedly, I found that observers were more confident when judging lie-tellers than truth-tellers. This effect was contrary to my hypothesis and has never been found in studies that examined language proficiency and lie detection. One explanation for this finding is that lie-tellers are expected to experience higher cognitive load and, thus, they should be easier to detect than truth-tellers. Vrij et al. (2008) found that increased cognitive load caused participants to think harder and monitor their behaviors, which may take away from their abilities to conceal a lie. My exploratory analysis revealed that lie-tellers (vs. truth-tellers) experienced heightened cognitive load, which

would suggest that they were unable to conceal their deceit. Perhaps observers were more confident in their decisions with lie-tellers, because observers noted a change in targets' behavior. However, the fact that observers' accuracy was higher for truth-tellers (vs. lie-tellers) suggests that observers were unable to determine whether the change in behavior was indicative of truthfulness or deceit.

Limitations and Future Research

The current study provided an important and novel look at deception detection; however, as with any study, there are opportunities for further research. Overall, the limitations of this study were associated with a lack of insight into the decision-making process of observers.

Because my findings replicated previous studies, it is important to be able to understand why observers continuously underperform when judging beginner English speakers. Other researchers (e.g., Cheng & Broadhurst) have required observers to report cues used to make deception detection judgments. However, observers in my study were only required to choose whether a target was lying or telling the truth and to report a level of confidence associated with that decision. Future studies should inquire into observers' processes by examining the cues that they used to make their decisions (i.e., auditory vs. visual stimuli).

In addition, researchers could examine observers' expectations and comprehension of non-native speakers. Specifically, they could examine the presence of a stereotype that non-native speakers communicate poorly (e.g., Lev-Ari & Keysar, 2012). Prior to watching a video, observers could be questioned about their previous experiences interacting with non-native speakers and their related expectations. Tsurutani and

Selvanathan (2013) found that non-native speakers' accents made a negative impact on observers' perceptions; however, this effect was mitigated by observers' previous contact (i.e., experience) with non-native speakers.

Observers could also be asked about speakers' intelligibility. That is, they could be asked about the ease with which they were able to comprehend the targets. Presumably, if observers were unable to understand non-native speakers then their decision-making process would be negatively impacted.

Implications

My results revealed that observers were unable to discern between the lies and truths of beginner English speakers. Given that the sample of targets was recruited from immigrant centers for adults and students, they all entered the country through a border and would have encountered a customs agent. These results suggest that this interaction may have been difficult for the customs agent because of the demonstrated difficulties discerning truthfulness (unless an interpreter was used or the agent spoke the target's native language). Following debriefing, many beginner English speakers (and other non-native speakers) spoke about their experiences at our airports. They said that they were apprehensive about their arrival to a new country, which was only made worse when they were met with suspicion and thoroughly questioned regarding their intentions. They recalled repeating their rehearsed itineraries and not being able to understand the agents' questions. Thus, these findings have real implications for airports and borders all around the world where non-native speakers of all languages are being interviewed.

There is an urgent need to conduct further research to be able to advise border and law enforcement agencies of better practices with regards to non-native speakers. Perhaps

Robert Dziekanski's death could have been avoided had there been more information on the interaction between individuals with varying levels of language proficiency. In the meantime, agents should make every attempt to find an interpreter or someone who speaks the interviewee's native language so that he or she is not placed at risk.

Conclusions

I examined the impact of varying language proficiencies on deception detection accuracy, bias, discrimination, and confidence. Overall, observers' accuracy was poorest when judging beginner English speakers. Indeed, observers were also better at discriminating between lie- and truth-tellers in native, advanced, and intermediate English speakers than beginner English speakers. Even though non-native English speakers did not face a judgment bias they were still at a disadvantage; native English speakers were perceived more positively. The results of this study have implications for the safety and security of borders and individuals and, thus, more research is needed to establish best practices when interviewing non-native speakers.

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Table 1

Similar and dissimilar items on the desk and the wall in the Innocuous and Suspicious videos

	Desk	
	Innocuous	Suspicious
Similar Items	Documents with blacked out names Laptop Tape holder	
Dissimilar Items	Books and booklet	Books and instrumental bomb-making manual
	Empty cardboard box	Cardboard box with imitation pipe bomb (i.e., metal cylinder, wires, red button)
	Blue print of a machine	Blue print of golden gate bridge
	Cup with pen, pencil, highlighter	Cup with tools (e.g., screwdriver)
	Wall	
Similar Item	Calendar with circled date	
Dissimilar Items	Map with pictures of tourists at Harbour bridge (Australia), Tower bridge (England), and Golden Gate Bridge (United States)	Map with pictures of the same three bridges. Golden Gate bridge is circled.
	Picture of President Obama	Defaced picture of President Obama
	Newspaper clippings of joyous events	Newspaper clippings of previous bridge malfunctions, demolitions, and explosions

Table 2

Table of means (M) and standard deviations (SD) for overall accuracy, overall confidence, discrimination, and response bias from Phase 2

Measure	Native		Advanced		Intermediate		Beginner	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Overall Accuracy	.60	.14	.57	.13	.62	.12	.50	.12
Discrimination (d')	.41	.59	.27	.49	.47	.50	-.00	.51
Response Bias (β)	1.24	.62	1.01	.32	1.15	.53	1.14	.43
Overall Confidence	75.43	8.92	71.95	7.62	71.92	9.49	75.08	11.12

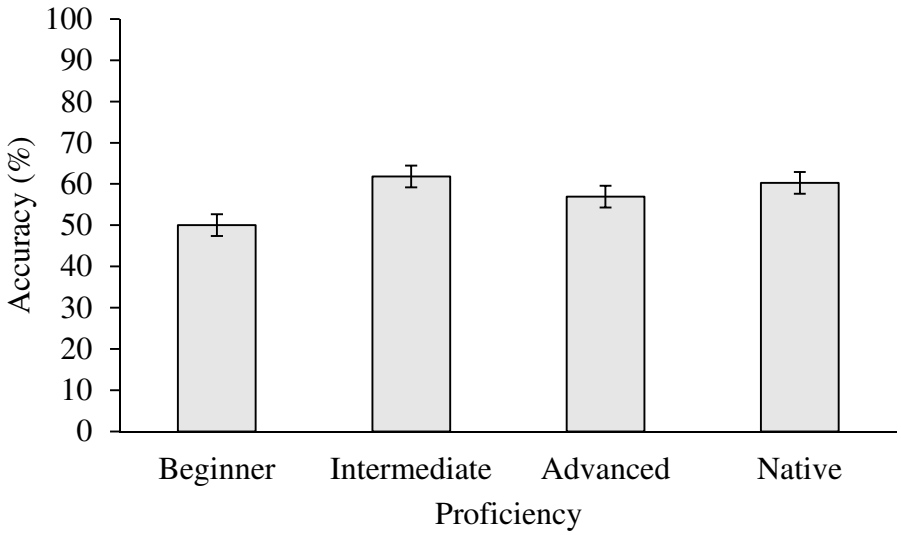

Figure 1. Observers' overall accuracy when judging lie- and truth-tellers across four proficiency levels. Error bars represent 95% confidence intervals.

Appendices

Appendix A

Demographics Questionnaire

Please provide the following information:

1. What is your gender? Male Female

2. Age: _____years

3. Race (check the one that *most* describes you):

_____ Aboriginal (Inuit, Métis, North American Indian)
_____ Arab/ West Asian (e.g., Armenian, Egyptian, Iranian, Lebanese, Moroccan)
_____ Black (e.g., African, Haitian, Jamaican, Somali)
_____ Chinese
_____ Filipino
_____ Hispanic
_____ Japanese
_____ Korean
_____ Latin American
_____ South Asian
_____ South East Asian
_____ White (Caucasian)
_____ Other _____

4. What language(s) do you speak? _____
5. What language(s) do you consider your native (or first) language (s)? _____

6. What language(s) do you speak at home? _____

7. What language did you learn first? _____

8. What is your English proficiency?

1 2 3 4 5
Poor Excellent

9. How many years have you been speaking English? _____

10. Please list all of the languages that you speak (including your native language):

Language 1: _____

Language 2: _____

Language 3: _____

Language 4: _____

(a) Estimate how often you communicate in each language:

1 = daily; 2 = several days a week; 3 = weekly; 4 = bi-weekly; 5 = monthly; 6 = every few months; 7 = once or twice a year; 8 = less than once or twice a year

Language 1: _____

Language 2: _____

Language 3: _____

Language 4: _____

(b) For each language, please rate your reading proficiency: 1 (not literate) to 5 (very literate):

Language 1: _____

Language 2: _____

Language 3: _____

Language 4: _____

(c) For each language, please rate your writing proficiency: 1 (not literate) to 5 (very literate):

Language 1: _____

Language 2: _____

Language 3: _____

Language 4: _____

(d) For each language, please rate your speaking ability: 1 (not fluent) to 5 (very fluent):

Language 1: _____

Language 2: _____

Language 3: _____

Language 4: _____

(e) For each language, please rate your listening ability: 1 (not fluent) to 5 (very fluent):

Language 1: _____

Language 2: _____

Language 3: _____

Language 4: _____

Appendix B

Experimental Questionnaire

1. How **nervous** were you when answering the interviewer's questions?
1 2 3 4 5 6 7 8 9 10
Not at all nervous Extremely nervous

2. How **excited** did you feel when you were answering the interviewer's questions?
1 2 3 4 5 6 7 8 9 10
Not at all excited Extremely excited

3. How **guilty** did you feel when you were answering the interviewer's questions?
1 2 3 4 5 6 7 8 9 10
Not at all guilty Extremely guilty

4. How **surprised** were you when answering the interviewer's questions?
1 2 3 4 5 6 7 8 9 10
Not at all surprised Extremely surprised

5. How **ashamed** were you when answering the interviewer's questions?
1 2 3 4 5 6 7 8 9 10
Not at all ashamed Extremely ashamed

6. How **afraid** were you when answering the interviewer's questions?
1 2 3 4 5 6 7 8 9 10
Not at all afraid Extremely afraid

7. How **anxious** were you when answering the interviewer's questions?
1 2 3 4 5 6 7 8 9 10
Not at all anxious Extremely anxious

8. How **negative** were you when answering the interviewer's questions?
1 2 3 4 5 6 7 8 9 10
Not at all negative Extremely negative

9. How **emotional** were you when answering the interviewer's questions?
1 2 3 4 5 6 7 8 9 10
Not at all emotional Extremely emotional

10. How difficult was it for you to answer the interviewer's questions?
1 2 3 4 5 6 7 8 9 10

Not at all difficult Extremely difficult

11. How difficult was it for you to understand the interviewer's questions?
1 2 3 4 5 6 7 8 9 10
Not at all difficult Extremely difficult

12. How hard did you have to think about your answers?

1 2 3 4 5 6 7 8 9 10
Not at all hard Extremely hard

13. How hard did you have to pay attention to your behaviours?

1 2 3 4 5 6 7 8 9 10
Not at all hard Extremely hard

14. How hard did you have to plan your answers?

1 2 3 4 5 6 7 8 9 10
Not at all hard Extremely hard

15. How hard did you have to remember your answers?

1 2 3 4 5 6 7 8 9 10
Not at all hard Extremely hard

16. How hard did you have to pay attention to the experimenter's behaviours?

1 2 3 4 5 6 7 8 9 10
Not at all hard Extremely hard

17. How long did you think when answering the experimenter's questions?

1 2 3 4 5 6 7 8 9 10
Not at all long Extremely long

18. How detailed were your answers to the experimenter's questions?

1 2 3 4 5 6 7 8 9 10
Not at all detailed Extremely detailed

19. How motivated were you to convince the interviewer that you were telling the truth?

1 2 3 4 5 6 7 8 9 10
Not at all motivated Extremely motivated

20. Do you think that the interviewer believed you? YES NO

Why? _____

21. What behaviours do you think that the interviewer was looking for?

_____

22. If I had a choice, I would prefer to be interviewed in (circle one):

MY NATIVE LANGUAGE MY NON-NATIVE LANGUAGE(S)

Please circle all of the items which you actually remember seeing in the video. Be sure to tell the truth (i.e., **do not lie**)

Cell phone	Phone bills	Coffee mug	Soda cans	Gun	Pens and pencils
Tools (e.g. screwdriver)	Guitar	Photo album	Printer	Bag of chips	Plant
Books	Scissors	Drawing	Blue prints	Calculator	Map
Calendar	Gum	Newspaper clippings	Headphones	Laptop	Box

Appendix C

Interview Questions

Experimenter: I know that you saw what was in the factory, so I am going to ask you questions about that.

1. What did you see on the wall?
2. What items were on the desk?

I have interviewed another person, so I have to verify his information – I need you to answer the following questions:

3. There were papers on the desk. What was written on them?
4. What was marked on the calendar?
5. Where was the gun?
6. What books were on the table?
7. What locations were marked on the map?
8. What is the significance of the locations marked on the map?
9. Can you describe who was in the pictures?
10. There was a package on the desk. Describe what was in the box.
11. Who do you think was working at that desk?
12. What do think that person is planning?
13. Is there anything that we have to be worried about?
14. Are you lying to me?

Experimenter: This is a serious matter and I have to get to the bottom of this.

15. I know there was a bomb in the room. Where was the bomb?
16. How big was the bomb?
17. If he/she wasn't making a bomb, then why were there tools on the table?
18. A date was marked on the calendar, when is the bomb planned to go off?
19. There were places marked on the map, where is he going to place the bomb?
20. I heard that he/she plans to plant a bomb on a bridge. Did you see anything that supports that?

Appendix D

Judgment Questionnaire

For each video, please indicate whether the participant in the video is lying or telling the truth and how confident you are in your judgment.

Video 1:
The participant is:

☐Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 2:
The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 3:
The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 4:
The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 5:
The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 6:
The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 7:
The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 8:
The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 9:
The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 10:
The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 11:
The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 12:
The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 13:
The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)

Video 14: The participant is:

☐ Lying ☐Telling the truth Confidence: _____ (0 – 100%)