Detecting Deception in Second-language Speakers

by

Cayla S. Da Silva

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CERTIFICATE OF APPROVAL

Submitted by **Cayla S. Da Silva]**

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Detecting Deception in Second-language Speakers

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Examining Committee

Dr. Phillip Shon	Chair of Examining Committee
Dr. Shari Forbes	External Examiner
Dr. Amy-May Leach	Research Supervisor
Dr. Brian Cutler	Examining Committee Member
Dr. Andrea Slane	Examining Committee Member

As research supervisor for the above student, I certify that I have read and approved changes required by the final examiners and recommend the thesis for acceptance:

_____ Dr. Amy-May Leach
Research Supervisor

Abstract

It is currently unknown how lie detection accuracy is affected when someone is speaking in his or her second language. We examined whether language proficiency had an impact on lie detection. We hypothesized that when judging the veracity of second-language speakers, participants would be better able to discriminate between truth- and lie-tellers and would have bias toward picking 'lying' since they may display cues associated with lying when communicating.We collected video footage of native- and second-language English speakers who lied or told the truth about a transgression. Undergraduate students (N = 51) then judged the veracity of these clips and indicated how confident they were in their ratings. Participants were most accurate and confident when judging native-language truth-tellers. In addition, participants were more likely to exhibit a truth-bias when observing native-language speakers, whereas they were more likely to exhibit a lie-bias when viewing second-language speakers. Implications for the justice system will be discussed.

Keywords: deception detection, bilingualism, cognitive load, bias

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Table of Contents

List of Figures

List of Appendices

Detecting Deception in Second-language Speakers

Generally, people are only able to detect lying as accurately as they would be able to predict heads or tails when tossing a coin (Bond & DePaulo, 2006). It may be problematic and unjust for people to rely upon their lie detection skills in forensic settings if they are not accurate. Researchers have extensively examined questions pertaining to whether detection is affected by the type or magnitude of the lie (e.g., O'Sullivan, Frank, Hurley, & Tiwana, 2009). However, very little research has explored the implications of communication barriers for interrogations. Specifically, it is unknown how lie detection accuracy is affected when someone is speaking in his or her second language.

Approaches to Lie Detection

There are two phases in lie detection research: (1) the production of the lie- and truth-telling stimuli; (2) others' observation and judgment of the stimuli. First, lie detection researchers must create scenarios that mimic how lie-telling is elicited in daily life or during interrogations. Individuals will be videotaped while lying or telling the truth about an opinion (e.g., capital punishment; Cheng & Broadhurst, 2005), event (e.g., going to a restaurant; Vrij, et al., 2009), or transgression (e.g., committing a crime; Vrij & Mann, 2001a). Typically, lie detection experiments have been conducted in laboratory settings (e.g., Bond & DePaulo, 2006; Vrij, et al., 2009). Researchers either examine lie-telling that has been purely experimentally manipulated (i.e., the participant is told to lie or tell the truth) or lying that is naturalistic (i.e., the participant is placed in a situation in which he or she chooses to lie or tell the truth of his or her own accord; Leach et al., 2009).

Once videos are compiled of individuals either lying or telling the truth, researchers move on to the lie detection phase of the research. During this phase, observers watch the video clips and determine whether each participant in the video is lying or telling the truth. Typically, these observers are university students or police officers (e.g., DePaulo & Pfeifer, 1986; Kohnken, 1987). Many contemporary lie detection studies have asked observers to rate their level of confidence in their veracity judgments on a scale from zero to one hundred (e.g., Kassin et al., 2007).

Lie Detection Accuracy

Across the majority of studies, individuals' ability to accurately identify deception is at, or near, chance levels (i.e., 50%). Specifically, a meta-analysis indicated that the average lie detection accuracy rate for laypersons was 54%: 61% of truth judgments were correctly identified and 47% of lie judgments were correctly identified (Bond & DePaulo, 2006). The inability to detect deception above chance levels is not only found in laypersons, but also law enforcement officials (e.g., police officers, federal polygraphers, judges, robbery investigators; e.g., Ekman & O'Sullivan, 1991).

A few researchers argue that certain groups are able to detect deception. Ekman and O'Sullivan (1991) found that Secret Service agents' accuracy was significantly higher than 50%. Ekman, O'Sullivan, and Frank (1999) also identified several groups that were able to detect deception at a level greater than chance: sheriffs, federal officials, and clinical psychologists. However, generally, law enforcement groups can only detect deception at chance levels.

One of the reasons why law enforcement officials performed poorly may be because the deception paradigms that they were judging did not align with the contexts in which they had professional experience (O'Sullivan et al., 2009). Specifically, the stakes associated with lying may have affected their accuracy. O'Sullivan et al. (2009) have argued that low-stakes lies are those that are unimportant, in terms of the consequences associated with being caught. Conversely, high-stakes lies have some personal significance to the individual because of either the subject matter and/or the consequences if they are (un)successful. Low-stakes lying – which is commonly produced in lie detection studies – may be difficult to detect simply because the lie-tellers may not mimic the behaviors exhibited by real-life lie-telling (e.g., anxiety).

Researchers have attempted to create high-stakes scenarios that are applicable to forensic contexts. Vrij and Mann (2001a) had police officers watch fragments of an interrogation of a suspect and identify whether the suspect was lying or telling the truth. Although the study was based only on the detection of one individual's statements, police officers were significantly better able to identify truth-telling (approximately 70% accuracy) than lie-telling (approximately 57% accuracy). However, police officers' overall accuracy was still at approximately chance levels. Police officers' may have only performed around chance levels within this study because they were only judging one individual, and he may have displayed idiosyncrasies related to truth- and lie-telling. Also, given that lie- and truth-telling segments were taken from the same interview, the suspect's lie-telling may have influenced how he told the truth (and vice versa). In another study, police officers were recruited to detect deception in news conferences in which individuals pleaded to the public to help find the person who murdered or

kidnapped their family members (Vrij & Mann, 2001b). In all of the clips, the family member was actually the murderer (i.e., he or she was lying). Again, police officers detected deception at the level of chance. Yet, police officers' may have again performed around chance levels because they were viewing videos that were not in their native languages. Overall, the use of high-stakes lies did not impact lie detection accuracy; however, as previously mentioned, there were several methodological limitations identified in these studies.

When the problems encountered in earlier studies were corrected, police officers' judgments of deception were more accurate. Mann, Vrij, and Bull (2004) found that police officers' accuracy was greater than chance when they judged a real-life interrogation. Police officers watched several video clips of real suspects who were either lying or telling the truth about having committed a crime. There was a high correlation between self-reported interrogation experience and accuracy. A more recent review by O'Sullivan et al., (2009) revealed that high-stakes lies increased accuracy rates, particularly those of law enforcement officials. Thus, observers can achieve higher-than-chance levels of accuracy in lie detection studies when real-life, high-stakes scenarios are used.

Lie Detection Confidence

Overall, observers overestimate their confidence in their lie detection judgments. For example, researchers have examined law enforcement officials and found that they are not only more confident in their deception judgments than laypersons, but also confidence above actual accuracy levels (e.g., DePaulo and Pfeifer, 1986). In fact, police

officers estimate that their lie detection accuracy is 77% (Kassin, et al., 2007). The overconfidence of law enforcement officials in their judgments may be due to training that they have received or the knowledge that they have obtained through experience (e.g., Meissner & Kassin, 2002). It is difficult to determine how this overconfidence affects their assumptions about suspects' guilt or innocence (Kassin & Fong, 1999). This overconfidence likely occurs because police officers and laypersons think that their decisions are generally correct; however there is no direct link between accuracy and confidence (DePaulo, Charlton, Cooper, Lindsay, & Muhlenbruck, 1997).

To compound the undesirable combination of low accuracy and high confidence in deception detection, a few studies have suggested that a response bias may underlie decision-making. Typically, laypersons are thought to exhibit a truth-bias (i.e., a tendency to believe that people are telling the truth; e.g., Bond & DePaulo, 2006). Meissner and Kassin (2002) found that prior experience in law enforcement affected the type of bias present. Compared to university students, police officers were more likely to label individuals as lie-tellers.

The Role of Cognitive Load in Lie Detection

Recently, researchers have begun to examine the role of cognitive load in deception (Vrij, Fisher, Mann, & Leal, 2008a). Creating a lie requires memory (e.g., remembering the lie and its chronological development) and other cognitive resources related to executive function (e.g., planning the lie, inhibiting behavioral responses indicative of deception, monitoring performance). Thus, when individuals lie, cognitive load increases (Vrij et al., 2008a). In fact, lie-tellers exhibit signs of impaired cognitive

resources (e.g., slower speech, increased speech errors and hesitations), particularly when cognitive demands are high (De Paulo, et al., 2003; Vrij, Mann, Fisher, Leal, Milne, & Bull, 2008b). Lie-tellers also look like they are thinking harder that truth-tellers (Vrij et al., 2008a). Thus, the multiple factors taxing cognition may make the visual and auditory differences between lie-tellers and truth-tellers more distinguishable (Vrij et al., 2008a, 2008b). If more demand is placed upon individuals' cognitive resources (e.g., working memory) when they are attempting to lie, then they will be less able to monitor and inhibit their own behaviors, and their lie-telling may be easier to detect (McCornack, 1997; Vrij et al., 2008a; Warren, Schertler, & Bull, 2009).

Second-language Speakers and Lie Detection

Speaking in a second language may also increase cognitive load. Research has shown that speaking in a second language places demands on neural processing because it requires the use of additional motor neurons that are involved in both the temporal and sequential organization of words (Perani & Abutalebi, 2005). These increases in neural activity are directly linked to declarative memory processes in second-language speakers; thus, it is more difficult for them to engage in word and event recall (Ullman, 2001).

Thus, speaking in a second language in conjunction with lie-telling will likely create large increases in cognitive load. Broadbent (1957) suggested that cognitive load increases when attention must be divided during the simultaneous performance of two tasks. When one task requires a lot of working memory and input to create a solution, it creates a lag in attention- switching; in turn, the second task does not receive as much attention (Kahneman, 1973). Presumably, having an individual lie in a second language

would significantly increase cognitive load, and performance of one of the tasks should suffer. In particular, second-language speakers may compromise their abilities to control the leakage of deception, and their lies may be easier to detect than native-language speakers' lies.

Many of the cues that are thought to be predictors of deception may also be present when individuals attempt to communicate in a second language. Overall, individuals have many incorrect beliefs about the cues to deception (Akehurst, Kohnken, Vrij, & Bull, 1996). For example, lie-tellers are commonly thought to avert eye gaze, fidget, groom or self-manipulate (e.g., adjust clothing), and cover their mouths (Akehurst, et al., 1996; DePaulo, et al., 1985; Vrij, 1991). However, second-language speakers are more likely to avert eye gaze, self-manipulate, and appear nervous -- especially when they are feeling anxious (Gregerson, 2005). Thus, second-language speakers might naturally display nonverbal cues that are associated with deception when communicating truthfully. It is possible that these linguistic cues create additional confusion during deception detection.

Recent research has found that individuals may be sensitive to a few of the difficulties associated with speaking in a second language. Da Silva, Leach, Vrantsidis, Meissner, and Kassin (2010) examined people's perceptions of native- versus second-language lie-tellers. They found that both undergraduate students and police officers reported using the same cues to detect deception, regardless of speakers' language proficiencies. However, there were a few significant differences in terms of their perceptions of native- and second-language speakers. Both groups thought that, compared to native speakers, second-language speakers would be less likely to understand the

differences between telling the truth and lying or to understand the questions being asked. It is unclear whether these beliefs affect lie detection performance.

To my knowledge, only one study has focused on the impact of second-language speaking on lie detection. Cheng and Broadhurst (2005) randomly assigned individuals to lie or tell the truth in either their first language (Cantonese) or second language (English). Post-graduate students watched video clips of these individuals and judged each person's veracity. The researchers presented descriptive data that suggested that native- and second-language speakers showed different patterns of verbal and nonverbal behaviors. For example, second-language deceivers tried to maintain eye contact, decrease speech hesitations, and control changes in pitch more so than native-language deceivers. However, observers were no more accurate in their identifications of second-language (vs. native-language) deception.

Despite the advances made by Cheng and Broadhurst (2005), there are several concerns about the internal and external validity of their study. First, they experimentally manipulated deception: individuals were instructed to lie or tell the truth about their opinions. Participants may not have been behaving as they would in a forensic setting. Naturalistic lie-telling (in which the individual freely chooses to lie or tell the truth) would be more applicable to a forensic setting. Second, the authors noted that they invoked high-stakes deception because participants lied or told the truth about a controversial topic (i.e., capital punishment). However, it was impossible to establish ground truth. That is, researchers could not be entirely certain of the actual veracity – or magnitude of the consequences of being caught lying – of individuals' statements. Third, individuals' language proficiencies were determined using participants' self-reports.

Participants were excluded from the study only if they reported English proficiency levels below 3 on a 7-point Likert scale (1 = *Very Poor English*; 7 = *Very Good English*). The accuracy of these self-reports (i.e., the actual fluency of each participant) is unknown; participants may have misreported their proficiency levels. Without the use of validated tests of actual fluency, language proficiency effects are difficult to gauge. Most importantly, throughout the study, the researchers allowed participants to code-switch. That is, participants were able to alternate between speaking Cantonese and English. Allowing code-switching may have affected the findings, as the participants were not speaking exclusively in their stronger, native-language (Cantonese) or in their weaker, second-language (English). Code-switching may have been a way for second-language speakers to decrease cognitive load. In turn, there may not have been significant differences between native- and second-language speakers because cognitive demands were the same in both groups.

The Present Experiment

In this experiment, I examined undergraduate students' ability to detect lie-telling and truth-telling in native- and second-language speakers. Unlike in Cheng and Broadhurst's (2005) study, code-switching was not permitted. This approach maximized cognitive load and ensured clear differences between the language groups. Ground truth was established in this experiment by recording the participants' actions using a hidden video camera.

This experiment involved naturalistic, high-stakes lie-telling. Participants were placed in a scenario in which they could commit a transgression (i.e., cheat on a test). Participants were instructed to refrain from discussing answers with another participant

during this test; whether they decided to share their answers was their decision. Then, they were questioned about this transgression in English, which was either their first or second language. Participants were not instructed to lie or tell the truth; rather, their responses were volitional. Video footage of their answers was then shown to undergraduate students, who were asked to detect deception and rate their confidence in each judgment.

Hypotheses

Discrimination. Observers were expected to have less difficulty discriminating between lie- and truth-tellers speaking in their second languages as compared to their native languages. Detection of second-language speakers' veracity was hypothesized to be easier because of the increased cognitive load associated with lie-telling *and* speaking in a second language.

Bias. We hypothesized that observers would be more likely to label second-language speakers than native-language speakers as lie-tellers. This expectation was based on second-language speakers' tendency to display more cues associated with lie-telling anytime they are speaking.

Confidence. Observers were expected to be significantly less confident about their judgments when viewing second-language speakers than when viewing native-language speakers. Although it might indeed be easier to discriminate between truth- and lie-tellers, it could be challenging to interpret second-language speakers' behaviors; thus, observers' confidence could decrease with the language proficiency of the speaker.

Chapter 2: Phase 1 - Cheating Paradigm

Method

Research Design. The design for this phase was a 2 (Statement type: lie vs. truth) x 2 (Language: native language vs. second language) between-participants factorial. Participants were randomly assigned to condition. Truth-tellers were not induced to cheat on a test and, when asked about their actions, they told the truth (i.e., they said that they did not cheat). Lie-tellers were induced to cheat (i.e., a confederate asked for help during the test), cheated, and lied about it. Participants who were induced to cheat and told the truth in response to one or more of the questions were considered confessors. These participants were excluded because they were not pure truth-tellers or pure lie-tellers.

Participants. Twenty-nine students were recruited from an on-campus English as a Second Language learning center (i.e., Culture Works). When individuals entered the Culture Works program, their English language proficiency was assessed in terms of their reading, writing, speaking, and comprehension abilities. Following assessment, they were assigned to a classification level that matched their proficiency within Culture Works' guidelines. There were four levels of proficiency in Culture Works that aligned with the Canada Language Benchmarks (CLB): Level 1 = CLB 5/6 (beginner), Level 2 = CLB 7/8 (low), Level 3 = CLB 9/10 (moderate), Level 4 = CLB 11/12+ (high). I recruited participants from Level 1 (i.e., the lowest level of English language proficiency) and Level 2 (i.e., the second-lowest level of English language proficiency) as these students were classified as "beginners" in terms of their speaking abilities. These students were not compensated for their participation. In total, 12 students told the truth, 7 students lied,

and 10 students confessed to having cheated. Given that I only wished to utilize pure truth- and lie-tellers, I used only video footage of 10 truth-tellers and 5 lie-tellers.

In addition, 35 undergraduate students, whose native language was English, were recruited from Introductory Psychology classes at UOIT. These Psychology students participated in exchange for course credit. In total, there were 15 truth-tellers, 12 lie-tellers, and 8 confessors in this group. To ensure that the two language groups were equal, only 10 truth-tellers and 5 lie-tellers were used.

Materials.

Demographic questionnaire. An 11- item questionnaire was used to obtain participants' demographic information (see Appendix A). Participants were asked to provide information related to gender, age, and race. In addition, participants were asked five questions about their language proficiencies (e.g., "*What language(s) do you consider your native (or first) language(s)?"*). Finally, participants were asked three questions about their experiences during the study. These questions assessed comprehension, difficulty, and nervousness during the test on a 10-point scale from 0 (*not at all*) to 10 (*extremely*).

Puzzler tests. Participants were asked to complete four problem-solving tasks (see Appendix B). In the first task the participant was asked to calculate the height of an object based on given measurements. The second task involved having the participant describe the steps required to change one word into another word by only altering one letter at a time. In the third task, the participant was asked to determine how many

triangles were within a figure. The fourth task consisted of a series of anagrams that the participant was asked to solve.

Interview questions. Participants were asked a series of open-ended and closed-ended questions about whether they had committed the transgression. Specifically, each student was asked, *"What do you think the problem is?"*; *"I left the room. I was gone for fifteen minutes. Can you describe everything that happened from the minute that I left until I returned?"*; "*Can you be more specific? I really need to know what happened.*"; *"Did you ask the other student (her) for help?"; "Did she ask you for help?"; "Did you share answers?"; "While I was gone, did you cheat on the test?"*; *"What do you think I should do about this?"*

Procedure. Participants were recruited to participate in a problem-solving study called Puzzler. All sessions were conducted in a small psychology laboratory on campus. Individually, the participant waited outside the laboratory doors with another 'participant' (i.e., a confederate posing as another student) until being greeted by a female experimenter. Upon entering the laboratory, the participant was informed that they would be completing a series of logic problems. The experimenter also informed them that Facilities and Building Management was testing the lighting throughout the laboratory, and that the current lighting may make them feel calm and relaxed. The participant was provided with *Puzzler tests* and specifically told not to share or discuss individual problems. Then, the participant was left alone in the room – with the confederate – for fifteen minutes to complete the questions. In the *lie* condition, the confederate asked the participant for help with one of the questions; in the *truth* condition, the confederate did not ask the participant for help. Regardless of condition, the experimenter was always

blind to condition (i.e., she did not know whether or not the participant chose to cheat on the test).

After the Puzzler tests were completed, the experimenter re-entered the room and collected the tests. Before leaving the room, she gave the participants the *Demographic questionnaire*. When the experimenter returned to collect the questionnaire she looked worried and said, "*I have to check on something. I'll be back in a moment*." Again, the experimenter left the participants alone in the test room. During this period, the confederate commented that the experimenter looked upset and asked the participant what he or she thought was wrong. In the *lie* condition, the confederate also mentioned to the participant that he or she should not tell the experimenter about being asked for help or sharing answers.

After approximately one minute, the experimenter returned to the room. The experimenter said that there may be a problem with the tests because both participants (i.e., participant and confederate) had the same wrong answer. The confederate was asked to wait outside the room in the reception area until it was her turn to be interviewed. Then, once they were alone in the room, the experimenter told the participant that she believed that they had shared their answers throughout the experiment. She explained that she had contacted her professor and that this may be considered a case of cheating. The experimenter then asked the participant the *Interview questions*. The interview was conducted in English; code-switching was not allowed because the experimenter did not speak any other languages.

All participants were fully debriefed at the conclusion of the study. The entire procedure was videotaped using a hidden camera. The duration of the experiment was approximately one hour. All procedures were approved by the University of Ontario Institute of Technology's Research Ethics Board.

Chapter 3: Phase 2 Deception Detection

Method

Research Design. In this phase, I used a 2 (Statement type: lie vs. truth) x 2 (Language: native language vs. second language) within-participants design. Undergraduate students all watched the same videos of native- and second-language truth- and lie-tellers.

Participants. Fifty-one undergraduate students (20 males and 31 females) were recruited from the Introductory Psychology participant pool to take part in the study. The average age of students was 20.37 years (*SD* = 2.79). Participants from nine different ethnic groups were included: Arab/West Asian (*n* = 4), Black (*n* = 5), White (*n* = 15), Hispanic (*n* = 1), Latin American (*n* = 1), South Asian (*n* = 19), South East Asian (*n* = 2), Other (*n* = 4). Students participated in the study in exchange for extra credit.

Materials.

Demographic questionnaire 2. In addition to the items listed in the demographic questionnaire (see the Cheating Paradigm), participants were asked five additional questions to assess occupation, training, and experience with lie detection (see Appendix C).

Video clips. Video footage was obtained from the modified Russano, Meissner, Narchet, & Kassin (2005) cheating paradigm in Phase 1. Participants' upper bodies and faces were visible throughout the session. In total, I compiled clips of 20 truth-tellers and 10 lie-tellers being interrogated (*M* length per clip = 92.73 seconds, *SD* = 32.17). Fifteen video clips featured native-language speakers who had been recruited from the

Introductory Psychology course. The other 15 clips were of second-language speakers who had been recruited from the on-campus English as a Second Language learning center (i.e., Culture Works). The clips contained 27 males and 3 females. The average age of students was 20.31 years (*SD* = 1.85). Participants from nine different ethnic groups were included: Arab/West Asian (*n* = 12), Black (*n* = 1), Chinese (*n* = 4), South Asian (*n* = 2), South East Asian (*n* = 2), White (*n* = 8), Latin American (*n* = 1). Where possible, we yoked native language participants to second language participants in terms of race and gender – we tried to match both the race and gender within video clips that we chose to use from both the native and second language clips available.

Lie detection decisions. Participants were asked to indicate whether the individual in the video clip was lying or telling the truth about sharing his or her answers on the test.

Confidence. Participants were asked to indicate how confident they were in each lie detection decision on a scale from 0 (*not at all confident*) to 100% (*extremely confident*).

Procedure. Individually, the participant was tested in a small, quiet room. The entire study was conducted on a computer using MediaLab (Jarvis, 2006). First, the participant was given instructions. Then, the participant viewed thirty randomized video clips of people lying or telling the truth about a transgression (i.e. cheating on the *Puzzler test*). Following each clip, the participant was asked to indicate whether the individual in the video clip was lying or telling the truth and their confidence in their judgment. The participant was then asked to complete the *Demographic questionnaires*. The participant was fully debriefed at the conclusion of the study. The duration of the experiment was one and a half hours.

Chapter 4: Results

Lie Detection Accuracy

Preliminary analyses involving participant gender yielded inconsistent results. Although there were some significant differences in terms of gender, they were not consistent across analyses and therefore were difficult to interpret. Thus, all further analyses were collapsed across gender.

I used a Language (native language vs. second language) x Veracity (lie vs. truth) within-participants ANOVA to test overall accuracy. Contrary to my hypothesis, participants were significantly more accurate when viewing native-language speakers (M = 0.57, SD = 0.19), 95% CI [0.54, 0.60] than when viewing second-language speakers (M = 0.49, SD = 0.23), 95% CI [0.45, 0.53], $F(1, 50) = 17.37$, $p < .001$, $d = 0.38$. In addition, participants were significantly more accurate when viewing truth-tellers (M = 0.65, SD = 0.19), 95% CI [0.61, 0.70] than lie-tellers (M = 0.40, SD = 0.24), 95% CI [0.34, 0.46], $F(1, 50) = 37.04$, $p < .001$, $d = 1.16$. However, these main effects were qualified by a higher-order interaction between Language and Veracity, $F(1, 50) = 17.37$, $p < .001$, $\eta_p^2 = 0.26$ (Figure 1). Post hoc analyses, using paired-samples t-tests, revealed that participants were significantly more accurate when viewing native-language truth-tellers (M = 0.75, SD = 0.17), 95% CI [0.70, 0.80] than second-language truth-tellers (M = 0.56, SD = 0.20), 95% CI [0.50, 0.62], $t(50) = 6.56$, $p < .001$, $d = 1.86$. However, participants were equally accurate when viewing native-language lie-tellers (M = 0.38, SD = 0.22), 95% CI [0.32, 0.45] and second-language lie-tellers (M = 0.42, SD = 0.26) 95% CI [0.34, 0.49], $t(50) = -0.87$, $p = .388$, $d = -0.87$.

Using a one-sample t-test, I compared participants' overall accuracy to chance (i.e., 50%). When participants viewed native-language truth-tellers, their judgments were significantly more accurate than chance, $t(50) = 10.53$, $p < .001$, $d = 2.98$. Similarly, when participants viewed second-language truth-tellers, their judgments were significantly more accurate than chance, $t(50) = 2.09$, $p = .042$, $d = 0.59$. Conversely, when participants viewed native-language lie-tellers and second-language lie-tellers, their judgments were significantly less accurate than chance, $t(50) = -3.85$, $p < .001$, $d = -1.09$ and $t(50) = -2.33$, $p = .024$, $d = -0.66$, respectively.

Signal Detection Analyses

I used Signal Detection Theory (Green and Swets, 1966), to determine how well observers discriminated between lie-tellers and truth-tellers (i.e., d′). This approach was also used to determine whether observers were more likely to choose one response option, such as indicating that most individuals were lying (i.e., bias).

Discrimination. I conducted a paired-samples *t*-test, with Language as the independent variable, on d'. Contrary to my hypothesis, participants were better able to discriminate between truth- and lie-telling native-language speakers ($M = 0.31$, $SD = 0.41$), 95% CI [0.19, 0.42] than second-language speakers ($M = -0.03$, $SD = 0.53$), 95% CI [-0.18, 0.12], $t(50) = 4.45$, $p < .001$, $d = 1.26$ Using a one-sample *t*-test, I then examined participants' ability to discriminate between truth- and lie-tellers by comparing their d′ values to zero (indicative of no sensitivity). Participants could discriminate between truth- and lie-telling native-language speakers, $t(50) = 5.38$, $p < .001$, $d = 1.52$, but not among second-language speakers, $t(50) = -0.35$, $p = .728$, $d = 0.10$.

Response bias. I conducted a paired-samples t-test, with Language as the independent variable, on β. There were significant differences in terms of participants' biases toward native-language speakers (M = 0.86, SD = 0.29), 95% CI [-0.22, -0.06] and second-language speakers (M = 1.12, SD = 0.37), 95% CI [-0.02, -0.23], $t(50) = -4.31$, $p < .001$, $d = -1.22$. Using a one-sample t-test, I examined participants' bias by comparing β values to a score of one (indicative of no bias). Consistent with my hypothesis, participants were more likely to call native-language speakers truth-tellers than lie-tellers (i.e., exhibit a truth-bias), $t(50) = -3.44$, $p = .001$, 95% CI [-0.22, -0.06] $d = -0.97$. However, they were significantly more likely to call second-language speakers lie-tellers (i.e., display a lie-bias), $t(50) = 2.37$, $p = .022$, 95% CI [0.02, 0.23], $d = 0.67$.

Lie Detection Confidence

I used a Language x Veracity within-participants ANOVA to test participants' confidence in their decisions. Consistent with my hypothesis, participants were significantly more confident when viewing native-language speakers (M = 78.73, SD = 13.41), 95% CI [75.10, 82.35] than second-language speakers (M = 74.95, SD = 16.97), 95% CI [70.35, 79.55], $F(1, 50) = 13.49$, $p = .001$, $d = 0.25$. There was no significant main effect of veracity, $F(1, 50) = 2.23$, $p = .141$, $d = 0.04$. There was, however, an interaction between Language and Veracity, $F(1, 50) = 10.82$, $p = .020$, $\eta_p^2 = 0.18$ (Figure 2). Post hoc analyses, using paired samples t-tests, revealed that participants were significantly more confident when viewing native-language truth-tellers (M = 80.68, SD = 12.26), 95% CI [77.23, 84.13] than second-language truth-tellers (M = 74.28, SD = 16.49), 95% CI [69.64, 78.92], $t(50) = 5.48$, $p < .001$, $d = 1.55$. However, participants were equally confident when viewing native-language lie-tellers (M = 76.78, SD =

14.56), 95% CI [72.68, 80.87] and second-language lie-tellers (M = 75.62, SD = 17.43), 95% CI [70.72, 80.52], $t(50) = 0.81$, $p = .420$, $d = 0.23$.

Relationships between Accuracy and Confidence

There was a significant correlation between accuracy and confidence when participants viewed native-language truth-tellers, $r(50) = 0.40$, $p = .004$. However, there were no significant correlations between accuracy and confidence when participants viewed native-language lie-tellers, $r(50) = -0.18$, $p = .208$, second-language truth-tellers, $r(50) = 0.05$, $p = .724$, or second-language lie-tellers, $r(50) = 0.08$, $p = .585$.

Chapter 5: Discussion

I examined whether language proficiency had an impact on lie detection accuracy, confidence, and bias. Results were consistent with the lie detection literature in terms of observers' accuracy and confidence levels when judging native-language speakers (e.g., Bond & DePaulo, 2006). However, there were several differences between how observers classified native- versus second-language truth- and lie-tellers.

I hypothesized that participants would be better able to discriminate between truth- and lie-telling second-language speakers (than native-language speakers) because of increases in cognitive load. However, I did not find support for this hypothesis. Participants were actually better at discriminating between truth- and lie-telling native-language speakers. They were unable to discriminate between truth- and lie-tellers who spoke in their second languages. Researchers have found that when individuals speak in their second languages, they often display far less emotion than native language speakers (Bond & Lai, 1986). In fact, many individuals actually choose to speak in their second languages to distance themselves, especially when they are faced with anxiety-provoking or embarrassing situations (Altarriba & Rivera–Santiago, 1994; Dewaele & Pavlenko, 2002). Thus, possibly due to the decreased emotionality of second-language speakers, observers could have had a more difficult time discriminating between truth- and lie-tellers. However, further research is required to determine whether there are overt behavioral differences in the emotional displays of native and second-language speakers.

I also examined whether there was a response bias present when participants viewed native- and second-language speakers. Consistent with my hypothesis, and previous research (e.g., Bond & DePaulo, 2006), I found that participants were more

likely to label native-language speakers as truth-tellers than lie-tellers. As expected, these participants also exhibited a lie-bias toward second-language speakers. Second-language speakers tend to display more nonverbal and verbal cues that have been linked to deception simply when communicating (Bialystok, Craik, Green, & Gollan, 2009; Gregersen, 2005; Vrij, 2000). For example, second-language speakers provide less detailed accounts of events because they must actively inhibit the neural control mechanisms that would otherwise automatically have them respond in their first languages (Wang, Xue, Chen, Xue, & Dong, 2007). In addition, second-language speakers must rely heavily on temporal lobe structures that can hinder their retrievable vocabulary; if the lexicon system is not well developed, speakers have much more difficulty with expressions of memory for events (Ullman, 2001). Given the extra effort that must be exerted by second-language speakers and the resulting changes in cues that are normally associated with deception, it is not surprising that observers were more likely to label them (as compared to native language speakers) as lie-tellers

There may also be individual biases within observers. Smith and Bond (1994) have noted that, when individuals provide statements that are challenging to comprehend, observers attempt to determine the source of their difficulties. Bond and Atoum (2000) suggested that some observers externalize blame when they cannot understand foreign accents. Individuals who speak with accents are also viewed as ‘different’ and – most importantly - untrustworthy (Brennan & Brennan, 1981; Munro, 2003).Thus, it is possible that observers had more negative overall impressions of second-language speakers, and these impressions affected judgments of veracity.

Although observers tended to have a lot of confidence in their judgments, I predicted that they would be more confident when viewing native- compared to second-language speakers. I did not find support for this hypothesis. Because individuals were not as familiar with second-language speakers, it may have been more difficult for observers to interpret their behaviors. In turn, observers were less confident when making their judgments.

Limitations

There were several limitations associated with the design of our study. The first issue has to do with our decision to use a within-participants design. This design may have elicited demand characteristics. Observers may have realized that the study was about language proficiency and, thus, they may have based their decisions on their expectations about what we were looking to examine, rather than on the actual behaviours of the individuals being interrogated. It is possible that participants were simply labeling truth- and lie-tellers based on whether the individual in the video spoke English proficiently or not; this could have accounted for why we found individuals more likely to label native-language speakers as truth-tellers and second-language speakers as lie-tellers. To address this confound, there must be examination of whether these findings are still present when a between-participants design is conducted (i.e., when individuals only watch all native- or all second-language video clips).

This study was also not an entirely crossed experimental design. We ensured that the native- and second-languages of participants was English. Further research should examine whether the results generalize to individuals who are interviewed in a (second) language other than English. In addition, we did not control for the native languages of

the second-language speakers. In the future we would control for native- and second-languages of participants by testing in a population that will have varying fluencies of only two languages. For example, we may test in a location that is bilingual – English and French only. Controlling for language would be the first step toward a crossed experimental design; however, we might also look for a location that would serve to control for race. Although lie detection research has not located differences in terms of race or culture, we may examine this in the future as a connection to language.

In addition, anecdotal evidence suggests that some participants began to use different strategies when viewing multiple native- and second-language speakers – representing a ‘learning curve’ of sorts. However, observers were not provided with immediate feedback. It is difficult to determine if participants’ thoughts about their strategies influenced their confidence ratings. This issue should be examined in future research.

Chapter 6: Future Directions

It is difficult to determine the ecological validity associated with a cheating paradigm. I was able to establish ground truth within a deception scenario that was relevant to university students. Accusations of cheating and the threat of repercussions associated with academic dishonesty likely created high stakes lying. However, being asked about cheating on a test might not be comparable to being interrogated about a murder. Thus, the generalizability of these findings to forensic contexts can only be suggested. Further research should examine videotaped, real-life interrogations of native- and second-language speakers.

Follow-up studies should also address the generalizability of my results to different populations. Specifically, researchers may wish to examine whether the findings extend to law enforcement officials who have had training or experience in second-language lie detection. Customs officers, particularly those who are at airports, are constantly interacting with passengers who are speaking in their second languages. They must make quick decisions about veracity that could have an impact on the safety of others. Due to their experience, customs officers may, indeed, have detection abilities that surpass those of laypersons. In addition, the deception detection performance of law enforcement officials would have policy implications. For example, if it is determined that customs officers are better able to detect deception in less proficient speakers, then these findings would support their current practice of interrogating individuals in their second languages. Alternatively, if officers are less able to detect deception in second-language speakers, then there may be evidence to suggest that individuals should not be interrogated in their second languages and, thus, translators should be made available.

In addition, it would be interesting to examine whether there are differences in observer judgments across the spectrum of language proficiency. In my study, I examined individuals with low levels of English proficiency in terms of Canada Language Benchmarks. Yet, second-language participants exhibited high enough English proficiency to be placed into a pre-university ESL program. It would be important to examine the boundary conditions of my discrimination, bias, and confidence findings. That is, I am interested in examining what occurs when observers watch video clips of individuals who exhibit lower or higher English proficiencies. Specifically, it is important to determine whether there is a decrease in accuracy and confidence as proficiency decreases and vice versa. It would also be important to determine whether there was a negative relationship between bias and proficiency. If so, I might have reason to suggest new procedures for interrogation based on the proficiencies of the individuals being interrogated.

Conclusions

My study is among the first to examine lie-telling in second-language speakers. I found that participants were better able to discriminate between truth- and lie-tellers when they were viewing native-language speakers than second-language speakers. Participants were also more likely to label native-language speakers as truth-tellers and second-language speakers as lie-tellers. Given the potential implications for law enforcement personnel and for second-language speakers, the difficulties and biases associated with second-language lie detection require further attention.

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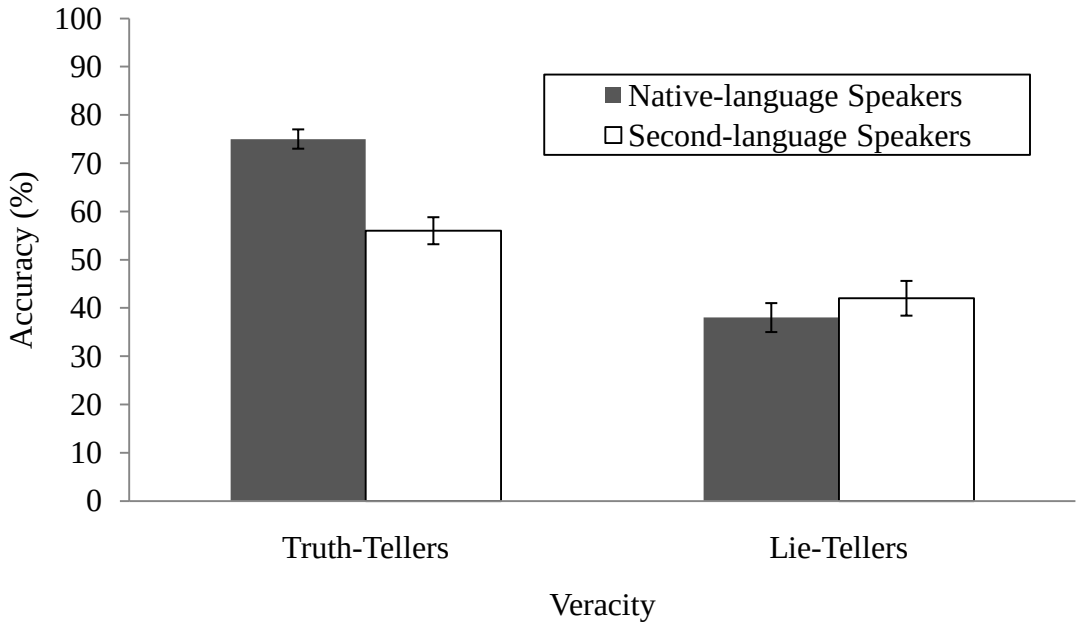


Figure 1. Participants' overall accuracy when viewing native- and second-language speakers. Standard errors are represented in the figure by error bars attached to each column.

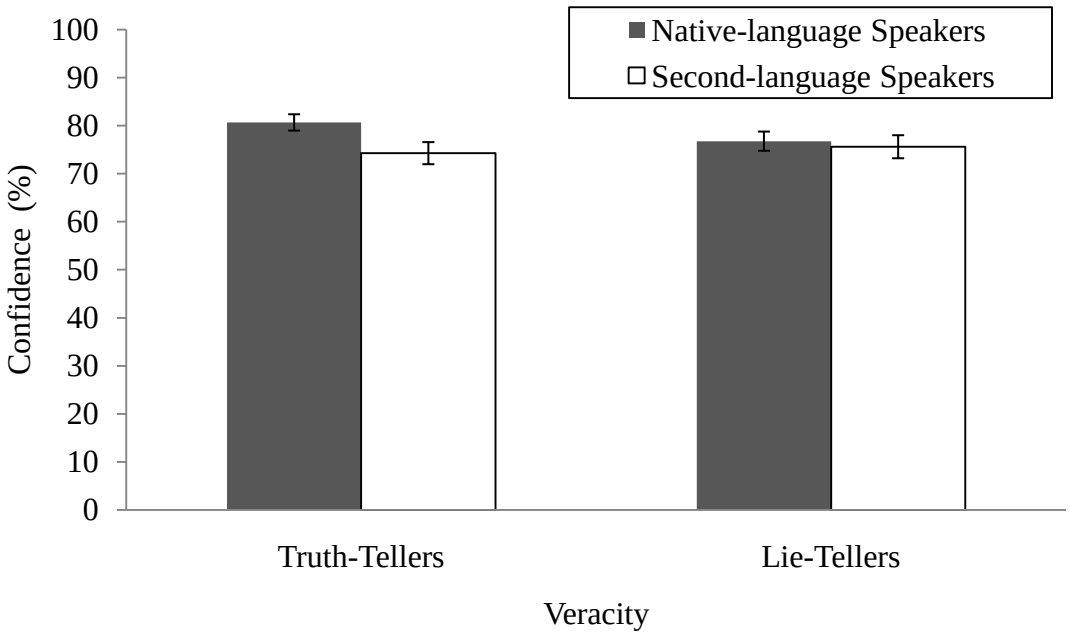


Figure 2. Participants' overall confidence judgments for native- and second-language speakers. Standard errors are represented in the figure by error bars attached to each column.

Appendix A: Demographic Questionnaire

Please provide the following information:

1. 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 consider your native (or first) language (s)? _____

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

6. What language did you learn first? _____

7. What is your English proficiency?

a) Level 1

b) Level 2

c) Level 3

d) Level 4

e) English is my first language

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

9. Did you understand the study instructions?

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

10. How hard were the Puzzler problems?

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

11. How nervous were you when you were answering the Puzzler problems?

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

Appendix B: Puzzler Tests

Problem Solving Questionnaire

S# _____ C# _____ Date _____

Problem #1

A chair is 200cm high plus half its height. What height is the chair?

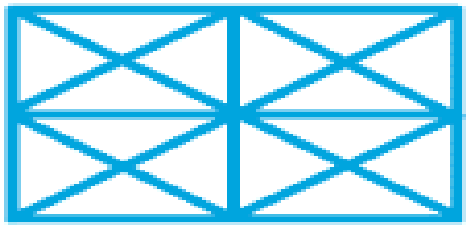
Problem # 2

Starting with the word “COOL”, change one letter at a time until you have the word “HEAT”. Each change **must result in a proper word,** and you can use any letters in the alphabet. Keeping in mind that you can only change one letter per step, what is the minimum number of steps required to achieve this change? What are the steps?
Example: KID to DAD (KID, DID, DAD)

Answer (Give Steps, i.e., the words): _____

_____

Problem # 3



How many triangles can you find in the figure above? Look carefully – there are more than 16!

Answer: _____

Problem #4

Each word jumble can be unscrambled to form a common word. There is a correct answer for each jumble.

Example: LSOOCH unscrambled is SCHOOL

1. AGMNO: _____
2. UFLAT: _____
3. OLBDUE: _____
4. NITGA: _____
5. HMUOT: _____

Appendix C: Demographic Questionnaire 2

12. What is your occupation? _____

13. Have you ever worked in law enforcement? Yes No

    Number of years: ____

14. Have you ever taken courses related to lie detection? Yes No

    Which ones? _____

15. Please rate your experience with lie detection:

Not at all experienced	A little experienced	Average	Somewhat experienced	Very experienced
1	2	3	4	5

16. Please briefly describe the experiences you have had with lie detection:

_____

_____