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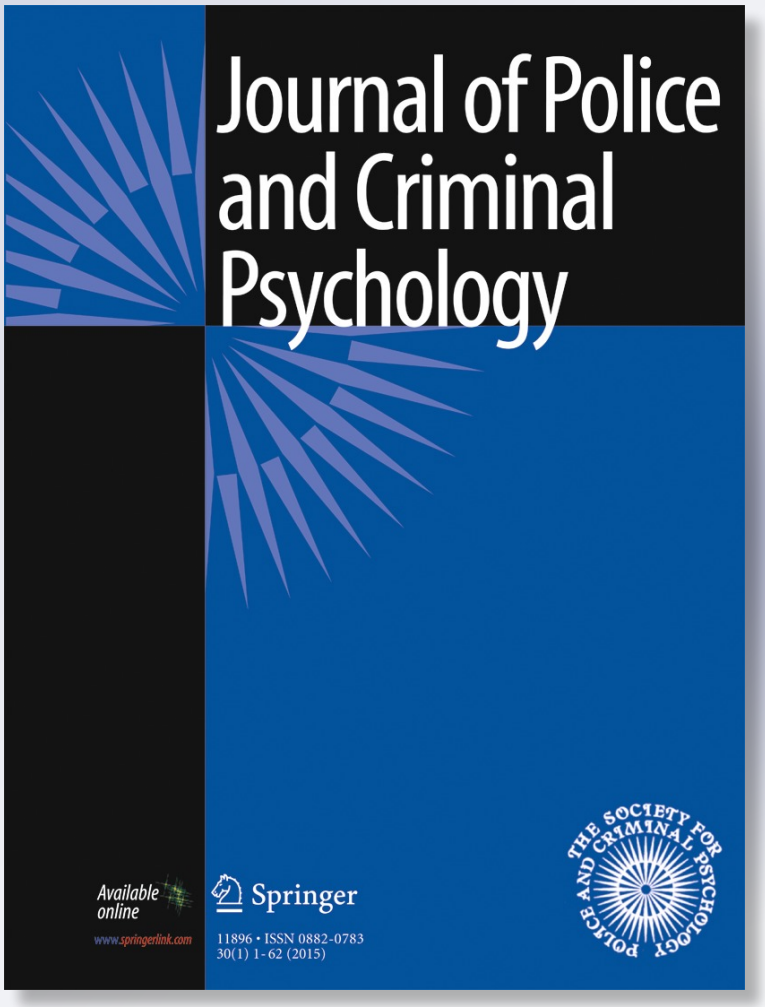

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Ethnic Similarities and Differences in Linguistic Indicators of Veracity and Lying in a Moderately High Stakes Scenario

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Abstract One technique for examining written statements or interview transcripts for verbal cues of veracity and lying involves the analysis of linguistic features and grammatical structures associated with word usage. This technique is commonly referred to as Statement Analysis (SA). There are varying degrees of empirical support for different SA techniques and for specific linguistic markers; what is less known in the literature is the degree to which verbal indicators of veracity and lying vary across cultures or ethnicities. In this study participants from four cultural/ethnic groups participated in an adapted version of a mock-theft scenario in which participants were either asked to steal a check and lie about it to investigators or not steal a check and tell the truth. After being assigned to the steal-lie/don't steal-truth condition, each participant engaged in three interviews, two prior to committing the crime (screening and secondary interviews) and one afterwards (investigative interview). Prior to the third investigative interview participants were asked to write a statement. The responses provided in the interviews and written statement were coded according to several empirically validated categories of SA. Some linguistic markers differentiated truths from lies across people of different ethnic/cultural backgrounds. Post-hoc analyses indicated interesting ethnic group differences in the base rates of usage for many of these categories but ethnicity did not moderate the veracity condition effects.

Keywords Deception · Culture · Ethnicity · Statement analysis

Introduction

One technique of examining written statements or interview transcripts for clues to deception involves the analysis of linguistic features and grammatical structures associated with word usage. This technique is commonly referred to as Statement Analysis (SA). SA is based on the premise that word use and grammar structures differ when people lie as opposed to when they tell the truth. Because words make up sentences and sentence construction follows a predetermined set of grammar rules, a careful examination of word use and grammar structures should identify specific features that can help detect deception.

SA has its roots in psycholinguistic research in the early 1900s but really has its more modern roots in the work of Undeutsch (1989) and a technique known as Statement Validity Analysis (SVA). SVA was founded on a hypothesis that statements based on actual memories differ from statements based on fabrication or fantasy (Undeutsch 1989). The crucial parts of SVA involve a criteria-based content analysis (CBCA) and an evaluation of CBCA outcomes using a Validity Check-List with criteria organized around categories such as general, unusual, motivational and stylistic features. In addition to SVA a number of other techniques that involve the analysis of the grammatical structures to make inferences about deception and truthfulness have emerged, including Theoretical Verbal Analysis (TVA; Connelly, et al. 2006), Reality Monitoring (RM; Johnson and Raye 1998),

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Scientific Content Analysis (SCAN; Sapir 1996), and Investigative Discourse Analysis (IDA), which is an extension of CBCA and similar to SCAN (Rabon 1994).

Research examining the efficacy of the various SA techniques listed above has provided evidence for many of them to detect truths from lies at better than chance accuracies (Porter and Yuille 1996; Vrij 2007; Vrij and Mann 2006; Zaparniuk, Yuille, and Taylor 1995). For example CBCA is linked to empirically based knowledge about naturalistic memory and thus to a fair amount of research demonstrating the validity of many of its criteria (Porter, Birt, Yuille, and Lehman 2000; Porter and Yuille 1996; Zaparniuk, et al. 1995). RM is also based on a solid empirical base of knowledge about memory (Johnson 1988; Johnson and Raye 1981) and reviews examining its usefulness in detecting deception have confirmed the validity of many of its criteria (Masip, Sporer, Garrido, and Herrero 2005; Sporer 2004).

At the same time the degree of empirical support for these various techniques differs across studies and contexts, especially for their specific categories. Porter and Yuille (1996), for instance, analyzed truthful alibis, partially deceptive accounts, completely false alibis, and truthful confessions to a mock theft using 10 CBCA criteria, four RM criteria, and three SCAN criteria; three of the 10 CBCA criteria differentiated the four types of statements while none of the RM or SCAN criteria did. Another study utilizing SCAN demonstrated that police officers with experience in investigative interviewing and interrogation performed just as well as SCAN-trained officers in detecting deception (Smith 2001).

Linguistic and Grammatical Markers of Veracity and Lying Used in this Study

There are some commonalities among the various SA techniques as they are based on a relatively common understanding of the nature of human memory and verbal recall of that knowledge. Differences among these systems occur concerning the specific linguistic categories considered indicative of veracity or lying and in the amount of scientific evidence that exists for all the various features of each system. Because SA techniques allow for the analysis of many different types of linguistic and grammatical markers with commonalities, and because of differences across studies in the degree of empirical support for specific categories within specific techniques, we selected for use in this study an eclectic group of SA categories from different techniques deemed most relevant for the source materials produced (and which were also the most effective in actual investigations based on the experiences of the third author). These categories were selected on an a priori basis for use in this study before any transcripts were coded.

Extraneous Information Truth tellers provide more details relevant to the question raised (DePaulo, et al. 2003; Vrij 2007); conversely liars provide more information that is irrelevant to the question asked, which we refer to as extraneous information. This information can justify the liars' actions, deflect the question because they may not want to respond to that specific question, help liars distance themselves from the act of lying or the content of the lie, or aid liars in exerting control over the interview (Adams 1996).

Equivocation Equivocation words qualify statements, allowing liars to distance themselves from the act or content of lying by tempering the action about to be described or by discounting the message even before it is transmitted (Weintraub 1989). Equivocation consists of words or phrases such as "maybe", "believe", "kind of", "sort of", "about", or "to the best of my knowledge", which suggest that the interviewee is being intentionally vague or ambiguous.

Non-Prompted Negation When responding to a question such as, "Tell me what you did in the file room," the expectation is that individuals will respond by providing information pertaining to what they actually did (Rudacille 1994; Sapir 1996; Weiner and Mehrabian 1968). Therefore a response about what the individual did not do does not answer the question and is an example of non-prompted negation. Negation in discourse or statements may be an indicator of deception inasmuch as respondents may use it to carefully omit their involvement in a crime (Adams and Jarvis 2006), and there are generally more negative statements in deceptive oral narratives than in truthful oral accounts (Hauch et al. 2012; Newman, Pennebaker, Berry, and Richards 2003; Porter, et al. 2000).

Moderating Adverbs We identify three types of moderating adverbs. (1) Intensifying adverbs such as "very," "really," "truthfully," or "honestly" are typically used when a communicator is attempting to convince another person of something. (2) Minimizing adverbs such as "only," "just," "simply," "merely" are typically used to downplay or minimize the role of the actor, who is generally the communicator him or herself. (3) Editing adverbs such as "after," "then," "next," "while," "so," "thereafter," or "when" may indicate a temporal lacunae (Rabon 1994; Schafer 2007) suggesting that the communicator is intentionally editing information and as such, something that might be crucial to an inquiry may be missing from the discourse. Because lies of omission are more common than lies of commission, and because liars tend to use fewer words than truth tellers (DePaulo, et al. 2003), editing adverbs provide liars with a simple yet strategic means of telling the truth up to a certain point, omitting crucial information and then picking up again by telling the truth.

Second Person Referencing This consists of the phrase, "You know", and can be used by a speaker to call attention to an action or to convince the listener (Rabon 1994). Although not common its use solely in response to relevant questions should invite careful scrutiny on the part of the investigator.

Stalled-Action Verbs These consist of words such as "started", "began", "commenced", "initiated", or "proceeded". Their use suggests that an action was interrupted or stalled by something or someone without any indication that the action was ever completed (Sapir 1996); thus such words allow for liars to distance themselves by allowing interviewees to substitute expressions to replace missing information. They also suggest a weakened assertion, thereby indicating that the speaker does not fully adhere to or assume responsibility for the action (Rabon 1994).

Passive Voice When describing their actions, people typically assume responsibility by using active voice. Passive voice may be used when liars attempt to conceal their identity as an actor, distancing themselves from the action of the verb (Connelly, et al. 2006; Rudacille 1994).

Present Tense in the Past This occurs when liars use a verb in the present tense to describe an action that clearly should have occurred in the past in an attempt to conceal or obfuscate their actions by actively composing as they write (Driscoll 1994; Sandoval 2008; Sapir 1996; Weintraub 1989).

Missing 1st Person Pronoun Liars tend to omit the use of the 1st person singular pronoun "I" when describing the action that they took, which suggests that they are distancing themselves from the action or activity (Newman, et al. 2003; Sapir 1996).

Overview of the Study

As mentioned above there are varying degrees of empirical support for the various techniques of SA and for specific linguistic categories. What is less known in the literature is whether verbal indicators of veracity and lying vary across cultures or ethnicities because most of the research to date has analyzed source materials produced by native English speakers. To be sure there are studies examining the verbal indicators of veracity and lying in non-English languages (Blandon-Gitlin, Pezdek, Lindsay, and Hagen 2009; Masip, Bethencourt, Lucas, Sanchez-San Segundo, and Herrero 2012; Ruby and Brigham 1997; Schelleman-Offermans and Merckelbach 2010; Vrij, Akehurst, Soukara, and Bull 2004); but it is difficult to compare results across studies because of study differences, which confound differences in results across studies.

We remedied this situation by analyzing the linguistic indicators of veracity and lying in a realistic, moderately high stakes scenario (mock crime) and by examining potential ethnic similarities and differences in those indicators within the same study. There are important theoretical reasons to investigate this issue. Cross-cultural consistency, for example, may provide evidence for potential pancultural similarity in the underlying psychological effects of lying and similarity as reflected in the linguistic choices that mark those effects. There are also important practical ramifications for examining possible ethnic and cultural differences. In the U.S., as in other countries, many individuals interviewed and interrogated in relation to national security or law enforcement interests come from very disparate cultures. There is a need for examining and elucidating cultural differences in indicators of veracity and lying so that interrogations with individuals from different cultures are supported by culturally appropriate and relevant information concerning potential cultural differences in indicators.

In this study individuals from four cultural/ethnic groups—European-Americans, Chinese, Hispanics, and Middle Easterners—participated in an adapted version of a mock-theft scenario in which participants were either asked to steal a check made out to "Cash" and lie about it to investigators or not steal a check and tell the truth. The Chinese, Hispanic, and Middle Eastern groups were chosen to sample a broad range of cultural differences that may influence indicators of veracity. After being assigned to the steal-lie/don't steal-truth condition, each participant engaged in three interviews, all in English, two prior to committing the crime (screening and secondary interviews) and one afterwards (investigative interview). Prior to the third investigative interview participants were asked to write a statement about everything they did while in the room where they could steal the check ("the file room").

Because there were rewards and punishments for participants depending on whether or not they were believed by the interviewers, the study involved a moderately high stakes scenario. Contrastingly many studies in this literature have examined lies produced in low-stake situations in which participants were not very motivated one way or another to lie or tell the truth and did not involve rewards or punishments if participants were believed or not. Higher-stakes studies are more analogous to the real-life situations that face law enforcement and security personnel, and the behavioral indicators associated with veracity and lying that emerge from higher-stakes studies are different and more compelling than those from low-stakes studies (DePaulo, et al. 2003; Frank and Svetieva 2013). Identifying indicators that are based in low-stakes studies that are not analogous to real-life situations and then training law enforcement personnel on them would have dire consequences; at least one study has demonstrated

detrimental effects of training to detect lies when non-validated indicators are used (Kassin and Fong 1999).

Also, some studies in this area have analyzed written statements; others have analyzed oral statements produced in interviews or individual declarations. The current study contributes to this literature by analyzing linguistic markers produced in different sources (three types of interviews and a written statement). It may be the case that the linguistic markers of deception differ depending on the type of source analyzed. When writing a statement, for example, individuals have some time to collect their thoughts, reflect on the events to be recalled and choose their words to some degree. In a live interview, however, individuals are put on the spot as they interact with another person, must listen to the questions and process those questions in relation to their lies while maintaining their composure. Thus spoken words may differ from written words, resulting in differences in the linguistic markers of truth telling and lying.

The current study also contributes to the literature by examining statements about future intent (to commit a crime or not) and about past actions (whether the crime was committed or not). Studies of lies about intent are rare. Vrij, Leal, Mann, and Granhag (2011) compared statements of lying about intentions vs. past actions, examining statements for detail, plausibility, and correspondence between truths and lies. They reported that lies about both intentions and past actions were less plausible than truths, and differences in details were more pronounced in lies about past actions than intentions. The current study extends this literature by examining lies about intentions vs. past actions in individuals of different ethnic groups using SA.

We hypothesized that liars would produce more linguistic markers described above than would truth tellers in their oral statements in each of the three interviews as well as in their written statements. We tested for differences separately for each of the source materials (interviews or statements) and among the four ethnic groups.

Methods

Participants

Participants came from one of four ethnic/cultural groups: European Americans and Chinese, Hispanic and Middle Eastern immigrants. All participants were recruited from student and non-student communities in the San Francisco Bay Area and Buffalo, NY through ads seeking "European American," "Chinese," "Hispanic," or "Middle Eastern" participants. The European Americans were all U.S. born-and-raised Caucasians. Ads for the other three ethnic groups stipulated individuals who were either immigrants born and raised in their home country or first generation born in the U.S., whose parents were both born and raised in the home country, and whose first language was not English but that of the home country. For the purposes of this study home country was defined for Chinese as the People's Republic of China, Hong Kong, or Taiwan and first language was Mandarin or Cantonese; for Hispanics country was defined as any country in Central or South America and first language was Spanish; and for Middle East country was any country in Northern Africa and Western Asia and first language was Arabic. Prior to participation all potential participants were telephone screened according to the inclusion criteria recruited for, and answered the same questions in a standard demographics form obtained as part of the pre-session measures Thus the participants included in the study were those who self-identified as one of the ethnic groups, self-selected to contact the research team, and confirmed their self-identification in screening and again as part of the pre-session measures. Additionally all participants completed ratings of their ethnic identities (the General Ethnicity Questionnaire, below), which further confirmed the ethnic differences among the groups.[1]

The final sample included 226 individuals who participated for a cash payment (standard participation fee was $20, with the possibility of making more depending on outcomes described below). They were roughly evenly distributed between males (47.4 %) and females (52.6 %) with an average age of 27.32 (range 19-47), ensuring that the samples were not entirely comprised of university undergrads typical of many

[1] The inclusion criteria meant that the three immigrant samples consisted of participants who were descendants of home countries that were culturally different (e.g., China, Hong Kong, and Taiwan). (To be sure the same could be said about European Americans.) Ethnicity refers to people of a nation or tribe, and can denote one's racial, national, or cultural origins (Matsumoto and Juang 2013); for example, within the U.S., African Americans, Asians and Pacific Islanders, Hispanics and Latinos, and Native Americans are often considered different ethnic groups. Culture refers to a unique meaning and information system, shared by a group and transmitted across generations, that allows the group to meet basic needs of survival and pursue well-being (Matsumoto and Juang 2013), and ethnic groups are often markers of cultural differences. Cultural values data examining differences within a country and country differences within a world region, for instance, demonstrate that differences within a world region are smaller than differences between regions (Hofstede 2001; Hofstede, Garibaldi de Hilall, Malvezzi, Tanure, and Vinken 2010; Schwartz 2004). Thus we were fairly confident that the regional origins of the three immigrant groups represented meaningful cultural differences.

The inclusion criteria used also meant that some individuals in the immigrant groups were foreign nationals while others were technically U.S. citizens. This is one of the reasons why we included the General Ethnicity Questionnaire in order document group differences in it. The ethnic groups sampled represented the same ethnic group categories with which differences in expressivity and cultural norms for emotional expression have been documented within the U.S. (Matsumoto 1993; Tsai and Levenson 1997; Tsai, Levenson and Carstensen 2000), and emotions often play an important role in telling lies and truths (Porter and ten Brinke 2008). The ethnic groups in this study were also representative of the cultural and ethnic diversity that law enforcement officers in the U.S. (and other multicultural societies) face.

studies. Sex and age breakdown were roughly equivalent across the four ethnic groups and within conditions. The European American sample included *N*s=40 and 38 in the lie and truth conditions, respectively; the Chinese sample included *N*s=46 and 36; the Hispanic sample included *N*s=28 and 18; and the Middle Eastern sample included *N*s=8 and 12, respectively.

Measures

At the beginning of the experiment all participants completed a basic demographics questionnaire that confirmed ethnic group identity, places of birth and upbringing of themselves and parents, and first and other languages with ratings of language proficiency; the General Ethnicity Questionnaire (GEQ; Tsai, Levenson, and Carstensen 2000; Tsai, Ying, and Lee 2000); an emotion checklist; the Machiavellianism Scale (Christie 1970); and the Self-Monitoring Scale (Snyder 1974). Participants also completed the emotion checklist at the end of the experiment.

The GEQ is a commonly used scale to measure acculturation and ethnic identity, and was included as a manipulation check for ethnic/cultural differences. It contains 38 statements, 25 rated on a 5-point Likert scale from strongly disagree to strongly agree and 13 rated on a 5-point scale from very much to not at all. The target group mentioned in the GEQ was modified to be applicable to each ethnic group. Analyses of the GEQ Total score, which was the mean of all items after reverse coding those negatively loaded, indicated that the Chinese sample had significantly higher scores than American born Chinese and Chinese who immigrated to the U.S. before the age of 12 reported by Tsai, Levenson, and Carstensen (2000) and Tsai, Ying, and Lee (2000), $t(74)=8.07$, $p<.001$, $d=.93$; $t(74)=1.71$, $p<.05$, $d=.20$, respectively. These analyses demonstrated that our Chinese sample identified themselves as Chinese and strongly with Chinese culture more so than American born Chinese. Norms for Hispanics and Middle Easterners using this same measure do not exist but their scores were comparable to the Chinese in our sample.

Interviewers and Questions

Ten male actors, all above the age of 30, served as interviewers. The authors, who have experience training law enforcement officers in investigative interviewing, conducted training sessions for the interviewers, some of whom were former law enforcement officers, to deliver the interviews in a neutral and objective manner and to follow the predetermined interview questions. The interviewers worked on a rotating schedule such that three were present for each session. Each interviewer's specific role alternated daily between Interviewer 1 (I1), Interviewer 2 (I2) or Interviewer 3 (I3); the first author also served as an interviewer.

The questions used in all three interviews were modeled after questions used in real-life security and investigative interviewing situations. They were developed after consultation with Subject Matter Experts (SMEs) from various law enforcement entities with interests in the practical application of the findings. Thus the questions were designed to be as realistic as possible yet to retain fidelity for research purposes. The questions for the first two interviews were based on those typically used at checkpoint security situations. For the post-event investigative interview we incorporated questions typically used by law enforcement officers (e.g., bait and indicator questions) as well as unanticipated questions and questions based on the Strategic Use of Evidence (SUE) technique (Hartwig, Granhag, Stromwall, and Kronkvist 2006; Hartwig, Granhag, Stromwall, and Vrij 2005). The initial screening included seven questions and lasted an average of 1:56 m; the secondary screening included 14 questions and lasted an average of 4:55 m; the investigative interview included 11 questions lasted an average of 9:46 m.

Questions from each of the interviews were selected for analysis prior to any coding because they were either questions to which liars had to commit themselves directly to their lies or were indicator questions that are used to differentiate truth tellers from liars (Inbau, Reid, Buckley, and Jayne 2005). (All other questions were those to which both truth tellers and liars could answer truthfully, such as "What is your participant number?" or "Did you find the building easily today?" Thus they were not of potential diagnostic value because both truth tellers and liars could answer truthfully to them.) Three questions from the initial screening interview were selected for analysis:

- Can you tell me in as much detail as possible what you plan to do in the file room today?
- Is that all?
- Do you intend to engage in any act that involves taking anything that does not belong to you?

Four questions from the secondary screening interview were selected for analysis:

- Why do you think the checkpoint screener selected you for this interview?
- What were your plans once you got through that checkpoint?
- Please describe in as much detail as possible your plans for the remainder of your visit after we're done with this interview.
- Do you have any plans that might involve you taking something that doesn't belong to you? Are you sure?

Six questions from the investigative interview were selected for analysis:

- Tell me in as much detail as possible what you did right after you left the previous interview.
- Describe in detail everything you did in the file room.
- I know that the check was made out to cash. It is very understandable that you would want to earn additional money by taking that check. If I were you, I would have wanted to take it. Now tell me truthfully, did you take the check?
- Why do you think that someone would take this $100 check?
- What should happen to someone who steals money and is caught?
- I have evidence of you with the white envelope. We have a security camera that takes snapshots every 30 seconds and we have one of you holding the white envelope. What do you have to say about that?

Stakes

Participants were told they will earn a minimum of $20 for their participation and bonuses of anywhere from $0 to $80 depending upon their assigned condition and the determinations of the interviewers. If they took the check and were believed by all three interviewers, they received an additional $80 and were allowed to leave early; but if they took the check and were not believed by any one interviewer, they received no additional money and had to stay an additional hour filling out a long questionnaire. If they did not take the check and were believed by all three interviewers, they received an additional $10 and were allowed to leave early; but if they did not take the check and was not believed by any one interviewer, they received no additional money and had to stay an additional hour filling out a long questionnaire.

Procedures

Participants were introduced to the study and told that they would be randomly assigned to either take a $100 check made out to cash or to look at but not take a $100 check and leave it where it was. They were also told that, irrespective of the assignment, their goal was to go through up to three checkpoints/interviews, convincing the officers of their honesty and sincerity. In order to be judged as truthful each participant needed to convince all officers of their innocence. The stakes associated with the experiment were revealed.

After instructions were delivered and consent obtained, participants completed the pre-session measures. When done the experimenter conducted a random assignment to condition procedure by asking the participant to select one of ten cards, five for the truth condition, five for the lie condition. The participants were given a folder containing their condition specific instructions, including a map of the area and the location of the file room where the stealing of the check would take place. The instructions repeated the stakes associated with their successful or unsuccessful performance and where to find the check and what to do with it (either take it or look at it and put it back). All participants were instructed to take a red index card in order to receive experiment payment; this card also constituted a story that participants could use to communicate to the interrogators why they were going to the file room. The participants were asked to keep the instruction reminder folder and to review the instructions later before going to the file room. The participants were thereafter given a quick verbal reminder about their instructions and the payoff stakes.

When the participant was ready to proceed, a second experimenter entered who was blind to the participant's condition, as were all interviewers. This experimenter escorted the participant out of the instruction area to the main floor of the experimental area, near a metal detector. The experimenter then left and Interviewer 1 (I1) appeared, walked by the participant, stepped behind a checkpoint interview table, and called the participant to empty their pockets before going through the metal detector. I1 then conducted the screening interview.

When the screening interview was done, I1 left and the experimenter re-entered the room and instructed the participant to have a seat in a waiting area. After a few minutes, the experimenter re-entered and informed the participant that he or she had been selected for a second interview and should go to the interview room. In the interview room the participant was left alone to sit and wait. Interviewer 2 (I2) entered and conducted the secondary screening interview.

Upon completion, I2 exited the room and the experimenter re-entered and escorted the participant back to the waiting area. The participant was instructed to re-examine the instruction reminder sheet and to perform his or her assigned task in the file room. The experimenter exited and when ready the participants went to the file room, clearly labeled. In the file room, depending on their condition, participants found a folder that contained the check and either looked at the check or took it by putting it on his or her body. In addition all participants were asked to take a red index card. Once ready the participants returned to the waiting area and rang a bell. The experimenter re-entered and informed the participant that he or she had been selected for a third interview and escorted the participant to the interview room.

Interviewer 3 (I3) entered the interview room and asked the participant to write a statement about "everything that happened in the file room" and left the room to give the participant time to write the statement. After three minutes I3 re-entered the room, read the statement quickly and conducted the investigative interview. I3 left the interview room upon completion. The experimenter re-entered and escorted the participant back to the original instruction and consent room and left. The first experimenter re-entered and administered

the post-session measures, debriefing, post-session consent, and payment.

Coding

Extraneous Information Each sentence within a participant's response that contained extraneous information was identified, regardless of the extent of the extraneous information within that one sentence, and the total number of sentences within each statement was tallied.

Equivocation Each sentence within a participant's response that included equivocation words/phrases was identified, regardless of how many individual equivocation words/phrases were found within that one sentence, and the total number of sentences within each statement was tallied. For example, the statement, "*I believe that I may have possibly seen the check*", was tallied once despite the fact that there were three individual occurrences of equivocation. The justification for coding 'equivocation' in this manner is due to the elasticity of this linguistic feature which, depending upon the context in which it is used, may not necessarily suggest intentional vagueness in an effort to deceive. For instance, the statement *"I entered the file room around 10 a.m., to the best of my knowledge"* technically contains two examples of the use of equivocation words/phrases, but the context suggests that their use is associated with time. The use of equivocation in relation to time is a baseline verbal behavior for many speakers and its use does not typically point to an effort to deceive.

Non-Prompted Negation Each individual word that constituted non-prompted negation within a response was identified and the total number of instances within each statement was tallied. For example in response to the open-ended question, *"Describe in detail everything you did in the file room"*, a response such as,"*I didn't take anything that doesn't belong to me. I would never do that*" was given a value of three.

Moderating Adverbs Each individual word that constituted an Editing, Minimizing, or Intensifying adverb within a response was identified, and the total number of instances within each statement was tallied for each of these three types of adverbs.

2nd Person Referencing Each individual use of 2nd person referencing within a response was identified, and the total number of instances within each statement was tallied. Caution was exercised inasmuch as investigators must examine the totality of a participant's words to insure that the use of 2nd person referencing is not part of baseline verbal behavior as opposed to its use solely in response to relevant questions where the participant may be endeavoring to convince. If it was determined that 2nd person referencing is baseline verbal behavior, this category was not coded.

Stalled-Action Verbs, Passive Voice, Present Tense in the Past, and Missing 1st Person Pronoun Each individual use of these categories within a response was identified and the total number of instances within each statement was tallied for each category.

Participant did not Understand We identified statements when it was apparent that a participant did not understand the relevant question being posed (coded Yes or No). Examples included a participant asking the interviewer to repeat the question multiple times or a participant providing a response that clearly did not answer the question. When this category was coded, no other coding feature was coded for that particular question.

Interviewer Contamination We identified instances when the interviewer impeded or negatively influenced the interview process, thereby causing the participant to potentially provide inaccurate information. Within this study, the following examples of interview contamination occurred: the interviewer misstated or rearranged the words of the relevant question so that it altered the meaning of the original question; interrupted a participant when he or she was responding; interjected words or phrases during a participant's response such as, "*keep going*", "*go on*"; and volunteering words to help a participant complete a response. Specific questions for which interviewer contamination occurred were identified (coded Yes or No).

Interrater Reliability Two coders, both of whom had several decades of law enforcement experience and who had extensive experience in conducting statement analysis in real-life investigative settings, reviewed transcripts from 10 cases and created the initial coding procedures (one of the coders was Sandoval). They then independently coded transcripts and statements from 10 additional cases. Initial interrater reliabilities were calculated for each of the categories and the coders were instructed to arbitrate any disagreements and recalibrate their codes. They then independently coded the transcripts and statements from a new set of 10 cases. Reliabilities were high and acceptable for all coding categories for all cases coded, including codes for Participant did not Understand and Interviewer Contamination ($.83 < r < 1.00$). A single coder then coded the remainder of the cases. Both coders were blind to the condition assignment of all cases.

Results

We first computed an overall Ethnicity (4 levels) x Veracity Condition (2 levels) by Source (4 levels: 3 interviews and the written statement) MANOVA, treating the 11 SA categories as multiple dependent variables. The Source x SA Category x Veracity Condition interaction was

significant, $F(27, 176)=2.23$, $p<.001$, $\eta_p^2=.26$. The four-way interaction including Ethnicity was not significant. To decompose the significant Source by Veracity Condition interaction, we first computed Veracity Condition (2 levels) MANOVAs using the coded SA categories as dependent variables separately for each of the four sources, and followed that with a log regression using Veracity Condition as the dependent variable and the coded SA categories as covariates using forward entry criteria.

For the screening interview the Multivariate F for Veracity Condition was significant, $F(7, 196)=3.21$, $p<.01$, $\eta_p^2=.10$ (Second Person Referencing, Stalled Action Verbs, Passive Voice, Present Tense in Past, and Missing 1st Person Pronouns were excluded from this analysis because they had zero frequencies). The same MANOVA computed by excluding all cases in which the participant did not understand the questions or where there was evidence of interviewer contamination produced the same effect, $F(7, 182)=3.19$, $p<.01$, $\eta_p^2=.11$. The log regression procedures entered three variables—Intensifying Adverbs, Non-Prompted Negation, and Editing Adverbs—and accounted for 60.5 % correct classification of cases; notably there was 86.6 % correct classification of lie cases (Table 1).

For the secondary interview the Multivariate F for Veracity Condition was marginally significant, $F(7, 196)=1.81$, $p<.08$, $\eta_p^2=.06$ (Stalled Action Verbs, Passive Voice, Present Tense in Past, and Missing First Person Pronouns were excluded from this analysis because they had zero frequencies). The same MANOVA computed by excluding all cases in which the participant did not understand the questions or where there was evidence of interviewer contamination produced the same effects. The log regression procedures entered one variable—Minimizing Adverbs—and accounted for 58.30 % correct classification of cases (Table 1).

For the written statement the Multivariate F for Veracity Condition was significant, $F(10, 193)=2.36$, $p<.05$, $\eta_p^2=.11$ (Second Person Referencing was not included in this analysis because it had zero frequency). There were no cases in which the participant did not understand the instructions; and because they wrote a statement there was no interviewer contamination effects. The log regression entered four variables—Extraneous Information, Equivocation, Non-Prompted Negation, and Intensifying Adverbs—and accounted for 61.90 % correct classification of cases (Table 1).

For the investigative interview the Multivariate F for Veracity Condition was not significant, $F(10, 193)=.73$, ns, $\eta_p^2=.04$. When cases in which participants did not understand the questions and interviewer contamination were excluded, however, the Multivariate F for Veracity Condition was significant, $F(10, 87)=1.94$, $p<.05$, $\eta_p^2=.15$. The log regression entered one variable—Editing Adverbs—and accounted for 63.50 % correct classification of cases (Table 1).

Thus SA categories were able to differentiate truths from lies at statistically significant rates, and there were no ethnicity differences in this differentiation.

Post-Hoc Analyses: Ethnic Differences in SA Categories

The ethnicity main effect in the overall MANOVA above was not significant but the Ethnicity x Source x SA Category interaction was, $F(81, 534)=2.08$, $p<.001$, $\eta_p^2=.24$. We thus computed MANOVAs using Ethnicity as the independent variable and the SA Categories as the dependents, separately for each source. These were significant for each, $F(21, 594)=2.26$, $p<.001$, $\eta_p^2=.07$; $F(21, 594)=4.50$, $p<.001$, $\eta_p^2=.14$; $F(30. 585)=1.85$, $p<.01$, $\eta_p^2=.09$; and $F(30, 267)=1.99$, $p<.01$, $\eta_p^2=.18$, for the screening interview, secondary interview, written statement, and investigative interview, respectively. We followed these by examining univariate analyses using Ethnicity as the independent variable and then following significant effects by computing pairwise comparisons using Bonferroni adjustments (see Table 2).

For the screening interview there were ethnicity differences on Non-Prompted Negation, Intensifying Adverbs, and Minimizing Adverbs. Chinese participants produced more Non-Prompted Negation than all other groups and used more

Table 1 Results of Logistic Regressions Predicting Deceptive and Truthful Statements, Separately for each Source

Source	Omnibus Test of Model	Overall Correct Classification %	False Positive %	False Negative %	Variables In	B	SE
Screening Interview	$\chi^2(3)=19.33$, $p<.001$	60.50 %	32.38 %	7.14 %	Non-Prompted Negation	.615	.226
					Intensifying Adverbs	1.570	.560
					Editing Adverbs	.258	.138
Secondary Interview	$\chi^2(1)=3.85$, $p<.05$	58.30 %	17.79 %	23.93 %	Minimizing Adverbs	.281	.151
Written Statement	$\chi^2(4)=20.53$, $p<.001$	61.90 %	30.00 %	8.10 %	Extraneous Information	.332	.160
					Equivocation	.426	.212
					Non-Prompted Negation	.532	.238
					Intensifying Adverbs	1.793	.601
Investigative Interview	$\chi^2(1)=13.18$, $p<.001$	63.50 %	14.42 %	22.12 %	Editing Adverbs	.172	.057

Table 2 Results of Post-Hoc Analyses of Ethnicity Differences in Coded Statement Analysis Categories

Source	Variable	Univariate F	Chinese M (SE)	European Americans M (SE)	Hispanics M (SE)	Middle Easterners M (SE)	Results of Bonferroni Tests
Screening Interview	Non-Prompted Negation	$F(3, 202)=6.32$, $p<.001$, $\eta_p^2=.09$	.79 (.10)	.28 (.10)	.28 (.13)	.16 (.20)	Chinese>All Others
	Intensifying Adverbs	$F(3, 202)=3.84$, $p<.05$, $\eta_p^2=.05$	.19 (.04)	.04 (.04)	.07 (.06)	.33 (.09)	None
	Minimizing Adverbs	$F(3, 202)=2.80$, $p<.05$, $\eta_p^2=.04$	.69 (.11)	.28 (.11)	.57 (.14)	.33 (.21)	Chinese>European Americans
Secondary Interview	Equivocation	$F(3, 202)=11.02$, $p<.05$, $\eta_p^2=.14$	1.80 (.20)	1.72 (.20)	3.03 (.26)	3.63 (.40)	Middle Easterners=Hispanics> Chinese=European Americans
	Non-Prompted Negation	$F(3, 202)=8.49$, $p<.05$, $\eta_p^2=.11$	1.69 (.19)	1.56 (.19)	.33 (.25)	.48 (.39)	Chinese=European Americans> Middle Easterners=Hispanics
	Minimizing Adverbs	$F(3, 202)=3.43$, $p<.05$, $\eta_p^2=.05$	.97 (.14)	.53 (.14)	1.07 (.18)	1.30 (.28)	None
	Second Person Referencing	$F(3, 202)=5.83$, $p<.001$, $\eta_p^2=.08$	.06 (.06)	.04 (.06)	.09 (.08)	.61 (.13)	Middle Easterners>All Others
Written Statement	Equivocation	$F(3, 202)=3.73$, $p<.05$, $\eta_p^2=.08$	.38 (.09)	.25 (.09)	.64 (.11)	.74 (.18)	Hispanics>European Americans
	Intensifying Adverbs	$F(3, 202)=5.30$, $p<.01$, $\eta_p^2=.07$	.11 (.04)	.04 (.04)	.07 (.05)	.35 (.07)	Middle Easterners>All Others
	Past Present Tense	$F(3, 202)=2.57$, $p<.06$, $\eta_p^2=.04$	.12 (.06)	.06 (.06)	.29 (.07)	.00 (.11)	None
Investigative Interview	Non-Prompted Negation	$F(3, 96)=10.70$, $p<.001$, $\eta_p^2=.25$	3.76 (.47)	3.81 (.47)	.85 (.45)	1.20 (.70)	European Americans=Chinese> Middle Easterners=Hispanics
	Intensifying Adverbs	$F(3, 96)=4.33$, $p<.01$, $\eta_p^2=.12$	.42 (.20)	1.04 (.20)	.28 (.19)	1.23 (.30)	Middle Easterners=European Americans>Chinese=Hispanics

Minimizing Adverbs than European Americans. No pairwise differences were significant on Intensifying Adverbs.

For the secondary interview Middle Easterners and Hispanics produced more Equivocation and less Non-Prompted Negation than European Americans and Chinese. Middle Easterners also produced significantly more Second Person Referencing than all other groups. No pairwise differences were significant on Minimizing Adverbs.

For the written statement Hispanics produced more Equivocation than European Americans and Middle Easterners produced more Intensifying Adverbs than all other groups. There were no significant pairwise differences on Present Tense in Past.

For the investigative interview European Americans and Chinese produced more Non-Prompted Negation than Middle Easterners and Hispanics. Middle Easterners and European Americans produced more Intensifying Adverbs than Chinese and Hispanics.

Discussion

The results supported the notion that some linguistic markers of deception can differentiate truths from lies across people of different ethnic/cultural backgrounds. These effects were not negligible; the effect size associated with the significant three-way interaction from the overall MANOVA was substantial ($\eta_p^2=.26$) and those corresponding to the veracity condition for each of the interviews and the written statement were moderate to large (η_p^2s ranged .06–.15). Follow-up analyses using log regressions indicated that the most important SA categories were Non-Prompted Negation, all moderating adverbs (Intensifying, Minimizing, Editing), Extraneous Information and Equivocation. These categories were able to classify cases correctly at above chance rates. Post-hoc analyses indicated interesting ethnic group differences in the base rates of usage for many of these categories but ethnicity did not moderate the veracity condition effects.

These findings were not generated without limitations. First although the Chinese, Hispanic, and Middle Eastern participants were either 1st or 2nd generation immigrants to the U.S., they all wrote and spoke in English. It was possible, therefore, that the non-findings concerning ethnic differences occurred because the participants used English and use of a standard language diluted the possibility of finding ethnic differences. Literature suggesting code or cultural frame switching (Hong et al. 2000) among bilinguals certainly is supportive of such a possibility. Moreover including multi-lingual/multi-cultural individuals in the study opened the door to the possibility that there were differences in their interpretations of the study procedures, especially the stakes, and

these differences may have influenced the data. Despite this possibility we opted to include bilinguals in the study because the GEQ data indicated they were culturally different than the European Americans. Also inclusion of bilinguals in the study was ecologically valid as there are many non-native English speaking individuals in the U.S. who come in contact with law enforcement and must speak or write in English, raising questions about the possibility of ethnic differences in the verbal indicators of veracity and lying.

Another limitation of the study concerned the exact questions that participants responded to in the interviews. While these questions had ecological validity and were grounded in the research literature, the responses given were inextricably tied to the questions asked. Thus the findings generated for the interviews were limited to the questions participants answered. If different questions were posed to the participants different responses would have been given, thereby producing different findings. Readers are therefore cautioned to interpret the findings above for the interviews with that caveat. This was not a factor for the written statement, although certainly different instructions for the written statement would also produce different statements.

A third limitation had to do with the differences in sample sizes across the ethnicities, especially the smaller sample size of Middle Eastern participants. Differences in the sample sizes made statistical comparisons among the ethnicities difficult; the effect sizes should enable readers to gauge the meaningfulness of the effect regardless of the associated p value. Still readers need to take into account the relatively small sample sizes of the Hispanics and Middle Easterners when interpreting the findings.

Despite these limitations the findings produced many interesting results that deserve attention. Perhaps the most striking finding was the relative lack of culture/ethnic group differences in the ability of the SA categories to differentiate truths from lies. Although it is certainly possible that these non-findings occurred because the participants spoke and wrote in English, they also suggest a possible cross-cultural similarity in the structure of memory, the recall of information from memory and the psychological demands placed on individuals who lie about that recall or their future intentions. To the extent that these findings are stable across time, they point to a potential universal mechanism of lying that can be identified by specific linguistic markers. Future research will need to examine the statements of people of different ethnicities and cultures in their native languages, not just English. Whether the same psychological demands are placed on individuals in the same ways when speaking and writing in their native language is an open question, and whether those psychological demands are manifested by the same linguistic markers is also a question ripe for future research. If the rules of grammar and deep structure of language (Chomsky 1957, 1972) and the principles of memory and recall (Undeutsch 1989) are similar across cultures then verbal indicators of truths and lies should occur regardless of culture, ethnicity, and language.

The cross-cultural generalizability of SA categories to differentiate truths from lies would also have important practical ramifications. In the U.S. as in many countries of the world, individuals from many different and disparate cultures and language groups are interviewed in situations where interviewers need to be able to differentiate truths from lies. Interviewees bring with them many cultural differences in customs, behaviors and languages, and many professional interviewers are sensitive to such cultural differences. In this backdrop knowing that some linguistic markers of deception may exist irrespective of culture or ethnicity would be powerful knowledge for the investigator to have as it can help investigators focus on these indicators with less ambiguity of their cross-cultural applicability.

The post-hoc analyses demonstrated a considerable amount of ethnicity differences in the usage rates of the various SA categories overall. To our knowledge these findings are new to the literature and may be indicative of different linguistic styles of communication for each of the ethnic groups, despite the fact that all used English. (They may also have occurred because of a 1st vs. 2nd language effect, although the specific differences observed did not necessarily fall along such lines.)[2] Practically, investigators will need to be aware of ethnicity main effects in the very same variables that differentiated veracity condition (e.g., Non-Prompted Negation, Moderating Adverbs, etc.) so that they can make more accurate interpretations of those markers when they occur in interviews and statements.

The findings from the log regressions indicated that approximately 60 % of the cases could be correctly classified according to veracity condition using the SA categories. (The high, 86.6 % correct classification of lie cases in the screening interview occurred because a disproportionate number of cases—78.57 %—were classified as lies, thus yielding a relatively high false positive rate as well.) Although this rate is not that much greater than the average accuracy rates for humans to detect lies from truths, which is 54 % (Bond and DePaulo 2006), we contend that the identification of the SA categories assessed here will be valuable aids to investigators as these categories serve as important behavioral indicators that can give investigators valuable insights into the personality, intentions, and motivations of the people they interview. These indicators can also provide valuable clues to the content areas of any interview that are important to probe, especially when incorporated into a strategic, tactically-oriented interview procedure that is informed by other sources of evidence

[2] Individuals who did not appear to understand English sufficiently to understand the protocol or complete the screening procedures were not included in the study. Also recall that participants' responses were coded according to whether or not they appeared to have understood the questions, and these cases were dropped from the analyses.

(witness statements, forensics, etc.). Thus we believe that even modest improvements in the ability to detect lies from truths using linguistic markers could well translate to fairly substantial differences in the efficacy by which ground truth can be obtained and cases closed.

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