Social Indicators of Deception

James E. Driskell, Eduardo Salas and Tripp Driskell

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James E. Driskell, Florida Maxima Corporation, Winter Park, Florida,
Eduardo Salas, and **Tripp Driskell**, University of Central Florida, Orlando

Objective: This study addresses a practical homeland security issue of considerable current concern: In a situation in which the opportunity exists to question or interview concurrently two or more suspects, how does one determine truth or deception at a social level?

Background: Recent world events have led to an increased emphasis on the capacity to detect deception, especially in military, security, and law enforcement settings. In many screening or checkpoint situations, the opportunity exists to question two or more suspects regarding their involvement in some activity, yet investigators know very little regarding characteristics of speech or behavior that are exhibited between two suspects that indicate truth or deception.

Method: We conducted an empirical study in which pairs of police officers and firefighters who had served together as partners took part. In the "truth" conditions, each dyad described a recent event in which they had actually taken part, and in the "deceptive" conditions, each dyad fabricated a story that did not take place. We expected that the officers in the truth-telling dyads would be able to draw on shared or transactive memory of the actual event they had participated in and would describe this event in a more interactive manner than would those in deceptive dyads.

Results: Results indicated greater evidence of synchrony of behavior as well as more interactive behaviors, such as mutual gaze and speech transitions, in truthful dyads than in deceptive dyads.

Conclusion: This research provides a unique perspective on detecting deception in a social context, and the results have both theoretical and practical value.

Application: These results can inform training programs and refine strategies used by screeners in field settings.

Keywords: deception, transactive memory, interviewing, homeland security, group processes

Address correspondence to James E. Driskell, PhD, Florida Maxima Corporation, 507 N. New York Ave., R-5, Winter Park, FL 32789; e-mail: jdriskell@rollins.edu.

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INTRODUCTION

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In reviewing the applications of human factors to homeland security, Cooke and Winner (2008) noted the issue of security screening, especially as it applies to the detection of deception or threat by humans. Recent world events have led to an increased emphasis on the capability to detect deception, especially in applied field settings, such as security checkpoints or screening contexts in airports, bus terminals, or train stations. The current study addresses a practical issue of considerable current concern: In a situation in which the opportunity exists to question or interview concurrently *two or more* suspects, how does one determine deception at a social level? In other words, if we question two persons who we believe may have been involved in some transgression, are there characteristics of speech or behavior that are exhibited between the two suspects that indicate truth or deception? Although considerable research has examined individual indicators of deception, this research is the first to examine social indicators of deception, that is, unique cues to deception that may occur in speech or behavior between two or more suspects.

Deception

Research on the detection of deception has a long and, as some have noted, colorful history (MacLaren, 2001). There are two separate and extensive lines of research in this area. The first area includes research on polygraph testing, the goal of which is to detect deception by analyzing physiological changes in the body that cannot be detected by human observation (National Research Council, 2003). One limitation of the traditional polygraph approach is that it requires that every suspect be subjected to a lengthy and invasive psychophysiological examination conducted by a trained polygrapher, making the use of the polygraph functionally impractical in a variety of field settings. The second major area

of deception research focuses on behavioral cues to the detection of deception (see DePaulo et al., 2003; Hartwig & Bond, 2011; Vrij, Granhag, & Porter, 2010). This approach is generally limited to the analysis of verbal and nonverbal behaviors that can be discerned by the human observer without special equipment.

Several decades of research on individual deception has resulted in an experimental paradigm in which one person (the truth teller or deceiver) sits across a table and is questioned by another person (the interviewer) in attempt to discern specific cues that distinguish truth from deception. Examining the verbal or linguistic profile of individual deception, Newman, Pennebaker, Berry, and Richards (2003) found that liars used fewer first-person-singular references, fewer cognitive complexity words, and more negative emotion words. In a comprehensive review of research on nonverbal cues to deception, DePaulo et al. (2003) found that liars were more tense and inhibited, displayed fewer gestures, pressed their lips more, exhibited greater pupil dilation and voice pitch, and in certain conditions, showed less eye contact and more feigned smiling than did those telling the truth. Although this evidence indicates that certain individual-level cues are predictive of deception, these effects were generally weak. As DePaulo et al. concluded, "the looks and sounds of deceit are faint" (DePaulo et al., 2003, p. 104).

Moreover, one significant limitation of all empirical research on deception is that the focal point of research is deception on an individual level. That is, existing research has been limited to the examination of cues to deception exhibited by a single suspect or deceiver in a one-on-one interview setting. Thus, existing research has treated deception as if it is a solely individual-level phenomenon, for two primary reasons.

First, most research on deception has taken place in academic settings in the experimental laboratory, focusing on the behavior of a single communicator or deceiver in isolation or, in some cases, the dynamics of the interviewer-interviewee dyad. This research has tended to ignore the possibility of examining two or more suspects in a broader social context because of the desire to examine the link between individual emotion and behavior in a "pure" sense in isolation from other social influences. Ekman and Friesen (1972) noted that "[when alone,] nonverbal behavior may be an especially rich source in such circumstances, because when the individual is alone, his nonverbal behavior is less subject to inhibition or control for social reasons" (p. 354). Thus, in this sense, social factors are seen as "noise," and the examination of suspects in a broader social context may interfere with the examination of individual emotional expression. (Research on deception has examined social factors related to individual deception, e.g., the dynamics between interviewer and interviewee, but the current study is the first to our knowledge that examines indicators of deception among pairs of persons who conspire to deceive and are interviewed at the same time.)

Second, there is a historical emphasis within law enforcement to isolate potential suspects as soon as possible prior to interrogation. This isolation is carried out to remove the individual from familiar surroundings and people, to heighten the stress of interrogation, and to increase his or her anxiety and incentive to confess (Kassin, 2005; Kassin & Gudjonsson, 2004). However, as Borum (2006) notes, there is an important difference between law enforcement interrogation and intelligence gathering: The purpose of a law enforcement interrogation is to obtain a confession from a suspect, whereas the purpose of a field interview in an intelligence-gathering context is to gather accurate, useful information from a source or sources. Nevertheless, the emphasis on separation of suspects and isolation has become the sine qua non of standard interviewing practice.

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One of the most pressing current needs in the military and intelligence community is the development of methods for gathering reliable information during screening or interviewing of human sources. Most vital are techniques that can be used in the field—at checkpoints, airports, and street corners—to gather information that may help prevent actions that may cause harm. In a typical scenario, security personnel may pull a vehicle over at a checkpoint and engage the passengers in a short conversation

as to where they have been or what activities they have been involved in, an airport screener may question two traveling companions, or a soldier may have the opportunity to question two persons on a street corner. We are interested in this type of field interview setting where the opportunity exists to question or interview two or more suspects together.

To our knowledge, there is no research that has directly examined cues to deception among two or more interactants. The goal of this project is to conduct initial research to extend the study of deception beyond the analysis of individual deception to situations in which two or more people may be involved in a transgression (which we may term *conspiracy*) and in which information may be obtained by interviewing these persons jointly. The theoretical contribution of this research is that it extends existing research that addresses only individual deception by considering deception in a social context.

There are several reasons this research question is important. First, as Loftus (2011) has noted, gathering accurate information by interviewing witnesses or persons of interest has taken on heightened importance in the post-9/11 era. Moreover, many terrorist acts, such as the 2005 London bombings or the September 11, 2001, terrorist attacks on New York and Washington, are carried out jointly by multiple participants or conspirators. As Crenshaw (1990) concluded, "acts of terrorism are committed by groups" (p. 250), and it is likely that many initial encounters with suspects or witnesses may take place in groups.

Second, although the term *investigative interview* may evoke the mental image of a hard-nosed cop on one side of the table and a sweating criminal on the other, in today's national security environment, information-gathering interviews are more likely to take place in field settings, such as checkpoints, street corners, and airport terminals. In other words, there are numerous settings in which the goal is not to force a confession but to obtain information in a social setting. For example, *Homeland Security Today* describes screening procedures that involve "pulling the vehicle over and engaging the passengers in short conversations designed to identify any hint of dishonesty" (Kimery, 2008, p. 2). However, we know very little about *social* indicators of deception—unique cues to deception that may occur between co-conspirators or accomplices.

Third, we believe that there are conditions in which it may be advantageous to interview pairs of suspected co-conspirators together. It is likely that the "looks and sounds of deceit" may differ in a situation in which a sole individual is attempting to deceive versus a situation in which two co-conspirators are attempting to deceive. Furthermore, there may be indicators of deceit at a group level, such as cues stemming from interaction *between* co-conspirators, that may not be apparent when these persons are interviewed individually. For example, interactive behaviors, such as speech transitions or mutual gaze, may serve as cues to deception during interaction between suspects, and these potential cues are simply not observable at an individual level of analysis.

Therefore, the basic question is, Are there indicators of deception that are observable at the social level that may occur when questioning two suspects or co-conspirators? We describe differences between the interaction of truth-telling dyads and deceptive dyads within the framework of *transactive memory systems*. In brief, we believe that two persons who recall an actual, jointly experienced event from transactive memory do so in a different manner than do two persons who are attempting to recall a fabricated event. Transactive memory is an approach to understanding group behavior through an understanding of how group members encode, store, and recall information regarding past events (Wegner, 1987; Wegner, Erber, & Raymond, 1991). In brief, this approach holds that just as individuals encode information, store information in memory, and retrieve information at the individual level, group members encode information, store information, and retrieve information through a transactive memory system.

For example, within a dyad, one person can serve as an external memory storage "facility" for the other person. This capacity for one person to store information for the other occurs because when information is encoded regarding a shared experience, responsibility for encoding information is divided or shared. This "transactive" encoding may be explicit

(e.g., "You remember that number") or implicit (e.g., each member of a dyad may keep track of information within his or her area of expertise). Therefore, information is stored transactively within the group. When information is retrieved, one must determine where it is stored—its location—and group members then assemble or retrieve that information from multiple locations. Hollingshead (1998) refers to *transaction information search*, in which group members work together to retrieve information by cuing one another to aid retrieval, verbalizing details about the context, posing questions to one another, and verbalizing connections. Thus, transactive retrieval of information regarding a past shared event is social and interactive.

Therefore, the transactive quality of shared memory is reflected during recall of information in the interactive nature of communication. When two members of a dyad attempt to access information regarding a prior shared event, each person's recollections are likely to trigger the recall of events by the other person, and thus the pair may fill in stories for one another, alternating in the retrieval of shared information (Wegner, 1987). In short, information that is encoded transactively is retrieved in an interactive manner.

This process of transactive information storage and retrieval suggests a critical distinction between truth-telling dyads and deceptive dyads. Those in truth-telling dyads are retrieving a story about past events that they took part in from transactive memory. In contrast, those in deceptive dyads are constructing or fabricating a story regarding an event that did not take place. This fabrication requires that each member of the dyad individually construct a story that sounds consistent with the partner's story, but in this case, retrieval of information is an individual cognitive task that requires summing or pooling of information at the time of recall.

Therefore, the transactive memory approach leads us to expect differences in social behavior during information retrieval between truth-telling dyads and deceptive dyads. We believe that these differences in behavior will be captured by two primary types of measures. First, we expect to find greater evidence of *synchrony* or *congruence* of social behavior within truth-telling dyads versus deceptive dyads. That is, examining interaction within dyads, we expect a higher correlation of social behaviors exhibited within truth-telling dyads than within deceptive dyads. To the extent that both partners in truthful dyads are engaged in the transactive process of information retrieval, we expect that this process will be reflected in a higher correlation between partners in truth-telling dyads in social behaviors, such as mutual gaze, and in the use of certain types of words, such as the use of first-person-plural *we*. Thus, when one partner uses the term *we* a lot, and the other partner uses the term *we* a lot, this usage reflects this simple form of synchrony.

Niederhoffer and Pennebaker (2002) have defined synchrony as the "matching of behaviors, the adoption of similar behavioral rhythms, the manifestation of simultaneous movement and the interrelatedness of individual behaviors" (p. 339; see also Ireland & Pennebaker, 2010). We use the term *synchrony* to reflect this co-occurrence of behavior. (It is important to note that the term *synchrony* has been used to refer to more complex patterns of behavior. For example, Bernieri, Reznick, and Rosenthal, 1988, noted that synchrony may be simultaneous, identical, in phase or alternating, mirrored, or out of phase. They further state, "It is not surprising that synchrony has been measured in many different ways" [p. 243]. *Synchrony* is used in the current study to refer to correlated behavior at the conversational level.)

Second, we expect to find overall mean differences in the display of certain social behaviors between truth-telling dyads and deceptive dyads. That is, we expect to find differences between groups in the extent to which they exhibit certain interactive behaviors, such as gaze, speech transitions, and the use of first-person-plural pronouns. For truth-telling dyads, the retrieval of information about a shared past event from transactive memory should be characterized by a high level of interactivity, including back-and-forth exchanges, mutual eye contact, and questions posed to one another. For deceptive dyads, the retrieval of information regarding an event that did not take place is not transactive but additive. That is, dyad members draw on individual memory to construct a plausible story that is pooled at the time of recall, a process that requires less interactivity.

METHOD

A research study was designed to examine social indicators of deception—unique cues to deception that may occur in speech or behavior between two or more suspects. Our goal was to create a situation in which two persons have carried out some action and are then interviewed in the presence of one another regarding their participation in that action. This method is analogous to a real-world situation in which two suspects may have committed an act and are questioned together regarding their activities.

We deemed it important to use "real-world" personnel describing realistic events in this research rather than university undergraduates. Accordingly, actual police officers and firefighters took part in this study as research participants, which provided two significant benefits. First, the police and firefighter personnel understood the practical significance of research on screening potential suspects and were motivated to do their best on this task. In a number of instances, they volunteered how important or relevant this task was to their jobs. A second advantage to using police and firefighter personnel as research participants was to increase the realism of the task. In a typical study of deception, a participant is asked to lie to cover up his or her actual feelings or opinions or to lie to cover up a transgression, such as stealing an object from a desk drawer (DePaulo et al., 2003). In the current study, it was imperative that the research participants be able to describe real-world events that actually happened rather than to discuss hypothetical or manufactured events. That is, when we asked truth-telling dyads to describe an event that both individuals had taken part in, they were able to draw on actual experiences, such as a criminal case or rescue operations in which they worked interdependently to perform a real-world task.

Participants

Research participants were 52 police and firefighter personnel who were randomly assigned in pairs to either the "truth" or the "deception" experimental condition. There were 50 males and 2 females with experience levels ranging from 1 year to 26 years.

Procedure

Two police officers or firefighters who had served together as partners took part in this study at a time. All interviews took place in a room approximately 12 × 12 ft. After the participants entered, they read and completed individual consent forms. The participants were then instructed as follows: In the truth condition, they were asked to simply describe an event or call that they had jointly participated in during the recent past. In the deception condition, they were instructed to fabricate a story on the spot that did not take place but to make the story as realistic and believable as possible.

Prior to the interview, each dyad received an envelope that contained the instructions, to either (a) describe an event that the dyad had actually participated in or (b) make up or fabricate an event that in fact had not occurred. They were to read the instructions, take a moment to decide what event they would discuss, and then signal the experimenter that they were ready. Therefore, the experimenter-interviewer was blind to the specific truth or deception manipulation of each dyad as he conducted the interview. The experimenter conducted the interview with each dyad, asking the dyad members to describe the event, each person's own and his or her partner's roles in the event, and actions taken to resolve the event. The dyad members stood side by side, facing the experimenter.

The goal was to conduct a brief investigative interview of several minutes' duration, similar to that which may occur during initial screening at a checkpoint or street corner. All interviews were videotaped for subsequent analysis. After the interview, the participants were debriefed and thanked for their participation.

Measures

Our analytic strategy was to focus on interactive measures—measures that reflect social activity between the two interactants. The two primary categories of measures examined include synchrony within truth-telling and deceptive dyads and mean differences in social cues between truth-telling and deceptive dyads.

Synchrony. The synchrony measure allows us to examine interaction patterns within truthful

dyads and deceptive dyads. We have argued that truth-telling dyads would be required to retrieve actual events experienced from transactive memory, resulting in greater synchrony or congruence in social behaviors during recall within truthful dyads than within deceptive dyads. That is, we expect that the interactive nature of transactive information retrieval should be more evident in truth-telling dyads, and this interaction will be reflected in a higher correlation in social behaviors between pairs of truth-telling dyad members than between pairs of deceptive dyad members. We believe this synchrony will be evident in three variables: (a) mutual gaze, (b) speech transitions, and (c) word usage.

Hollingshead (1998) has suggested that retrieval of information from transactive memory should be reflected in dyads in greater mutual eye contact. We believe that members of deceptive dyads are required to coproduce a plausible story and that one individual will occasionally look at the other to check the other's response to the story being told. In truth-telling dyads, members are actively retrieving information regarding an experienced shared event from transactive memory, and this higher level of interactivity during recall should be reflected in more correlated gaze behavior as members jointly elaborate and support each other's recall of information. In this study, we operationalized gaze as the number of times that each interactant looked at the other, which was coded by two independent raters from the videotapes.

We further expect that speech transitions will reflect the interactive nature of transactive memory retrieval in truth-telling dyads. A speech transition is operationalized as an event in which one person's speech immediately follows the other person's speech within the flow of conversation, a back-and-forth verbal exchange. For example, after the interviewer asks a specific question, Person A may respond and after his or her initial response, Person B may accept the opportunity to elaborate, correct, or extend what Person A has said. This pattern is illustrated in the following excerpt:

> Interviewer: What actions were taken to resolve this event?
> Bruce: Um, I determined that the individual needed mental health treatment, so he was transported to the central reception center. Is that what it is called?
> Jeff: Yes. [Transition 1, Jeff]
> Bruce: Central reception center. [Transition 1, Bruce]
> Jeff: Central receiving center or facility. [Transition 2, Jeff]
> Bruce: Yes. [Transition 2, Bruce]

Speech transitions were coded directly from the written transcripts as the number of times a person provided an elaboration or response that immediately followed the preceding person's turn. A higher correlation in speech transitions between dyad members would indicate greater joint elaboration of information.

The third measure we examined in the synchrony analysis was word usage. To examine word usage, we used the Linguistic Inquiry and Word Count (LIWC) language analysis program (Pennebaker, Booth, & Francis, 2007). The LIWC program analyzes text files on a word-by-word basis and provides measures of total word count; linguistic dimensions; word categories tapping psychological constructs, such as social processes; and other paralinguistic dimensions, such as fillers or nonfluencies. For each conversation, LIWC calculates each linguistic category, such as the use of first-person-plural pronouns, and expresses each as a percentage of total words in the text. Because LIWC includes a number of linguistic categories, we focused on several categories that reflect interactive behavior. These include indicators of social behavior, such as the use of first-person-plural pronouns (i.e., *we, us, our*), and the category of social processes. We also include several linguistic categories that we thought would reflect the process of negotiating interactive recall, such as words related to tentativeness (e.g., *maybe, perhaps*), certainty (e.g., *always, never*), negations (e.g., *no, not*), and inhibition (e.g., *stop, refrain, wait*).

Guided by our emphasis on social interaction, we expected synchrony to be reflected in higher within-dyad intercorrelations in truth-telling dyads versus deceptive dyads for these

linguistic categories. We conducted the analysis of synchrony in word usage at the conversational level by correlating the degree to which one person in the dyad used a comparable number of types of words, such as first-person-plural words, as the other person (see Niederhoffer & Pennebaker, 2002). This simple cotemporaneous correlation is a basic measure of dyadic synchrony (Bernieri et al., 1988; Cappella, 1997).

Mean differences in social cues. We expect to find overall mean differences between the truth-telling and deceptive dyads in the extent to which they exhibit interactive behaviors, such as gaze, speech transitions, and the use of first-person-plural pronouns. DePaulo et al. (2003) found that there is little association between gaze and individual deception (mean $d = 0.03$). However, in these studies, gaze was operationalized as the extent of gaze between the participant and the interviewer. In contrast, we expect mean differences between truthful and deceptive dyads in the extent of participant-to-participant gaze, reflecting the transactive nature of information retrieval.

We also expect differences between truth-telling dyads and deceptive dyads in the number of speech transitions that occur within their conversations. In truthful dyads, the mean number of transitions should reflect the interactive nature of the information retrieval task. In deceptive dyads, we expect fewer overall transitions in that each person in the dyad is attempting to fabricate a story and not in a position to elaborate or extend the other's statements and less likely to accept an opportunity to do so.

Finally, we expect to find differences between persons in truth-telling dyads and deceptive dyads in their usage of first-person-plural pronouns, such as *we, us*, or *our*. We expect that those in truth-telling dyads would respond with a greater proportional usage of first-person-plural pronouns (i.e., "*We* questioned a suspect but *our* primary role . . .") than would those in deceptive dyads, who again are forced to fabricate an event (an individual-level cognitive task) and who we believe are more likely to describe that event from an individual perspective. We also examined mean differences in the usage of several other word categories provided by LIWC, such as words related to social processes and assent and questions that we believe may distinguish truth-telling dyads from deceptive dyads. We expect that the interactive nature of communication in truth-telling dyads is likely to be reflected in more communication related to social processes and assent (e.g., agreements, affirmations) and a greater number of questions posed to the other than in deceptive dyads.

RESULTS

Each videotaped interview was transcribed into a written text file for each participant. The gaze variable was coded by two raters (Cronbach's alpha = .973), and discrepancies were resolved to achieve perfect agreement. The other study variables were directly coded from the written transcripts.

Descriptive Data

The average length of the interview sessions was approximately 4.5 min (4 min and 37 s). The length of the interviews ranged from 3 min and 16 s to 7 min and 43 s. There was no significant difference in the length of the interview between the truth-telling dyads ($M = 4.47$) and the deceptive dyads ($M = 4.25$), $t(22) = .45$, $p > .1$. Table 1 presents descriptive data for this study.

Synchrony

Using between-subjects analysis, we correlated the degree to which one member of the dyad exhibited similar behaviors (e.g., gaze and transitions) and used similar linguistic categories as the other member, for both the truth-telling dyads and the deceptive dyads. Because this study is exploratory, we report significance levels at the .01, .05, and .10 levels. The results are shown in Table 2.

The results indicated that there is considerable evidence of synchrony of behaviors and linguistic styles in conversation in the truth-telling dyads. Using Cohen's (1988) benchmarks for small ($r = .10$), medium ($r = .30$), and large ($r = .50$) effect sizes, in almost all cases, we found that the effects of synchrony observed for truth-telling dyads are of medium to large magnitude. Thus, for example, the more words that one dyad

TABLE 1: Measures Used in the Current Study and Descriptive Data

Measure	Description and Examples	Mean
Gaze	Number of times each dyad member looks at the other	6.83
Transitions	Number of times each dyad member elaborates or extends the response of the other	4.02
First-person plural	We, us, our	3.35
Negations	No, not, never	1.46
Social processes	Us, friend, talk	11.36
Tentative	Maybe, perhaps, guess	2.54
Certainty	Always, never	1.03
Inhibition	Stop, block, constrain	0.57
Assent	Yes, OK, agree	0.53
Questions	Any question (e.g., Is that correct?)	0.45

Note. Gaze and transitions are raw counts. The remaining categories are reported as a mean percentage of word usage for each respondent.

TABLE 2: Verbal and Nonverbal Markers of Synchrony

	Truthful Dyads (*r*)	Deceptive Dyads (*r*)	*Z*
Gaze	.863***	.732***	0.83
Transitions	.927***	.299	2.97***
Time speaking	.322	–.079	0.92
Word count	.156	–.165	0.72
First-person plural	.547*	.081	1.19
Negations	.570**	.230	0.92
Social processes	.695***	–.001	1.92**
Tentative	.536*	–.023	1.39*
Certainty	.528*	–.101	1.56*
Inhibition	.649**	.297	1.05

Note. The *r* reported is the between-subject correlation for the dyads in the truthful and the deceptive conditions. Significance levels are two-tailed tests and based on $n = 13$. The *Z* value assesses the difference between the two correlations (tests of significance are one-tailed tests).
*$p < .10$. **$p < .05$. ***$p < .01$.

member used related to social processes, the more words that the other dyad member used related to social processes ($r = .695$).

Furthermore, we found considerably less evidence of synchrony or congruency within the deceptive dyads. Again, in almost all cases, the correlations observed are of lower magnitude for the deceptive dyads than for the truth-telling dyads. The results of the *Z* test for the significance between two correlations indicates which differences are statistically significant, with the results also reflecting the relatively small sample size of dyads. Thus, for example, whereas there was a significant correlation within truth-telling dyads in the number of words used related to social processes ($r = .695$), there was no discernable relationship in the use of words related to social processes in the deceptive dyads ($r = –.001$). There was a significant difference between these two groups, $Z = 1.92$, $p < .05$.

Social Cues

The preceding data indicate that especially for truth-telling dyads, there is evidence that the responses of the two persons are correlated on

TABLE 3: Mean Scores by Condition and Results of Linear Mixed Model Tests

	Truthful Dyads		Deceptive Dyads		Test of Fixed Effects			
Measure	*M*	*SD*	*M*	*SD*	Num. *df*	Den. *df*	*F*	*p*
Gaze	9.88	8.70	3.77	3.75	1	24	5.39	.029
Transitions	7.19	4.79	0.84	1.01	1	24	28.09	.000
First-person plural	3.52	1.94	3.18	1.91	1	24	0.44	.513
Social processes	12.51	4.90	10.20	2.12	1	24	2.96	.098
Assent	0.77	0.63	0.27	0.41	1	24	11.05	.003
Questions	0.64	0.65	0.25	0.36	1	24	10.91	.003

Note. All means reported are at the individual level. The gaze and transitions measures are the mean number per person. The remaining measures are percentages of total words. Num. df and Den. df represent the degrees of freedom in the numerator and denominator, respectively.

a number of variables, which is used to infer synchrony. However, this also indicates nonindependence in the data, which violates the statistical assumption (as in ANOVA models) of the independence of observations. Furthermore, simply analyzing the individual-level data from these dyads as if they were independent would result in biased *p* values.

One way to assess nonindependence in dyadic designs is to compute the intraclass correlation coefficient (Alferes & Kenny, 2009). However, Kenny, Mannetti, Peorro, Livi, and Kashy (2002) note that with small sample sizes, the intraclass correlation may not be significant yet may be large enough to bias *p* values. Therefore, in dyadic designs in which there is a small number of dyads, the prudent approach is to assume nonindependence and to conduct statistical analyses accordingly. Therefore, in the following analyses, we employed a linear mixed-modeling statistical technique that can be used when data have a hierarchically nested structure (i.e., it allows us to test hypotheses about individual behaviors while controlling for group membership). Mean scores for truth-telling and deceptive dyads and results of the linear mixed-model analyses are shown in Table 3.

Gaze. Results indicate that those in truth-telling dyads gazed more at their partner ($M = 9.88$, $SD = 8.70$) than did those in deceptive dyads ($M = 3.77$, $SD = 3.75$), $F(1, 24) = 5.39$, $p = .029$. Note that the difference in gaze patterns is almost a 3-to-1 margin.

Transitions. Results indicate that those in truth-telling dyads followed up their partner's responses more often ($M = 7.19$, $SD = 4.79$) than did those in deceptive dyads ($M = 0.84$, $SD = 1.01$), $F(1, 24) = 28.09$, $p = .0001$. This difference is striking; whereas those in truth-telling dyads averaged approximately seven transitions during the 5-min interview, those in deceptive dyads averaged less than one transition.

First-person-plural usage. We found no evidence that first-person-plural usage differed between those in truth-telling dyads ($M = 3.52$, $SD = 1.94$) and those in deceptive dyads ($M = 3.18$, $SD = 1.91$), $F(1, 24) = 0.44$, $p = .51$.

LIWC social categories. Results for the *social processes* category were equivocal. Those in truth-telling dyads used more words related to social processes ($M = 12.51$, $SD = 4.90$) than did those in deceptive dyads ($M = 10.20$, $SD = 2.12$), but the difference was marginal, $F(1, 24) = 2.96$, $p = .098$. Results indicate that those in truth-telling dyads used more assent words, such as *yes* or *agree* ($M = 0.77$, $SD = 0.63$), than did those in deceptive dyads ($M = 0.27$, $SD = 0.42$), $F(1, 24) = 11.05$, $p = .003$. Results also indicate that those in truth-telling dyads asked more questions of one another ($M = 0.64$, $SD = 0.65$) than did those in deceptive dyads ($M = 0.25$, $SD = 0.36$), $F(1, 24) = 10.91$, $p = .003$.

CONCLUSIONS

The results of this research suggest that deceptive communication between co-conspirators is

characterized by less synchrony within deceptive dyads than within truthful dyads and by mean differences in the display of specific social cues between truthful dyads and deceptive dyads. Those in truth-telling dyads exhibit considerable synchrony in behavior and communications in terms of gaze and verbal transitions and in the use of first-person-plural pronouns, negations, social processes, and linguistic markers of tentativeness, certainty, and inhibition (see Table 2). All of these effect sizes were of large ($r > .50$) magnitude. In each case, deceptive dyads exhibit less synchrony in behavior, although significant differences between the level of synchrony in truth-telling dyads and deceptive dyads were shown for only a subset of these variables.

The results further indicate that deceptive communication between co-conspirators is characterized by a relative absence of interactive or social behaviors, such as gaze or speech transitions. Those in truth-telling dyads were more likely to look at their partners, follow up or elaborate their responses, ask questions of them, and use terms related to assent or approval than were those in deceptive dyads (see Table 3).

It is useful to distinguish this approach from more traditional approaches to detection of deception. Most research on the detection of deception focuses on the individual and is based on theories of emotion (i.e., liars feel more nervous or guilty than truth tellers) or cognitive complexity (i.e., lying is more cognitively demanding than telling the truth) (see Vrij et al., 2010). Our approach is unique in that it examines deception at the social level—cues to deception that arise out of the interaction between two people conspiring to lie—and it is based on a transactional memory theoretical approach.

We argue that a key distinction between truth-telling dyads and deceptive dyads is that when questioned about a past event, the truth-telling dyad is required to recall the actual event from transactive memory. Just as that event information was encoded in an interactive manner, it is decoded interactively, resulting in greater synchrony of social behavior and more behavioral interactivity. In contrast, those in deceptive dyads, who are required to describe a fabricated event that did not actually occur, do not retrieve information from transactive memory at the time of recall but instead individually construct a story that sounds consistent with the partner's story. Thus, in one instance, information is interactively reconstructed during recall, and in the other, information is simply pooled. The results provide reasonable support for this approach.

This study is the first to our knowledge that has directly examined cues to deception among multiple interactants, and it opens up a new paradigm for examining deception in a social context. At the same time, this study is exploratory, and caution should be taken in extrapolating the results of a single study. There are several limitations that must be considered in interpreting the results of this study. First, in this study, and in other deception studies that examine retrospective reports, we have no way of determining the "ground truth" of participants' statements. That is, we have no independent way of knowing whether the dyads who were instructed to describe a truthful event actually did so or whether the dyads who were asked to describe a fabricated event actually did so. However, we took steps to ensure that all participants approached this task in a serious and helpful manner by selecting police and firefighters as research participants and by describing the research goals in terms of real-world events that are relevant to them. Doing so helped to ensure that they would take the task seriously and were motivated to perform it correctly. One way to address the problem of verifying ground truth, as implemented in some deception research, is to have participants view a video or perform some staged task and then instruct them to lie about it. This approach establishes ground truth but may result in an artificial or unrealistic task environment.

Second, although we discussed "truthful" dyads and "deceptive" dyads, it is useful to note that truth and deception are rarely so clearly defined. For example, researchers have noted that truthful stories often contain some fabrication, and deceptive stories may contain some truth (see DePaulo et al., 2003). Third, we created an experimental task that represents what we view as a "field interview" setting, in which interviewers conduct a brief interview with suspects who have only a moment to develop a cover story. In the case of such short-term, informal, or opportunistic field interviews, we

believe that suspects may have only a brief opportunity to construct a story of "Here is what we should say," at best. Certainly, we can envision situations in which a "more accomplished" set of suspects may have the opportunity to prepare a joint cover story ahead of time in anticipation of being questioned. Whether such prepared joint fabrications would have similar characteristics to the spontaneous joint fabrications examined in this study is unknown.

Although this study provides an initial exploratory analysis of social deception, many questions remain. For example, this research indicates that deceptive dyads exhibit or "give off" observable cues to deception. However, we do not know whether interviewers or observers do an accurate job in "reading" these cues in distinguishing truth from deception. A related question is whether observers can be trained to use these cues effectively (see Driskell, 2011).

It is important to note some of the applications of this research. First, we have noted that deception is not solely an individual-level phenomenon. Certainly, there are numerous situations in which two people may conspire to lie or deceive. At a broad level, just as it is useful to understand individual deception, it is beneficial to understand how to detect what we have termed *social deception*, or conspiracy among dyads. More specifically, in military and law enforcement settings, numerous occasions arise in which personnel have the opportunity to question two or more suspected co-conspirators regarding their activities. These situations often occur in the field, and personnel do not have the luxury or opportunity to conduct one-on-one interviews. In these field interviews, in which two or more persons may be observed "loitering with intent" or two or more persons may be suspected of some threat, it is useful to develop an understanding of how to determine the likely veracity of information provided.

We recall one iconic image captured by security cameras of two backpacked suspects in the 2005 London terrorist bombings approaching a subway entrance. A suspicious officer, if present, would have had the opportunity to question these suspects on the spot. This is the essence of the field investigative interview: a brief, opportunistic occasion to gather information. Detecting signs of deception in such field interviews with two or more suspects can be of considerable practical value.

As another example, the Transportation Security Administration conducts what it terms *casual conversations* with travelers as part of airport security procedures to identify anomalies in behavior or statement content. In this case, an initial interview may take place at a social level (questioning two suspects together) to determine cause for going to the next screening level, which may then require separate individual-level interviews. In this case, gathering information at a social level may serve as a decision point for further questioning. The results of the current research, although an exploratory examination of deception at a social level, may inform strategies used by screeners in field settings.

Recent world events have led to an increased emphasis on the capability to detect deception, especially in applied settings, such as security checkpoints or screening contexts in airports, bus terminals, or train stations. Development of an approach to detect deception among suspected co-conspirators may serve as a considerable advance compared with current individual-level models of deception. This research has identified some cues that distinguish truth from deception in dyads, and these cues may be of practical import in screening or interviewing multiple suspects in real-world settings. Moreover, as Cooke and Winner (2008) have noted, this type of human factors research can inform training programs and provide low-cost, high-impact solutions to homeland security issues.

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KEY POINTS

- Many terrorist acts are carried out jointly by multiple participants, and officials often have the opportunity in screening contexts to question two or more suspected co-conspirators regarding their activities.
- No prior data exist regarding social indicators of deception—unique cues to deception that may occur in speech or behavior between two or more suspects.

- Results of this research indicated greater evidence of synchrony of behavior as well as more interactive behaviors, such as mutual gaze and speech transitions, in truthful dyads than in deceptive dyads.
- These results can inform training programs and refine strategies used by screeners in field settings.

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James E. Driskell is the president and a senior scientist at Florida Maxima Corporation in Winter Park, Florida. He received his PhD from the University of South Carolina in 1981.

Eduardo Salas is the Pegasus Professor of Psychology and university trustee chair at the University of Central Florida. He received his PhD in industrial and organizational psychology from Old Dominion University in 1984.

Tripp Driskell is a doctoral student in the Applied Experimental and Human Factors program at the University of Central Florida. He received his MS in human factors from Embry-Riddle Aeronautical University.

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