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See No Evil: The Effect of Communication Medium and Motivation on Deception Detection

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Abstract The present study reports an experiment that examines the role of communication medium and liar motivation on deception detection. Participants were randomly assigned to one of two dyadic communication conditions, text-based, computer-mediated environment or face-to-face, and to one of two motivation conditions, high or low. Participants engaged in a discussion of four topics, in which one participant was deceptive during two topics and truthful during the other two. No main effect of communication medium or motivation level was observed. However, an interaction effect suggests that highly motivated liars interacting in a text-based, computer-mediated environment were the most successful in deceiving their partners. The implications of these results are discussed both in terms of the elimination of nonverbal cues, as well as the potential advantages to the motivated liar offered by text-based media.

Keywords Deception detection · Lying · Deception · Computer-mediated communication · Motivation · Interpersonal communication

1 Introduction

In general, people are not very good at identifying deceptive behavior. In fact, the accuracy of deception detection by non-experts tends to be at about, or only marginally

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better than, chance (Vrij 2000). A review of the literature concerned with deception detection, however, suggests that there are a number of factors that influence an individual's ability to successfully detect deceit, including, among others, behavioral cues associated with deception and the motivation of the liar.

In the present study we examine another factor that may play an important role in our ability to detect deception, the communication medium. With the widespread use of communication technology our social interactions increasingly take place in text-based media, such as email, in which participants send messages asynchronously, and instant messaging, in which participants send messages in real time. Collectively, these new media are referred to as text-based computer-mediated-communication (CMC), and these new media can affect the practice of deception (Hancock et al. 2004). How might text-based CMC affect deception detection and the operation of other factors that have been identified to be important to detection in more traditional FtF interactions, such as behavioral cues and motivation levels?

1.1 Factors in Deception Detection

As noted above, people are typically poor at detecting deception and frequently perform at chance levels (DePaulo et al. 2003; Vrij 2000). A number of studies, however, have demonstrated that attention to some specific factors may improve deception detection accuracy. For example, a study by Porter et al. (2000) found that both Parole Officers and Undergraduate students substantially improved in their accuracy level after receiving training on identifying empirically based factors of deception.

Perhaps the most important of these factors are the verbal and non-verbal cues that tend to be associated with deception. The most well known of these are "leakage cues," which are non-strategic behaviors (usually non-verbal) that are assumed to betray the senders' deceptive intentions and true feelings or beliefs, such as the increased vocal tension in a liar's voice (Ekman and Friesen 1969; Vrij 2004). Similarly, the emotions that liars experience, such as fear, may be reflected in "feeling cues," which include higher pitch, pauses, and speech errors, that are assumed to be indicative of detection apprehension (Ekman 2001; Vrij 2000).

A recent meta-analysis of the many cues that have been examined in the context of deception detection suggests there are in fact a small set of relatively reliable verbal and nonverbal cues to deception (DePaulo et al. 2003). Verbal cues include an increase in negative statements and linguistic constructions that distance the liar from their presentations (e.g., passive versus active voice). Nonverbal cues indicative of deception are less discernable, but include appearing more tense (generally through *less* illustrators or body movement), higher vocal pitch, and increased pupil dilation. Given that non-verbal behavior is arguably more difficult to control than verbal behaviors, deception detection techniques that focus on the systematic non-verbal differences between truth-tellers and liars have been, to some degree, effective (Ekman et al. 1991; Frank and Ekman 1997). There is also evidence that composite methods, which rely on combining verbal and non-verbal cues, enhance deception detection rates (Vrij et al. 2000).

A second important factor in the detection of deception is the motivation level of the deceiver to succeed at their lie, although there is some debate about its specific

operation. DePaulo and colleagues (DePaulo and Kirkendol 1989; DePaulo et al. 1988, 1983) have argued that high motivation impairs nonverbal performance during deception, in part by reducing control over leakage cues and increasing behavioral rigidity, but tends to improve verbal performance. However, research has demonstrated that overall, highly motivated deceivers will be detected more accurately than deceivers who have little (or no) motivation to act deceptively. Several studies have provided empirical evidence for this *motivational impairment effect* (DePaulo et al. 1983, 1988; Vrij 2000; Vrij et al. 1996; Zuckerman and Driver 1985). For example, Vrij (2000), describes a study where honest and deceptive accounts of a murderer were carefully examined for differences. One of the conclusions from studying the videotaped police interviews was that non-verbal differences in his truthful and deceptive accounts were influenced by the presumably high motivation to appear not guilty of the offence (see also Davis and Hadiks 1995). Indeed, Depaulo and Morris (2004) provided compelling evidence for the motivational impairment effect in their quantitative review of deception detection studies conducted on 120 samples of participants. Their review revealed that it was typically easier to identify a number of non-verbal differences in highly motivated deceivers (when compared to their less motivated counterparts). For example, highly motivated deceivers spoke in a higher pitch, made less eye-contact, and appeared more inhibited in general (as demonstrated through a reduction in foot and leg movements).

Predictions from interpersonal deception theory (IDT) (Buller and Burgoon 1996; Burgoon et al. 1994; Burgoon and Floyd 2000), however, suggest that moderate levels of motivation may facilitate verbal and nonverbal aspects of deception. According to IDT, deceivers are assumed to be active agents who strategically plan and adapt their interpersonal behavior to maximize credibility and deception success (Burgoon and Floyd 2000). When deceivers are motivated to lie during interactive communication, they may be more likely to self-monitor and engage in strategic behaviors to convince their partner that they are being truthful (e.g., by using more direct and complete messages), which should enhance their credibility.

Although the motivational impairment effect and Interpersonal Deception Theory make somewhat different predictions with regard to the impact of motivation on nonverbal behavior, it is important to note that they are consistent in regard to the effect of motivation on verbal behavior. In particular, both the motivational impairment effect and Interpersonal Deception Theory assume that increased motivation should improve verbal performance during deception. For example, Burgoon and Floyd (2000) employed a methodology similar to the present study and found that, consistent with IDT, when motivation was examined on a continuum (from low to high motivation) and when various operational definitions of motivation were considered, it was possible to facilitate the verbal performance of deceivers. In fact, Burgoon and Floyd (2000) proposed that some types of motivation (such as the goal of succeeding) appeared to also enhance non-verbal deceptive communication, which is not consistent with research supportive of the motivational impairment effect. However, the majority of existing literature from either perspective has been largely theoretical, and restricted mostly to monologues with particularly little empirical investigation into the effects of motivation on deception detection for interactive text-based discussions.

1.2 Communication Medium and Deception Detection

The preceding analysis suggests that both behavioral cues and the motivation of the liar play an important role in deception detection. Previous research, however, has been limited primarily to deception detection in face-to-face (FtF) contexts. What impact might text-based CMC, in which interlocutors interact via text messages, have on our ability to detect deception? For example, previous research has demonstrated that certain types of verbal analysis techniques (such as criteria-based content analysis) can be fairly effective in detecting the differences between liars and truth-tellers (e.g., Vrij 2005). However, these techniques are employed for analyzing statements that are made using static, first-person narratives, rather than on dynamic interactions between individuals in a computer-mediated environment.

In a recent framework proposed by Carlson et al. (2004), a number of factors are assumed to play an important role in deception and its detection in mediated communication settings, including features of the medium (e.g., cue availability, editability, planning time, etc.) and characteristics of the deceiver and receiver (e.g., the motivations of the participants, intrinsic lying abilities, etc.). Perhaps the most obvious impact of text-based communication media is the elimination of nonverbal and vocal cues. Because text-based settings limit interactions to the verbal channel, the visual and audible cues that may be employed in deception detection are not available in CMC. As such, although verbal cues (e.g., the logical structure of a partner's messages) can be assessed in text-based interactions, the nonverbal cues described above, such as vocal properties, facial characteristics, illustrators and other behaviors, are not transmitted. The elimination of nonverbal, vocal and physiological cues in text-based CMC environments should potentially undermine deception detection (Vrij et al. 2000). For example, in a recent study, Burgoon et al. (2003) found that in text-based interactions liars were perceived as more truthful than truth tellers, suggesting that it should be difficult to detect deception in text-based media.

The elimination of nonverbal cues in text-based communication may also have important implications for the operation of motivation in deception detection. As described above, the motivation impairment effect appears to operate primarily through the leaking or involuntary transmission of nonverbal cues, such as rigid posture, less blinking, and less head movements (e.g., DePaulo and Kirkendol 1989; Vrij 2000). Because these types of nonverbal cues are eliminated in text-based settings, any negative effects of motivation during deception should be attenuated in text-based CMC.

The fact that CMC involves primarily the exchange of verbal messages also has implications for motivation effects. Recall that both the motivational impairment effect and the Interpersonal Deception Theory suggest that high levels of motivation actually improve performance in a written context (Burgoon and Floyd 2000; DePaulo and Kirkendol 1989). For example, in one study examining the effect of motivation on verbal and non-verbal deception detection, participants lied orally to a panel of judges, and the lies were videotaped and later transcribed (DePaulo et al. 1983). Results indicated that when judges had access to both verbal and nonverbal (audio and visual) cues in the videotapes, highly motivated deceivers were less successful than unmotivated deceivers (i.e., the motivational impairment effect). However, highly motivated

deceivers were *more* successful than unmotivated deceivers when judges only had access to the verbal content of the transcripts.

Note that in this study lies were produced only orally, but they were judged either orally or in a transcribed format. An important question in the present context is whether the positive effect of motivation on verbal presentation observed by DePaulo et al. (1983) will also be observed in communication settings in which the lie is both judged *and produced* in a text-based format. That is, in the context of modern communication technology, in which many of our everyday interactions are enacted in text-based CMC, such as email and Instant Messaging, will higher levels of motivation improve a liar's ability to deceive successfully when they are producing lies in a text-based medium?

There are several features of text-based CMC settings that suggest that motivation should indeed enhance a deceiver's performance in text-based interactions. For example, while FtF speakers must produce their messages on the fly (i.e., *extemporaneously*), as they are being constructed, text-based CMC speakers construct their utterances *before* transmitting them to the addressee. Similarly, because text-based CMC interactions tend to be less *instantaneous* than FtF interactions (i.e., replies to messages tend to be delayed in text-based CMC relative to FtF), speakers in text-based CMC settings should have additional time to develop deceptive messages (Carlson et al. 2004). Indeed, previous research suggests that text-based CMC interactions tend to last four to five times longer than similar FtF interactions (Hancock and Dunham 2001a; Walther et al. 1994). Because the construction of deceptive messages tends to take more cognitive effort than truthful messages (Zuckerman et al. 1981), the increased time available in text-based CMC settings should be particularly advantageous to the motivated liar engaged in strategic communication processes (Burgoon and Floyd 2000). Ekman (2001), for example, has recently suggested that increased preparation time is one potential advantage for deceptive individuals.

Another potential feature of a text-based CMC setting that may be strategically useful to a motivated liar is the property of *editability*. Text-based CMC settings enable the sender to carefully edit their messages before transmitting them to their partner, which allows speakers greater control over message generation and transmission (Carlson et al. 2004; Dennis and Valacich 1999). It is important to note that even in synchronous text-based CMC communication settings, in which participants interact in real-time (e.g., Internet Relay Chat, Instant Messaging), senders still have the opportunity to edit their messages before transmitting, primarily because there tends to be at least a several seconds between responses (Hancock and Dunham 2001b). Indeed, in text-based CMC exchanges, participants can intentionally select, accentuate and present certain information about themselves to their interaction partners. The ability to selectively present information about oneself in text-based settings has been referred to as *selective self-presentation* (Walther 1996), which should be particularly useful to a deceptive communicator that is sufficiently motivated to take the time to edit their messages.

Considered together, these features (e.g., editability and increased composition time) of the text-based CMC setting suggest that a sufficiently motivated liar should have several advantages over an FtF liar, such as more time and increased control over message production. As such, text-based CMC settings that eliminate non-verbal cues should not only attenuate the motivational impairment effect, they should also

enhance a motivated liar ability to deceive successfully, resulting in a medium-specific *motivational enhancement effect*.

The objective of the present research was to examine the effect of both the communication setting and motivation to lie on deception detection. Participants interacted with an unacquainted partner, and were randomly assigned to a text-based CMC or FtF interaction condition, and to a low or high motivation to lie condition. During their conversation, one of the participants, assigned to the sender role, was instructed to be truthful when discussing some topics and deceptive when discussing others. After the interaction, the other participant, assigned to the receiver role, attempted to detect their partner's deception.

As suggested by the preceding analysis, because text-based CMC settings eliminate nonverbal cues, which should undermine the detection of deception, and because there are several features of the text-based CMC setting that may be advantageous to deceivers, such as more time to construct and edit deceptive messages, deception detection was expected to be less accurate overall in text-based CMC than in FtF settings (Burgoon et al. 2003).

H1 Deception will be detected less accurately in text-based CMC than in FtF interactions

The operation of motivation on deception detection across text-based CMC and FtF interactions was also of interest. Although there is some debate regarding the effect of motivation on deception in FtF contexts (DePaulo and Kirkendol 1989; Burgoon and Floyd 2000), consistent with the motivation impairment effect, we predicted that sufficiently high levels of motivation in FtF interactions should lead to more accurate deception detection. In contrast, in text-based CMC interactions, the negative aspects of motivation (i.e., nonverbal leakage cues) should be attenuated and the positive aspects of motivation (i.e., increased strategic presentation) should facilitate or enhance the liar's ability to deceive. As such, an interaction between motivation and medium was expected, in which motivation should impair deception performance in the FtF condition, but enhance performance in the text-based CMC condition.

H2 Motivation should increase deception detection accuracy in the FtF condition, but should decrease deception detection accuracy in the text-based CMC condition.

We were also interested in how the communication medium might affect one of the fundamental problems humans face when attempting to detect deception, the *truth bias*, which refers to the fact that people tend to be hesitant in attributing deception to others (Levine et al. 1999; Vrij 2000). Because language use assumes that language partners are cooperative and truthful (Grice 1989), we tend to be predisposed to assume that our partner is telling the truth. Several recent studies examining trust in mediated communication, however, suggest that trust tends to be lower and take longer to develop in text-based interactions, presumably because text-based CMC increases the sense of social distance between communicators (Bos et al. 2002). As such, we pose the following research question:

RQ Will the truth bias be reduced in text-based CMC relative to FtF interactions?

2 Method

2.1 Participants

Participants (N=148) were upper-level students at a northeastern American university, and they participated for course credit. Participants were randomly paired to form 74 same-sex, unacquainted dyads. They were recruited for a "study of how unacquainted men and women interact on various conversation topics in CMC and FtF environments." One dyad (two participants) was discarded due to problems with the materials, and three dyads (six participants) were excluded because the participants failed to follow instructions.

2.2 Procedure

Upon reporting to the laboratory, participants were led separately to remote rooms where they completed an initial set of forms, including informed consent form, and a questionnaire assessing their computer experience and familiarity with computer-mediated communication.

The general procedure was adapted from Burgoon et al. (2001). Two participants were asked to discuss several topics with each other, and one participant was asked to lie on two topics and tell the truth on two topics. In particular, all participants were told that they would be having a conversation with an unknown partner. They were instructed that they would discuss five topics, which were then provided to the participants on a set of cards. The first topic was always "When I am in a large group, I…" This initial topic was designed to allow the participants to become comfortable interacting with their partner, and was not included in any analyses. After this topic, participants began a discussion of the four experimental topics: "Discuss the most significant person in your life", "Talk about a mistake you made recently", "Describe the most unpleasant job you have ever had to do" and "Talk about responsibility." There was no time limit and participants were asked to discuss each topic until they had exhausted it and understood each other's responses.

One of the two participants was randomly assigned to the role of sender, and the other to the role of receiver. Senders were asked to deceive their partner. In particular, they were instructed "to NOT tell 'the truth, the whole truth, and nothing but the truth"' (Burgoon et al. 2001) on two topics, and to be truthful on the other two topics. Examples of lies were given to the senders, and it was emphasized that the sender should try to produce large magnitude lies (e.g., saying that they went on a vacation when in fact they did not) rather than small, white lies (e.g., saying that they wore a blue sweater yesterday when in fact they wore a red one). Senders had approximately 5 min to plan their stories. Receivers were blind to the deception manipulation.

The sequence in which the topics were discussed, and the order in which the sender lied, was counterbalanced across 16 orders. Senders were instructed to lie on either the first two topics or on the last two topics. Half of the senders followed a truth-first, deception-second order. The remainder followed a reverse order. Because topics

followed a diagram-balanced Latin square order within truth and within deception, all topics appeared within a given time period. No statistical effects of topic were observed, and it was therefore excluded from the analysis reported below.

Participants were randomly assigned to either FtF or CMC conditions. Participants in the FtF condition discussed their topics in an interaction room where they sat at a table across from each other. The interaction room adjoined an observation room that had a one-way mirror, which allowed unobtrusive videotaping of the conversation. The FtF participants were aware that they were being videotaped, and provided their consent to do so.

In the CMC condition, participants performed the task at isolated computer terminals and did not meet until the debriefing. Participants used one of two desktop computer stations while the experimenter monitored and recorded the interaction from a third station. Once participants were seated at their terminals, the experimenter briefly demonstrated the use of the computer interface (Microsoft Netmeeting), in which participants typed their message in a private composition window and hit enter to send their message to a shared window. Note that participants could edit their message before transmitting it to their partner.

Once participants finished the discussion task, they were asked to complete a series of questionnaires based on their conversation. FtF participants returned to their original, separate rooms were they were provided with a videotape copy of their interactions. Participants assigned to the sender role were instructed to review their discussion on each topic and to rate their level of truthfulness for each of the four topics. Specifically, the sender was asked to describe, on a scale of 0–10, their truthfulness during the discussion of that particular topic, with 0 representing 'not at all truthful,' 5 representing the midpoint, and 10 representing 'completely truthful.'

Receivers were instructed to review each topic and rate their perception *of their partner's* truthfulness on each of the four topics. Specifically, the receiver was asked to describe, on a scale of 0–10, their perception of their partner's truthfulness during the discussion of that particular topic, with 0 representing 'not at all truthful,' 5 representing the midpoint, and 10 representing 'completely truthful.' Before answering the questionnaires, receivers were informed that their conversation partner "may have lied to them on some or none of the conversation topics." Both senders and receivers were permitted to rewind the videotape and examine it for as long as they wished.

Participants in the CMC condition remained at their computer station to complete the questionnaires, and were given transcripts, with timestamps for each utterance, of their conversation rather than videotapes. The sender and receiver received the same instructions for completing the questionnaires as their counterparts in the FtF condition. The sender and the receiver were able to review the transcript for as long as they deemed necessary.

2.3 Motivation Manipulation

Senders were also randomly assigned to one of two motivation conditions: 'low motivation to lie' or 'high motivation to lie'. The motivation manipulation was based on previous research procedures used to manipulate motivational levels of liars (e.g.,

DePaulo et al. 1983; Forrest and Feldman 2000). In the case of high motivation manipulation, senders were falsely informed "that they had to make sure that they were able to convince their partner on the topics that they were lying about, as it was a very important skill to be able to deceive others in daily interactions." They were also told that "research clearly shows that the ability to lie to others successfully is a good predictor of their future success in social settings, various jobs like consulting and counseling and for the maintenance of friendships, and that it was therefore important that they could make their partner believe their lies." In the low motivation condition, senders were simply informed to lie on the topics given to them. Only senders received the motivation manipulation; receivers were blind to the motivation manipulation.

As part of the post-interaction questionnaires that the sender completed, one of the Likert-scale items was used in assessing the effectiveness of the motivation manipulation, *"It was important for me to deceive my partner"* (1 = not at all, 7 = very important).

2.4 Debriefing

After completing the post-interaction questionnaires, each member of the dyad was brought to a common room, and introduced to his or her partner and they were fully debriefed. The debriefing included a discussion of the background and general rationale for the project, and senders in the high motivation condition were informed that in fact no relationship between lying ability and future success has actually been documented. The total duration of the procedure was approximately 1 h.

2.5 Deception Detection Measure

Our primary question of interest was how communication settings and motivation affected deception detection accuracy. As noted above, we calculated deception detection accuracy following Burgoon et al. (2001), in which the absolute difference is calculated between the sender's rating of their truthfulness (on a scale from 0, completely untruthful, to 10, completely truthful) and the receiver's rating of the sender's truthfulness (on the same scale). Lower scores of absolute difference accuracy represent more accurate detection. For example, a score of zero on a given topic indicates that the receiver had accurately detected the truthfulness of the sender's messages for that topic, while a score of ten indicates that the receiver was completely inaccurate in their perception of the sender's truthfulness.

3 Results

3.1 Motivation Manipulation Check

We conducted two manipulation checks to ensure that the senders followed instructions. First, we examined whether senders were truthful during discussion in which they were instructed to be truthful and deceptive when they were instructed to not be truthful. A comparison of the sender's self-report of deception revealed that senders

were substantially less truthful during deceptive discussions ($M = 1.78$, SE = .21) than during truthful discussions ($M = 9.37$, SE = .14), $F(1, 66) = 1017.38$, $p < .001$, $\eta^2 = .94$.

Second, we examined the effectiveness of the motivation manipulation (DePaulo et al. 1983; Forrest and Feldman 2000). An analysis of the responses to the question "*How important was it for you to deceive your partner?*" revealed a main effect of motivation, $F(1, 65) = 5.73$, $p < .05$, $\eta^2 = .08$. Deceiving their partner was more important for motivated senders ($M = 5.22$, SE = .29, 1 = not at all important, 7 = very important) than for unmotivated senders ($M = 4.24$, SE = .29), suggesting that the motivation manipulation was effective. No other effects were observed, indicating that the motivation manipulation was equally effective across the two communication conditions.

3.2 Deception Detection Analyses

A 2 (discussion type: truth versus lie) × 2 (setting: CMC versus FtF) × 2 (motivation level: low versus high) mixed general linear model (GLM), with discussion type entered as the repeated measure, and setting and motivation entered as between-subject factors, revealed several effects on detection accuracy. First, the analysis revealed a main effect of discussion type, $F(1, 66) = 64.06$, $p < .001$, $\eta^2 = .49$. Receivers were substantially more accurate at detecting truthful discussions ($M = 2.21$, SE = .23) than deceptive discussions ($M = 5.33$, SE = .26).

Although participants were somewhat more accurate in the FtF condition ($M = 3.93$, SE = .20) than in the CMC condition ($M = 3.62$, SE = .20), contrary to hypothesis 1, this difference was not significant, $F(1, 66) = 1.16$, *n.s*. The main effect of motivation was also not significant, $F(1, 66) = 2.10$, *n.s*. Overall, motivated ($M = 3.98$, SE = .21) and unmotivated senders ($M = 3.57$, SE = .20) were detected with the same levels of accuracy.

An interaction between the setting and motivation factors, however, was observed, $F(1, 66) = 5.21$, $p < .05$, $\eta^2 = .07$. As can be seen in Fig. 1, although the direction of the difference between the means is consistent with the motivational impairment effect predicted in the FtF condition, receivers were not significantly more accurate at detecting motivated senders than unmotivated senders, $t(33) = .62$, *n.s*. In contrast, in the CMC condition, receivers detected the truthfulness of motivated senders *less* accurately than unmotivated senders, as predicted, and this effect was reliable, $t(33) = -2.86$, $p < .05$.

Our second question of interest was whether the communication medium affected the receivers' truth bias. To address this question, we examined the receiver's Likert-scale responses regarding their partner's truthfulness. An examination of the receiver's Likert-scale responses also revealed an overall truth bias. Overall, receiver's rated their partner's truthfulness at 7.29 (SE = .20), which was significantly above the midpoint of the scale, $t(69) = 11.65$, $p < .001$, suggesting an overall truth bias. A comparison of the receiver's responses across the FtF ($M = 7.19$, SE = .28) and CMC ($M = 7.38$, SE = .28) conditions was not reliable, $F(1, 66) < 1$, *n.s*., suggesting that the truth bias was not reduced in the text-based interactions.

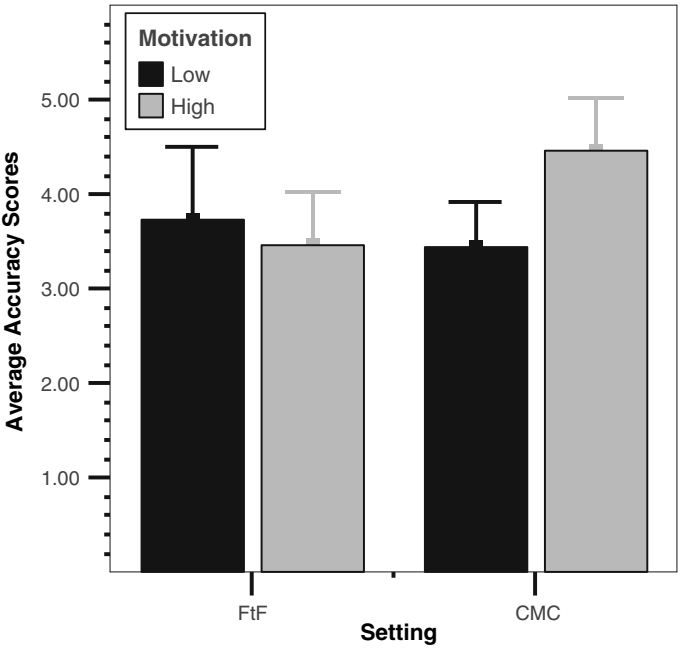

Fig. 1 Average accuracy scores between sender and receiver ratings as a function of communication setting and motivation

Despite this truth bias, receivers rated their partners less truthful when they were lying ($M = 6.86$, SE = .24) than when they were telling the truth ($M = 7.72$, SE = .24), $F(1, 66) = 10.36$, $p < .01$, $\eta^2 = 14$. This observation suggests that, although receivers continued to rate their partner as truthful (i.e., above the midpoint of the scale) regardless of whether they were lying or not, receivers were somewhat sensitive to the truthfulness of their partner.

A final analysis examined whether or not the order in which senders told the truth or deceived their partner affected deception detection accuracy. Previous research (e.g., Burgoon et al. 1999; Burgoon and Floyd 2000) using counterbalanced approaches similar to the present design have observed that senders that tell the truth first then deceive are more successful in their deceptions than senders that deceive first then tell the truth. Although truth-first senders were slightly more successful ($M = 3.99$, SE = .19) than deception-first senders ($M = 3.57$, SE = .19) this difference did not achieve significance, $F(1, 62) = 2.24$, $p = .14$. Furthermore, truth-order did not significantly interact with any of the other factors.

4 Discussion

The objective of the present research was to examine the detection of deception in interpersonal conversations that took place in FtF and text-based CMC communication settings. The first question of interest was whether deception detection accuracy

would be decreased in a text-based communicative environment, in which cues that may facilitate deception detection, such as nonverbal (foot or leg movement and eye contact) and vocal cues (DePaulo et al. 2003), are eliminated. Given this reduction of cues, we expected that participants in the text-based CMC environment should find it particularly difficult to distinguish between truthful and deceitful messages. Contrary to Hypothesis 1, however, deception detection was no less accurate in the text-based CMC condition on average than in the FtF condition. The elimination of nonverbal cues in the text-based CMC setting was not sufficient in the present study to reduce deception detection below levels observed in the more signal-rich FtF communication environment.

Although there is considerable evidence in support of a motivational impairment effect for deceivers in FTF contexts, some researchers have suggested that the verbal aspects of deception are improved in high-stakes lies (e.g., Burgoon and Floyd 2000; DePaulo et al. 1983). Given that text-based CMC messages are limited to verbal exchanges, and given that a motivated liar may take advantage of the editability and increased time available for planning messages in text-based CMC, we predicted that a motivational *enhancement* effect should be observed in the text-based CMC condition, and the motivational impairment effect should be observed in the FtF condition.

A reliable interaction between medium and motivation was observed. In the FtF condition, levels of deception detection accuracy across levels of motivation were not significantly different, although the direction of the difference was consistent with the motivational impairment effect (i.e., accuracy was slightly higher for motivated senders relative to unmotivated senders). In contrast, in the text-based CMC condition, deception detection was significantly less accurate when the sender was highly motivated than when the sender was unmotivated, as predicted by Hypothesis 2. Indeed, a comparison across the four conditions in the study reveals that the highly motivated text-based CMC senders were the *most* successful in their ability to deceive their partner.

This pattern of results is consistent with DePaulo et al. (1983), in which motivated deceivers were more successful than their unmotivated deceivers when only the verbatim transcripts of their orally produced lies were available for evaluation. The present study extends this earlier finding to lies that are both *produced and assessed* in textual format. This update to DePaulo et al. (1983) original observation is especially important given the increasing frequency with which people produce text-based messages as a part of their everyday communication, such as email and instant messaging.

Why were highly motivated text-based CMC senders more successful than any other type of sender in deceiving their partner? As noted above, the CMC environment may offer motivated liars several advantages. First, because the text-based CMC setting does not transmit nonverbal and vocal behavior, the motivated text-based CMC sender should not be susceptible to the motivational impairment effect observed in FtF contexts. Second, text-based CMC senders have enhanced control over the production of their messages relative to FtF senders. In particular, the CMC communicative environment allows senders to (1) take more time to construct their messages (Hancock and Dunham 2001a), (2) edit their messages before transmitting them to their partner (Hancock and Dunham 2001b), and (3) engage in selective self-presentation (Walther 1996). Each of these factors should improve a deceiver's ability to deceive their partner.

The fact that highly motivated senders were significantly more successful at deception than unmotivated senders in text-based CMC, however, suggests that participants must be sufficiently motivated to take advantage of these various features. Further, as suggested by DePaulo et al. (1983), it may be that deceivers (and individuals in general) find it much easier to control and construct their verbal presentation, compared to the non-verbal aspects of their presentation.

These data provide some support for Burgoon and colleagues' (Buller and Burgoon 1996; Burgoon et al. 2003) contention that motivation is not necessarily a negative factor in deception, but that under some circumstances higher levels of motivation may actually improve deception success. As suggested by the present research, motivated senders may be more likely to engage in strategic communication behaviors that maximize credibility and deception success (Buller and Burgoon 1996).

However, one important limitation of the current study is the relatively weak motivation manipulation. For example, as Frank and Ekman (1997) point out, "high stakes" deception (i.e., that also include the potential for punishment or negative consequences), rather than simply being told that it is important to be able to deceive one's partner, is critical for drawing out the effects of motivation on deception. Future studies would benefit from ensuring that a particularly salient motivation manipulation has been employed. It is also worth contemplating if the effects of motivation are perhaps not as pronounced (or somehow different) within an interactive conversational setting, rather than the type of "monologue" or continuous uninterrupted self-report that is most commonly viewed by participants in research studies (e.g., Vrij 2000). Indeed, a recent paper by Dunbar et al. (2003) found that interactive deception does in fact differ in important ways from non-interactive deception. It would therefore also be useful to employ a methodology where both the senders and receivers are highly motivated in their task. Granhag and Stromwall (2004) recently contended that one of the crucial elements of successfully detecting deceit is that the receivers of deceptive information must be highly motivated to accurately determine the truth.

A second question of interest was whether the truth bias, which reflects the fact that people tend to be unwilling to judge others as deceptive (Levine et al. 1999; Vrij 2000), was affected by the communication medium. Consistent with previous research, the receivers in our study demonstrated a strong truth bias, and, on average, tended to always rate their partners above the midpoint on the truthfulness scale. The fact that this truth bias was not affected by communication medium is surprising given recent research suggesting that trust tends to develop more slowly and fragilely in text-based interactions (Bos et al. 2002). One possible explanation for this result is that by discussing personal information in their conversations the participants were able to establish trust in the text-based interactions. Zheng et al. (2002), for example, observed that participants that were able to exchange social or personal information before playing a prisoner's dilemma game via text-based CMC tended to trust their partners as much as participants that played the game FtF. The fact that participants in the present study discussed highly personal topics (e.g., most significant person, biggest mistake, etc.) may have been sufficient to establish trust and explain why the truth bias was not diminished in the CMC condition.

Although participants revealed an overall truth bias, they did appear to be somewhat sensitive to deception. In particular, on average, receivers rated their partner's truth-

fulness 6.85, on a scale of 0–10 (0, completely untruthful, to 10, completely truthful), when they were being deceived and 7.72 when they were being told the truth. The fact that differences in the receivers perception of truthfulness across deceptive and truthful messages were observed despite this truth bias suggests that this type of procedure, in which a participant's perception of deception and truthfulness is measured along a continuum, may be a more informative approach to examining deception detection accuracy than simply examining dichotomous responses of deception versus truth (see also, DePaulo and Rosenthal 1979). In fact, a number of recent studies have found that when participants judge messages on scaled measures (i.e., Likert-scale), such as their degree of confidence in whether someone is lying or not, their ratings tend to be more accurate at distinguishing lies from truths than when they judge messages dichotomously, such as percent accuracy (e.g., Anderson et al. 2002, 1999; Burgoon et al. 2003; DePaulo et al. 1997; DePaulo and Rosenthal 1979). For instance, if our participants, who on average rated deceptive communications above the mid-point of our scale, were forced to identify their partner only as either deceptive or truthful, they would have usually identified their partner as truthful despite being sensitive to deception.

Despite this potential drawback of the dichotomous (truthful versus not truthful) approach, an important advantage of dichotomous ratings is that it allows us to easily determine whether detection rates are different from chance (i.e., 50%). In addition, the dichotomous percent accuracy approach is the most typically reported statistic for deception detection accuracy. As such, we recoded the receiver's scaled responses into a dichotomous measure, with responses above the midpoint considered a judgment of truthfulness and below the midpoint as a judgment of deceptiveness. Using this measure, the overall accuracy for the sample was 51.4%, which is not reliably different from chance, $t(69) = .68$, *n.s.* When the analysis described above was applied to the percent accuracy measures, the same pattern of results was observed as those obtained with the scaled responses. In particular, as can be seen in Table 1, no effect on percent accuracy was observed for communication medium or motivation, but the interaction between medium and motivation was significant, with participants in the high motivation CMC condition the least accurately classified.

In summary, regardless of whether deception detection accuracy is operationalized as the difference between sender and receiver judgments of truthfulness or as a dichotomous percentage accuracy, the most difficult liar to catch is one who is highly motivated and communicating in a text-based medium. As more and more people com-

Table 1 Means (Standard Errors) of dichotomous percent accuracy scores across communication medium and motivation level

	FtF	CMC	Average
Low	51.5%	55.6%	53.5%
High	58.3	42.6	50.5
Average	54.9	49.1	

Main effect of medium: $F(1, 66) = 1.97$, *ns*; Main effect of motivation: $F(1, 66) < 1$; Medium × motivation effect: $F(1, 66) = 5.71$, $p < .05$

municate in online environments, this observation will have an increasing number of important implications for social, business and even criminal electronic communications. For example, the Federal Bureau of Investigation recently indicated that there are a growing number of individuals/consumers that were falling prey to deceptive practices and information that they had received through computer mediated contexts such as the internet (Internet Fraud Complaint Center 2003). Further, for a number of years investigators have warned of the increasing number of generally highly motivated sexual offenders (particularly pedophiles) who have been using various on-line communication forums to lure potential victims (Mitchell et al. 2001). Considering the substantial amount of trust that many individuals invest in the Internet, we believe it is essential that additional research examine deception in the context of mediated communication.

One important limitation of the present work is the focus on the impact of the verbal components of the text-based environment on deception detection, and how the properties of editability and planning may have interacted with motivation levels to affect detection. Future research will examine the transcripts of the FtF conversations in an effort to explicate how motivation affects the verbal components of deception in communication that includes both verbal and non-verbal channels. Indeed, a growing number of articles have proposed that the verbal and nonverbal communication channels must be considered together and that valuable information is potentially lost when the two are separated (e.g., Burgoon et al. 2002; Jones and LeBaron 2002).

Although additional research will be required to determine how exactly motivated text-based CMC senders engaged in strategic communication to deceive their partner, the present research advances our understanding of how communication media and levels of motivation affect our ability to detect deception. First, medium alone does not appear to affect deception detection accuracy. Instead, our data suggest that the medium may interact with the motivation level of the sender such that motivated liars in text-based CMC environments will be relatively more successful in their deceptions. As noted above, these data have important implications for interpersonal deception detection as text-based forms of communication, such as instant messaging, become increasingly ubiquitous, but they also have theoretical implications. In particular, theoretical perspectives regarding deception detection need to consider both the medium in which the communication occurs as well as the motivation of the liar.

References

Anderson DE, DePaulo BM, Ansfield ME, Tickle JJ, Green E (1999) Beliefs about cues to deception: mindless stereotypes or untapped wisdom. J Nonverbal Behav 23:67–89. doi:10.1023/A:1021387326192

Anderson DE, DePaulo BM, Ansfield ME (2002) The development of deception detection skill: a longitudinal study of same sex friends. Pers Soc Psychol Bull 28:536–545. doi:10.1177/0146167202287010

Bos N, Olson J, Gergle D, Olson G, Wright Z (2002) Effect of four computer-mediated communications channels on trust development. In: Proceedings of CHI 2002, pp 135–140

Buller DB, Burgoon JK (1996) Interpersonal deception theory. Commun Theory 3:203–242. doi:10.1111/j.1468-2885.1996.tb00127.x

Burgoon JK, Floyd K (2000) Testing the motivational impairment effect during deceptive and truthful interactions. West J Commun 64:243–267

Burgoon JK, Buller DB, Guerrero LK, Feldman CM (1994) Interpersonal deception: VI. Viewing deception success from deceiver and observer perspectives: effects of preinteractional and interactional factors. Commun Stud 45:263–280

Burgoon JK, Buller DB, White CH, Afifi W, Buslig ALS (1999) The role of conversational involvement in deceptive interpersonal interactions. Pers Soc Psychol Bull 25:669–686. doi:10.1177/0146167299025006003

Burgoon JK, Buller DB, Floyd K (2001) Does participation affect deception success? A test of the interactivity principle. Hum Commun Res 27:503–534

Burgoon JK, Bonito JA, Ramirez A, Dunbar NE, Kam K, Fischer J (2002) Testing the interactivity principle: effects of mediation, propinquity, and verbal and nonverbal modalities in interpersonal interaction. J Commun 52(3):657–677. doi:10.1111/j.1460-2466.2002.tb02567.x

Burgoon JK, Stoner GM, Bonito JA, Dunbar NE (2003) Trust and deception in mediated communication. Proceedings of the 36th Hawaii International Conference on Systems Sciences, USA

Carlson JR, George JF, Burgoon JK, Adkins M, White C (2004) Deception in computer-mediated communication. Group Decis Negot 13: 5–28. doi:10.1023/B:GRUP.0000011942.31158.d8

Davis M, Hadiks D (1995) Demeanor and credibility. Semiotica 106:5–54

Dennis A, Valacich JS (1999) Rethinking media richness: towards a theory of media synchronicity. Proceedings of the 32nd Hawaii International Conference on Systems Sciences, USA

DePaulo BM, Kirkendol SE (1989) The motivational impairment effect in the communication of deception. In: Yuille JC (ed) Credibility assessment. Kluwer, Dordrecht pp 51–70

Depaulo BM, Morris WL (2004) Discerning lies from truths: behavioural cues to deception and the indirect pathway of intuition. In: Granhag PA, Stromwall LA (eds) The Detection of deception in forensic contexts. Cambridge University Press, United Kingdom pp 15–40

DePaulo BM, Rosenthal R (1979) Telling lies. J Pers Soc Psychol 37:1713–1722. doi:10.1037/0022-3514.37.10.1713

DePaulo BM, Lanier K, Davis T (1983) Detecting the deceit of the motivated Liar. J Pers Soc Psychol 45:1096–1103. doi:10.1037/0022-3514.45.5.1096

DePaulo BM, Kirkendol SE, Tang J, O'Brien TP (1988) The motivational impairment effect in the communication of deception: replications and extensions. J Nonverbal Behav 12:177–202. doi:10.1007/BF00987487

DePaulo BM, Charlton K, Cooper H, Lindsay JJ, Muhlenbruck L (1997) The accuracy-confidence correlation in the detection of deception. Pers Soc Psychol Rev 1: 346–357. doi:10.1207/s15327957pspr0104_5

DePaulo BM, Lindsay JJ, Malone BE, Muhlenbruck L, Charlton K, Cooper H (2003) Cues to deception. Psychol Bull 129:74–118. doi:10.1037/0033-2909.129.1.74

Dunbar NE, Ramirez A, Burgoon JK (2003) The effects of participation on the ability to judge deceit. Commun Rep 16:23–33

Ekman P (2001) Telling lies: clues to deceit in the marketplace, politics, and marriage. Norton, New York

Ekman P, Friesen WV (1969) Nonverbal leakage and clues to deception. Psychiatry 32:88–106

Ekman P, O'Sullivan M, Friesen WV, Scherer KR (1991) Face, voice, and body in detecting deceit. J Nonverbal Behav 15:125–135. doi:10.1007/BF00998267

Forrest JA, Feldman RS (2000) Detecting deception and judge's involvement: lower task involvement leads to better lie detection. Pers Soc Psychol Bull 26:118–125. doi:10.1177/0146167200261011

Frank MG, Ekman P (1997) The ability to detect deceit generalizes across different types of high stakes lies. J Pers Soc Psychol 72:1429–1439. doi:10.1037/0022-3514.72.6.1429

Granhag PA, Stromwall LA (2004) Research on deception detection: intersections and future challenges. In: Granhag PA, Stromwall LA (eds) The detection of deception in forensic contexts. Cambridge University Press, United Kingdom pp 15–40

Grice HP (1989) Studies in the way of words. Harvard University Press, Cambridge

Hancock JT, Dunham PJ (2001) Impression formation in computer-mediated communication revisited: an analysis of the breadth and intensity of impressions. Commun Res 28:325–347. doi:10.1177/009365001028003004

Hancock JT, Dunham PJ (2001) Language use in computer-mediated communication: the role of coordination devices. Discourse Process 31:91–110. doi:10.1207/S15326950dp3101_4

Hancock JT, Thom-Santelli J, Ritchie T (2004) Deception and design: the impact of communication technologies on lying behavior. Proceedings, Conference on Computer Human Interaction, vol 6. ACM, New York, pp 130–136

Internet Fraud Complaint Center (2003) IFCC 2002 internet fraud report. Retrieved March 17, 2004, from http://www.ifccfbi.gov/strategy/2002_IFCCReport.pdf
Jones SE, LeBaron CD (2002) Research on the relationship between verbal and nonverbal communication: emerging integrations. J Commun 52:499–521. doi:10.1111/j.1460-2466.2002.tb02559.x
Levine TR, Park HS, McCornack SA (1999) Accuracy in detecting truths and lies: documenting the "veracity effect". Commun Monogr 66:663–675
Mitchell KJ, Finkelhor D, Wolak J (2001) Risk factors & impact of online solicitation of youth. JAMA 285:3011–3014. doi:10.1001/jama.285.23.3011
Porter S, Woodworth M, Birt A (2000) Truth, lies and videotape: an investigation of the ability of Federal parole officers to detect deception. Law Hum Behav 24:643–658. doi:10.1023/A:1005500219657
Vrij A (2000) Detecting lies and deceit. Wiley, Chichester
Vrij A (2004) Guidelines to catch a liar. In: Granhag P, Stromwall LA (eds) The detection of deception in forensic contexts. Cambridge University Press, United Kingdom pp 287–314
Vrij A (2005) Criteria-based content analysis: a qualitative review of the first 37 studies. Psychol Public Policy Law 11:3–41. doi:10.1037/1076-8971.11.1.3
Vrij A, Semin GR, Bull R (1996) Insight into behavior displayed during deception. Hum Commun Res 22:544–562. doi:10.1111/j.1468-2958.1996.tb00378.x
Vrij A, Edward K, Roberts KP, Bull R (2000) Detecting deceit via analysis of verbal and nonverbal behavior. J Nonverbal Behav 24:239–264. doi:10.1023/A:1006610329284
Walther JB (1996) Computer-mediated communication: impersonal, interpersonal and hyperpersonal interaction. Commun Res 28:105–134. doi:10.1177/009365001028001004
Walther JB, Anderson JF, Park D (1994) Interpersonal effects in computer-mediated interaction: a meta-analysis of social and anti-social communication. Commun Res 21:460–487. doi:10.1177/009365094021004002
Zheng J, Veinott E, Bos N, Olson J, Olson G (2002) Trust without touch: jumpstarting long-distance trust with initial social activities. In: Proceedings, Conference on Computer-Human Interaction, vol 4, pp 141–146
Zuckerman M, Driver RE (1985) Telling lies: verbal and nonverbal correlates of deception. In: Siegman AW, Feldstein S (eds) Multichannel integrations of nonverbal behavior. Erlbaum, Hillsdale
Zuckerman M, DePaulo BM, Rosenthal R (1981) Verbal and nonverbal communication of deception. In: Berkowitz L (ed) Advances in experimental social psychology. Academic Press, New York pp 2–59