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THE EFFECTS OF COMPUTER-MEDIATION, TRAINING, AND WARNING ON FALSE ALARMS IN AN INTERVIEW SETTING

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ABSTRACT

Deception in applicant résumés is a major business problem. With the rapid growth of Internet job websites and computer-mediated communication, organizations are more at risk than ever before. Researchers have tried to improve individuals' deception detection accuracy to minimize the impact of deception, including warning individuals about deception and training individuals to detect deception. However, evidence was found that trained and warned individuals might make more incorrect judgments about true information, which are known as false alarms. Further, few previous studies focused on the computer-mediated settings that are now a central part of business communication. After conducting an experiment to understand these and other causes of false alarms in computer-mediated interview settings, we found that individuals performing interviews over an audio-based communication channel incorrectly judged interviewees as being deceptive more often than did individuals performing interviews via e-mail. We found that while the number of lies detected was low for both types of communication, individuals communicating over an audio-based channel had more false alarms. We also found that the combination of in-advance training and a just-in-time warning did not affect receivers' judgments about deception in our computer-mediated interview setting.

KEYWORDS: deception, computer-mediated communication, interviews

I. INTRODUCTION

Understanding deception is important because lying is a daily activity [Vrij, 2000]. Unfortunately, researchers have found that individuals are generally good at lying and bad at detecting lies. Individuals' average deception detection rate is only 35% [Levine et al., 1999]. These results are particularly important to businesses, where individuals can use deception to further personal goals that differ from the goals of the organization. One business setting that is particularly vulnerable to deception is the job applicant interview setting. Previous research identified a problem with applicant résumé faking [George et al., 2004]. Challenger [1997] reported that over a third of applicants lie on their résumés.

One of the major influences on individuals' ability to detect résumé faking is the computer-mediated communication (CMC) that is now part of many business processes. Electronic mail and instant messaging technologies are a daily part of organizational communication. A development that furthered the use of computer-mediated communication is the growth of online job websites where individuals post their résumés. When employers view applicant résumés online, they can e-mail applicants to verify their information and filter out bad candidates. This procedure can lead to a stream of questions and answers where employers and applicants exchange a substantial amount of information through a computer-mediated channel. Unfortunately, computer-mediated communication filters many cues to deception, leaving these individuals with limited cues to deception, and potentially making it easier for applicants to deceive. Past deception research has largely ignored computer-mediated communication, and so there is an incomplete understanding of how individuals deceive and detection deception in these settings.

Researchers have attempted to identify ways to improve individuals' deception detection accuracy. These efforts include warning individuals about deception and training individuals to detect deception [Biros et al., 2002; DePaulo et al., 2003; Miller and Stiff, 1993]. However, trained and warned individuals make more incorrect judgments about true information, which are known as false alarms [Biros et al., 2002]. The use of computer-mediated communication may also affect these tendencies because many cues to deception do not transmit in computer-mediated communication [Daft and Lengel, 1986]. These influences are important, because if an individual's number of false alarms is greater than their number of correct deception judgments, the individual's reputation and task performance could be at risk. It is therefore important for organizations and individuals to recognize where false alarms are more likely to occur so that they know where to scrutinize judgments about deception.

In the rest of this paper, we review the literature in relation to deception, deception detection (including false alarms), and computer-mediated communication (Section II). We then present several hypotheses about false alarms (Section III) and our research design (Section IV). We conclude with a discussion of our analysis and the implications of this study.

II. LITERATURE REVIEW

Deception is a message purposely transmitted to foster a false belief or conclusion in a receiver [Buller and Burgoon, 1996]. Deception does not happen by accident. Communicators must intend to foster a false belief or conclusion in receivers in order to be deceivers. Individuals lie and attempt to detect lies daily, highlighting the importance of deception research [Vrij, 2000]. Lies range from outright lies, where information is fabricated, to subtle lies, where the truth is told in a misleading way. Unfortunately, people are generally good at lying and bad at detecting lies. Researchers found that individuals' typical deception detection rate is only 35% [Levine et al., 1999].

Interpersonal deception theory [Buller and Burgoon, 1996] is one view of how the deception and deception detection process works. It depicts deception as part of an ongoing process between a sender and receiver. Deceptive individuals are often unable to maintain normal behavior and leak cues that reveal their deceptive intentions [Ekman, 1992]. This situation generally occurs when deceptive individuals fear deception detection or when they divert cognitive energy away from their effort to behave normally [Miller and Stiff, 1993]. Because deception is a cognitively intense process, any other activity that diverts cognitive energy away from or disrupts the cognitive process can cause a leakage of cues to deception. Cues to deception include visual cues (pupil dilation, pressed lips, self-grooming, fidgeting, and scratching), paralanguage or vocal effect cues (a short response length between messages, speech errors, hesitations, and a higher pitch of voice), verbal cues (negative statements, irrelevant information, and generalized statements), and speech error cues (word/sentence repetition and slips of the tongue) [DePaulo et al., 2003; Zuckerman and Driver, 1985].

Once deceivers leak cues to deception, receivers may become suspicious. If receivers recognize a deceiver's abnormal behavior, they might listen more attentively, ask for clarification on certain issues, or evaluate the truthfulness of information more carefully. If they detect suspicion, deceivers may also adapt their behavior in an attempt to hide more cues to their deception [Buller and Burgoon, 1996].

Also important to the deception detection process is the motivation of the receiver. The receiver needs some motivation to detect deceptive messages. In some cases, the receiver may not want to interpret deceptive messages as being deceptive. In situations where the receiver perceives that detection of deception will produce more loss than gain, the receiver may lack motivation to detect deceptive messages and will be persuaded by the deceiver [Miller et al., 1993]. However, with sufficient motivation a receiver will follow up on suspicions about leaked cues and will have an opportunity to detect deception.

Most of what we know about deception involves dyads communicating in the traditional face-to-face mode. Investigating deception via computer-mediated modes requires an understanding of how different media transmit meaning during communication. Media richness theory [Daft and Lengel, 1986] recognizes that differences exist in feedback, social cues, language variety, and personal focus in different communication channels. These differences reflect the ability of a particular channel to carry equivocal information [Daft and Lengel, 1986].

The variety of cues transmitted across different communication media varies based on the richness of the medium, and so different communication media can lead to varying degrees of cue leakage [Miller et al. 1993]. Concerning the number of communication cues transmitted, face-to-face communication is very rich because it can transmit a high number of cues, and text-based media is very lean because it filters many cues. Most electronic media are less rich than telephone communication, but more rich than written communication [Carlson and Zmud, 1999]. Since many cues to deception are vision and audio based, like gestures and audio pitch [DePaulo et al., 2003], not all communication media allow the transmission of all the cues to deception. For example, communication via telephone, a moderately rich medium, eliminates all of the visual communicative cues such as pupil dilation and self-grooming. Communication via e-mail, a very lean medium, eliminates all of the visual cues as well as the vocal cues such as pitch of voice and speech hesitation.

Another factor concerning the communication medium is social presence. Social presence reflects the social immediacy or intimacy of a communication medium [Short et al., 1976]. The ability to transmit facial expression, posture, and non-verbal cues contributes to the social presence of the medium [Short et al., 1976]. Media that are high in media richness are also high in social presence. Social presence is important because a low level of social presence can influence a communicators' feelings of realness about a communication event. Communicators' feelings of realness about a communication event influence the degree of realistic dialogue in which they engage, and can cause them to pay less attention to a deceiver. If they are not active in realistic dialogue and are not paying attention to a communication partner, individuals will not investigate many of the limited cues that do exist in lower-richness media [Short et al., 1976].

One individual characteristic that is important to the success of deception is social skill. Socially skilled individuals may have an advantage in making more favorable impressions on others (Riggio 1986). Social skill has both emotional and social dimensions (Riggio 1986). The emotional dimensions include emotional expressivity, emotional sensitivity, and emotional control. The social dimensions include social expressivity, social sensitivity, and social control. These dimensions capture how adept individuals are in guiding the direction and content of communication, inspiring others, hiding their emotions, and in reading the emotions of others (Riggio 1986). These skills should lead to deception success since deception is successful when the individual communicating the deceptive messages is perceived as possessing no ulterior motives (Jones 1990).

Underlying most deception detection research is signal detection theory [Davies and Parasuraman, 1981]. Signal detection theory recognizes that several outcomes are possible when individuals strive to detect signals, such as deception, from background noise. The first two possible outcomes are the successful detection of signals or background noise. The other outcomes include false alarms, which are incorrect judgments about background noise, and misses, which are incorrect judgments about signals. Research based on signal detection theory shows that individuals with greater knowledge and experience in a task domain are better equipped to detect a wider set of signals from background noise. However signal detection theory also explains that individuals can become overly sensitized to the possibility of deception and produce an excessive number of false alarms. Since signals such as deception can be ambiguous, individuals must make decisions on how to judge unclear signals. Individuals' expectations of the number of signals present will affect these judgments, and so the expectation of many signals will lead to false alarms [Klein et al., 1997].

Traditional deception research has primarily focused on face to face situations and found that individuals are typically poor at detection deception. A review of deception literature found that on average individuals correctly detected 78% of truthful messages and 35% of lies in previous studies [Levine et al., 1999]. While researchers found low detection rates in previous research, false alarms were not found to be a significant problem. Receivers had more correct identifications about lies than false alarms in previous studies. Unfortunately, there is virtually no research on computer-mediated settings in these reviews, and so the effect of false alarms in settings where cues to deception are limited by the communication medium is still unknown.

Two strategies that researchers use to increase deception detection success are training and warning receivers about deception [Biros et al., 2002; DePaulo et al., 2003; Miller and Stiff, 1993]. Simply warning receivers about the potential for deception can increase receivers' suspicion of deception, decrease the truth bias, and improve detection deception accuracy [McCornack and Levine, 1990]. However, some researchers found that increased suspicion may not increase detection because it leads to false alarms [Burgoon et al., 1994; Miller and Stiff, 1993; Parasuraman, 1984].

If people are trained to be aware of cues for deception, they should be better able to recognize cues and improve their chances of detecting deception. Cues such as higher voice pitch, blinking, and speech hesitations can be taught to receivers before they make deception judgments [DePaulo et al., 2003; deTurck et al., 1985; Ekman et al., 1991; Vrij, 2000; Zuckerman et al., 1984]. If people are not aware of these cues, they may rely on incorrect information about cues to deception [Fiedler et al., 1993]. Training has been shown to lower the truth bias and improve detection rates [Stiff et al., 1992], and some researchers have suggested that giving training right before a task, or just-in-time training, may be more effective than traditional training that contains a time lapse between the training and the task [Biros et al., 2002; Globerson et al., 2001]. However, others have suggested that training be given ahead of time so the subjects can digest the training over a period of time [Frank et al., 2003]. Researchers recently found that just-in-time training and warning increased the number of false alarms, making the benefit of JIT training and warnings questionable [Biros et al., 2002]. While training and warnings appear to help with deception detection, their relationship with false alarms, and whether they should be applied early or late in the process, are not completely clear.

III. HYPOTHESES

We developed two hypotheses based on the literature discussed in Section II to further the understanding of false alarms deception judgments in two largely unexplored communication settings. Our first hypothesis looks at the differences between audio-based computer-mediated communication and text-based CMC. Visual cues, such as those related to body movements, are not transmitted over either type of channel, and audio cues are not available via text-based computer-mediated channels. Without these cues, receivers will be uncertain about the limited cues that lean communication messages do transmit, and uncertainty has been found to lead to

truthful judgments about deceivers [Vrij, 2000]. Therefore, individuals with extremely limited cues on which to base their judgments will be less likely to label deceivers as being deceptive. Also important is the level of realness receivers feel while communicating. This realness is a result of the social presence of the communication medium. Since e-mail is one of the leanest communication channels, individuals will feel a very low level of realness about the communication process when communicating with it. A lack of realness will lead to receivers to make fewer deceptive judgments. Audio-based CMC, while still a lean medium, allows individuals to transmit more communication cues that lead to a higher level of perceived realness about the communication process. This feeling of realness will cause receivers to be more active in the communication process and investigate more cues to deception. This will lead to more deceptive judgments, even though detection will be difficult with the limited number of cues with which they are working. We therefore hypothesize that:

H1: Individuals communicating over an audio-based computer-mediated communication channel will have more false alarms than individuals communicating over a text-based computer-mediated communication channel.

Recent research has found that just-in-time (JIT) training and warning leads to more false alarms and that in-advance training alone does not affect detection [Biros et al., 2002]. The combination of warning and in-advance classroom training has not yet been tested even though individuals in real organizations often receive this type of training. Because it is often not possible to train an individual right before they perform a task, in-advance training is used. The combination of training and a just-in-time warning will heighten the level of suspicion of receivers. According to interpersonal deception theory, suspicious receivers will attempt to identify potential cues to deception [Buller and Burgoon, 1996]. However, since cues to deception are so sparse in computer-mediated communication they will have a greater number of false alarms. We therefore hypothesize that:

H2: Individuals who are trained in advance to detect deception and are warned about potential deception will have more false alarms than individuals who are not trained or warned about deception.

IV. RESEARCH DESIGN

We used a 2x2x2 factorial design for this study, with training (present vs. absent), warning (present vs. absent), and communication medium (audio CMC vs. text CMC) as our independent variables. For training, we gave 50 percent of the receivers in the study classroom training on the reliable cues to deception. For warning, we gave 50 percent of the receivers in the study a verbal warning about deception right before they performed their task. For the text CMC treatment, participants used Microsoft Hotmail, and for the audio treatment, participants communicated via an audio relay using headphones and a microphone. Subjects were randomly assigned to treatments, and there were ten groups per treatment cell, for a total of 80 groups.

V. EXPERIMENTAL PROCEDURE

We conducted an experiment in which we tested 160 undergraduate business students at a large Southeastern university in a simulated interview setting similar to the one used in a previously conducted study [George et al., 2004]. All participants were given class extra credit and $10 as an incentive to participate.

We randomly assigned participants to one of two different computer-based communication media, e-mail (using Hotmail) or an audio relay (a phone conversation using NetMeeting). In addition, we warned half of the interviewers about deception. There were told, “Remember, 40 percent of all applicants have been found to have lied on their applications,” right before the interview started.

One week before their scheduled experimental sessions, participants were required to attend a classroom training session. We trained forty of the students (half of the students that would serve as interviewers during the experimental task) with a short 20-minute video about cues to deception. The training was about deception in general, and did not focus on computer-mediated communication. Subjects completed a pre-test on deception detection and were told that they would be taking another short quiz after watching the video, in order to motivate them to learn from the video. The video covered audio, visual, and textual cues to deception, but it did not include specific information about screening résumés. The training test scores showed that subjects improved their deception detection skills. Subjects had an average pre-test score of 6 out of 15 questions correct and an average post-test score of 11 out of 15 questions correct. We showed the remaining participants (the subjects that would serve as interviewees and the other interviewers) a dummy-video about interviewing so that they would have the same time commitment as the trained participants.

The students showed up for their experimental session the week after they attended the training (or dummy training). We paired each student with another student, but neither knew the other's identity. In the experimental sessions, students reported individually to a suite of interview rooms. We kept the students separated so that interviewers and applicants could not see each other. One student became the interviewer and the other became the interviewee. One student in each dyad arrived at the experiment site 15 minutes before the other. We placed the first student to arrive in the role of the applicant, and the student who arrived second served as the interviewer.

We told the applicants that their department was developing a scholarship for a top student. We then told the applicants that we needed them to fill out a sample application with the goal of making themselves look like top candidates, so that the standards for the scholarship could be set. Students completed the scholarship application using items from their actual résumé that they brought to the session. Although we never said it explicitly, all participants inferred that falsifying their personal information was acceptable to make them appear as top candidates for the scholarship.

After we identified the items they changed from their actual résumé, we informed the applicants that an interviewer was going to question them about their applications, and that they needed to convince the interviewers that the applications were completely legitimate. We told them that they would not see the interviewers and they would only communicate via computer. To protect the applicants' identities, we omitted their names.

We told the later-arriving students they would be acting as interviewers. Each interviewer was told he or she would be interviewing a student who was applying for a top scholarship in his or her department. They knew they were part of a study, but they did not know the scholarship was not real, which increased their motivation to spot lies. We informed Interviewers that the interviews would be occurring over computer-based media. We then transferred the falsified application to the interviewer's computer, and we instructed interviewers to ask the applicants about questions based on the information on the résumé. The interviewers had up to 20 minutes to conduct their interviews.

Following the interview, subjects answered questionnaires to measure their motivation and social skills. We asked interviewers if they felt applicants had lied about their applications and to state what they thought was false. This style of questioning is common in deception research [George and Marett, 2004; George et al., 2004; Marett, 2004], although it should be recognized that it might serve as another warning about deception. We also measured deceiver social skill with thirty items that assessed both verbal and nonverbal social communication skill [Riggio, 1986] and receiver motivation with nine items that assessed the receiver's vigilance, effort, and suspicious beliefs [Burgoon et al., 1994].

VI. RESULTS

To test the hypotheses, we ran a MANOVA with three covariates: the number of lies, receiver motivation, deceiver social skills, and two dependent variables: the number of correct deception judgments and the correct number of false alarms. We controlled for the number of lies because the frequency of lies should increase the suspicion of receivers and the number of judgments they make. We measured the number of correct judgments in order to gauge the importance of false alarms. We gathered data for our dependent variables from an item response on the receiver's questionnaire. We first asked the receiver, "Do you believe that person you interviewed was being dishonest?" We then asked the receiver to write down the specific items about which they thought the applicant was lying. The number of correct judgments and false alarms were then calculated by comparing the statements the receiver indicated they perceived the sender was being dishonest about, with the actual dishonest statements on the sender's other résumé. We used established scales to measure the receiver's motivation [Burgoon et al., 1994] and deceiver's social skills [Riggio, 1986]. Both receiver motivation and deceiver social skills are important influences on the deception process that was previously discussed. Since MANOVA analyses are sensitive to outliers, data that were outside of two standard deviations from the mean for our dependent variables were not included in the analysis. We removed three outliers from the analysis.

Table 1 shows the means, standard deviations, and correlations among the study variables. We first looked at the F-tests for our covariates. The overall F-tests for all of our covariates were significant: the number of lies ($F(2,65) = 4.25$, $p < .019$), receiver motivation ($F(2,65) = 7.57$, $p < .002$), and deceiver social skills ($F(2,65) = 3.98$, $p < .025$). When looking at the individual F-tests, we found that all three covariates were significantly related to the number of false alarms: the number of lies ($F(1,66) = 7.21$, $p < .010$), receiver motivation ($F(1,66) = 1.02$, $p < .001$), and deceiver social skills ($F(1,66) = 7.67$, $p < .008$).

Table 2 shows the false alarms descriptive statistics for each of our hypotheses. The overall F-test (Wilks' Lambda) for the communication medium was significant ($F(2,65) = 4.41$, $p < .017$). The overall F-test for the variables training and warning ($F(2,65) = .24$, $p < .785$) was not significant, so we did not find support for our second hypothesis.

Given that the overall F-test for the communication medium was significant, we were able to look at the individual F-test for false alarms to test our first hypothesis. There was a statistically significant effect for false alarms ($F(1,66) = 5.712$, $p < .021$). Receivers communicating over the audio-based CMC channel had more false alarms (mean = .13, s.d. = .414) than did receivers communicating over the text-based CMC channel (mean = .03, s.d. = 0.160), supporting our first hypothesis.

We also looked at the number of correct judgments between these groups in order to understand our findings regarding the first hypothesis. We found no significant difference in the correct number of lies identified between the individuals using audio-based CMC and the groups using text-based CMC; there was no correlation between the number of false alarms and the number of correct detections. However, the audio-based CMC groups did have more false alarms (.13 average false alarms, s.d. = .414) than correct detections (.08 average correct detections, s.d. = .273), while the text-based CMC groups had fewer false alarms (.03 average false alarms, s.d. = .160) than correct detections (.44 average correct judgments, s.d. 1.209). The average number of lies in the audio sessions was 9.40 (s.d. = 3.433), and the average number of lies in the e-mail session was 8.38 (s.d. = 3.295).

Table 1. Means, Standard Deviations, and Correlations

	M	SD	1	2	3	4	5	6	7
1. Trained	.49	.503							
2. Warned	.48	.503	- .01						
3. Medium	1.51	.503	- .01	.01					
4. Identified Lies	.26	.894	.06	.19	.20				
5. False Alarms	.08	.315	.00	.01	- .02	- .07			
6. Receiver Motivation	16.76	1.728	.36**	.35**	.00	.19	.34**		
7. Deceiver Social Skills	4.28	.944	.03	.04	- .12	- .03	- .23*	- .09	
8. Lies	8.86	3.382	- .17	- .03	- .12	.09	- .26*	.25*	- .43**

N = 77

* *p*<.05, **p<.05 (2-tailed)

Table 2: False Alarms Descriptive Statistics

	Mean	**SD**	**N**
H1 (supported)			
Audio-based CMC	.13	.414	38
Text-based CMC	.03	.160	39
H2 (Not Supported)			
Not trained or warned	.10	.447	20
Trained and warned	.11	.323	18

The statistics in Table 3 about the numbers of lies, correct lie identifications, and missed lies help put the false alarms data in context. Even though deceivers provided an average of eight lies or more in each of the experimental conditions, the number of lie identifications (hits) and false alarms was less than one for each condition. That is, interviewers thought that the large majority of the interviewees' lies were truthful statements.

VII. DISCUSSION

We found support for our first hypothesis. Interviewers who communicated over audio-based CMC generated more false alarms than did interviewers who communicated over e-mail. We hypothesized that the small number of cues and low level of perceived realness associated with communication over an extremely lean medium like e-mail would result in few false alarms, compared to moderate number of cues and higher level of perceived realness associated with a moderately rich medium, like audio. This implies that semi-rich communication media (such as

audio-based CMC) may actually be more detrimental to deception detection than extremely lean communication media (such as text-based CMC), since the number of correct detections of lies is low for both of types of media. Comparable studies in face to face settings have a significantly higher average lie-detection rate (35%) [Levine et al., 1999], which highlights the importance of understanding deception in computer-mediated environments. We also found that individuals communicating with the audio-based CMC had a greater number of false alarms than correctly identified lies. Such a tendency could harm individuals' reputations and have a detrimental impact on their task performance.

Table 3: Lies, hits, and misses per treatment (standard deviations in parentheses)

	Lies	**Hits**	**Lies Missed**
Audio	9.26 (3.47)	0.08 (0.27)	9.18 (3.53)
E-mail	8.46 (3.29)	0.44 (1.21)	8.03 (3.25)
Trained & warned	8.00 (3.84)	0.42 (0.69)	7.58 (3.67)
Not Trained or warned	9.25 (3.64)	0 (0)	9.25 (3.64)

The differences in the number of false alarms across media were not accompanied by differences in the number of correct detections of lies. Both the text-based and the audio-based communication channels likely hindered the detection accuracy of receivers enough that there was no difference in the number of hits. As previously mentioned, the number of hits identified in this study was significantly lower than the average number of hits identified in traditional face-to-face studies. This leads us to believe that more cues to deception (than are available in audio-based communication) are needed in order for receivers to have a significantly higher level of detection accuracy.

We also found that the combination of deception detection training a week before the task was performed and a JIT warning about deception did not affect the number of false alarms. The cue detection skills that individuals acquired from the training were likely overcome by the low richness and social presence of the computer mediated setting. Receivers did not see many of the cues that they were taught in the training, and they did not follow up on suspicions because of the low social presence of the media. These findings show that in-advance training may not change the behavior of receivers in computer-mediated settings, even with a warning about deception right before their interaction with a deceiver.

VIII. LIMITATIONS

Testing students in an artificial interview setting is a limitation of this study. Students took roles as interviewers and interviewees in a situation in which they did not have a stake. However, we did not tell them that the scholarship they were interviewing for was not real, leading them to believe they were trying to set the standards for a future scholarship. Also, the average age and average experience of the student subjects were likely different than those of the average organizational employee. These differences could affect individuals' deception and deception detection tendencies. However, previous studies have found that individuals with experience in deception detection may not do better than inexperienced individuals in deception detection [Burgoon et al., 1994; Ekman et al., 1991], meaning that student subjects might not be different than business employees. Regardless, the differences between student subjects and business

employees are unclear, and they should be recognized when interpreting the findings from this study.

Another potential limitation to this study is the style of questioning we used when measuring deception detection. We asked receivers after the interview if they felt applicants had lied about their applications and to state what they thought was false. Although this style of questioning is used in other deception studies [George and Marett, 2004; George et al., 2004; Marett, 2004], it could cause a receiver to make more deceptive judgments since the question highlights the possibility of deception. There was likely no bias in this study since the number of deceptive judgments was low, and because there was a difference in the number of false alarms in the two communication settings. However, it should be noted that this style of questioning could potentially cause receivers to make more deceptive judgments in certain settings.

The generalization of our findings to settings other than interview settings is also questionable. The context in which the deception takes place can affect the cognitive load and motivation of the participants, both of which can affect the deception process. Individuals performing a task with higher or lower difficulty and different implications might deceive or detect deception in a different manner.

IX. FUTURE RESEARCH

We found that the combination of in-advance deception detection training and a JIT warning about deception did not have the same effect as JIT training and warning in another recent study [Biros et al., 2002]. These findings show that in-advance training may not change the behavior of receivers, even with a warning about deception right before their interaction with a deceiver. The differences between in advance deception training and JIT training in computer-mediated settings are unclear, and a study that tests both JIT and in-advance training for deception in computer-mediated settings would help further the understanding of training for deception detection.

Another direction for future research would be to test individuals in an actual business setting. Since students do not have the experience that the average business worker does, they might formulate lies and detect lies less efficiently than a more experienced worker. A future study in an actually business setting with actual workers as subjects would help reveal what differences might be present in such a setting.

A final direction for future research concerns the behavior of deceivers lying over different communication media. Deceivers may have different tendencies when communicating over lean and rich media and it may be more difficult to lie over certain media. Future studies should explore this half of the deception process to better understand deceivers' tendencies in different settings.

X. CONCLUSIONS

A limited number of communication cues are available in computer-mediated communication [Daft and Lengel, 1986]. Limited cues to deception lead to confusion and inactivity in receivers due to the unavailability of secondary cues such as body movements. Our results indicate that individuals communicating over a moderately rich audio-based channel have more false alarms than individuals communicating over an extremely lean text-based communication channel. However, we found that there was no difference in the number of lies detected between the two groups. In addition, individuals communicating with audio had more false alarms than correct identifications.

There are several implications from these findings that are relevant to organizations.

1. Computer-mediated communication is now a key part of many organizational processes, such as the interview process. Organizations must realize individuals' weaknesses in these settings.

2. Initial job interviews conducted over audio channels are commonplace. However, they may now be initially conducted via e-mail. The findings of this study show that individuals conducting interviews over the phone may be at more risk of incorrectly judging interviewees as deceptive more frequently than individuals conducting interview via e-mail.

3. While the deception detection rate can be low for both types of communication, individuals communicating over an audio-based channel are subject to more false alarms. Individuals conducting interviews need to be aware of these tendencies so that they can be careful when making judgments about deception.

4. Organizations may want to communicate with interviewees over several communication channels to minimize the weaknesses of communicators using a single channel.

5. We found that the combination of in-advance training and a just-in-time warning does not offer any benefits to receivers in computer-mediated interview settings. If organizations want to take proactive measures against deception, they might use JIT training and warning, which has been found to have some impact on deception detection and task performance [Biros et al., 2002].

Once individuals and organizations recognize these tendencies, they should be better able to minimize the negative effects of false alarms.

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