**Journal of the Midwest Association for Information Systems (JMWAIS)**

Volume 2018 | Issue 2 Article 2

2018

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Recommended Citation
McHaney, Roger; George, Joey F.; and Gupta, Manjul (2018) "Deception Detection: An Exploration of Annotated Text-Based Cues," *Journal of the Midwest Association for Information Systems (JMWAIS)*: Vol. 2018 : Iss. 2 , Article 2.
DOI: 10.17705/3jmwa.000041
Available at: http://aisel.aisnet.org/jmwais/vol2018/iss2/2

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**Date: 07-31-2018**

# Deception Detection: An Exploration of Annotated Text-Based Cues

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## Abstract

Do embedded textual cues in asynchronous communication affect deceptive message detection? The expanded use of social media and rich media applications in business make this an important issue. Prior research indicates deception commonly occurs in all forms of communication and people have difficulty detecting its use. Asynchronous online communications are no exception and offer users a variety of media choices which may complicate deception detection, particularly if the sender has strategically selected a channel intended to disguise their intentions. The current study investigated whether embedded, non-verbal cues in common media forms found in asynchronous online venues influenced deception detection. Drawing on media synchronicity theory, results suggest embedding non-verbal cues in the form of annotated text can enhance deception detection. Overall, the findings suggest managers must be wary of sender motivations, which can influence message veracity, particularly in low synchronicity environments where media is subject to edits and manipulations.

**Keywords:** media synchronicity theory, annotated text, deception detection, deceptive communication, paralanguage, computer-mediated communication, social media

Please note: A prior version of this article received the Midwest Association for Information Systems (MWAIS) 2nd place best paper award at the MWAIS 2017 conference in Springfield, IL. The article has been expanded and subject to a second round of reviews. We congratulate the authors.

DOI: 10.17705/3jmwa.000041

## 1. Introduction

Digital deception can manifest in seemingly innocuous forms that may cause serious detriment to individuals and organizations. This is important because many businesses depend on technology, particularly in mediated communications. Applications such as email, texting, instant messaging, social networking, and video conferencing increasingly enhance the reach of decision makers and can reduce business costs. In application, technology-mediated communication channels often enhance or replace face-to-face job interviews, virtual meetings, product reviews (Jensen, Averbeck, Zhang, & Wright, 2013), sales presentations, crowdfunding venues (Siering, Koch, & Deokar, 2016), and technical support forums. While removing people from direct contact can save time and reduce geographic constraints, it also can result in loss of nonverbal cues valuable to deception detection (Zuckerman, DePaulo, & Rosenthal, 1981). This means precautions may be necessary, particularly in critical situations.

Unfortunately, digital deception practices have grown along with mediated communication practices (McHaney, George, & Gupta, 2015). These deceptions can be direct, such as lies specifically intended to further one's personal or business goals (Toma & Hancock, 2010), or indirect, such as exaggerated reviews intended to influence the opinions and actions of others (Ott, Cardie, & Hancock, 2012; Yoo & Gretzel, 2009). Past research indicates individuals are not very good at detecting deception in interpersonal settings. In fact, on average, people are little better than chance at successful deception detection (Bond & DePaulo, 2006). This suggests several research questions. For instance: *are individual abilities to successfully detect deception different in mediated contexts? Specifically, are peoples' abilities to detect deception degraded when using technology-mediated communication channels? To what extent do cues transmitted by media impact detection? Can annotating text messages, which convey relatively few cues, improve decision makers' detection abilities?*

Researchers investigating Media Synchronicity Theory (MST) and its application to business suggest communication media vary in ability to enable users to communicate and develop understanding (Dennis, Fuller, & Valacich, 2008). For instance, according to MST, media with lower synchronicity means more time exists between messages. The receiver has more time to process the messages and determine their meaning, and in the case of this research, determine if the deception is embedded in the message. Media that can effectively and efficiently clarify ambiguity are more likely to result in good communication outcomes (Dennis et al., 2008; Dennis & Valacich, 1999).

Past research suggested reliable verbal and nonverbal cues that indicate deception exist, and these cues are present to lesser and greater extents depending on media type and format (DePaulo et al., 2003). Further, studies have shown when decision makers are trained to recognize cues to deception, their detection accuracy may increase from 50% to above 75% (Colwell, Hiscock-Anisman, & Fede, 2013; Porter, Woodworth, & Birt, 2000). Media capable of transmitting fewer cues, such as emails or text posts on social media venues, may convey less meaning. However, research has indicated the use of emoticons may help replace some lost non-verbal cues in email communication (Skovholt, Grønning, & Kankaanranta, 2014). Likewise, we believe annotated text offers the ability to add more cues.

It makes sense that if recognizable verbal and nonverbal cues can enhance deception detection, then media containing more of these cues may enhance capabilities to detect deception. However, the converse may be true as well. Media with the capability to transmit more cues may enhance deceivers' abilities to influence a message recipient. A past study investigated this issue using text and found decision makers had little success in detecting deception, perhaps due to loss of nonverbal cues (Zhou, Twitchell, Qin, Burgoon, & Nunamaker, 2003). The current study used text and audio media choices to determine impact on detection with specific attention paid to social media and asynchronous communication typical to modern platforms. We believe it remains an open question as to whether media choice impacts deception detection in asynchronous environments, such as those commonly found in social media applications. This informed our study's fundamental research question. *To what extent does annotated text influence deception detection in asynchronous environments*?

The next section of this article presents relevant literature on deception, its detection, and media synchronicity. We also provide a brief background on social media and asynchronous communication use in that area. We follow this with the development of our research hypotheses. The remaining sections cover our methodology, data collection and analysis. The paper ends with a discussion of our findings, shortcomings, and implications for research and practice.

## 2. Background

### 2.1 Asynchronous Communication

Asynchronous communications have greatly expanded in recent decades. Research shows the likelihood of encountering deception in asynchronous venues appears to be very high (Tsikerdekis & Zeadally, 2014b). This is partly attributable to the nature of communication in these venues. For instance, social media operates with a lowered sense of social presence. This may reduce a communicator's sense of connection with her or his receivers (Tsikerdekis & Zeadally, 2014b). Likewise, social media adds a sense of anonymity to communications, reducing the cognitive dissonance often experienced by liars. Another consideration in some asynchronous communication is reduction of cues available for deception detection. As such, message content is subject to manipulation. For instance, deceivers create, edit, recreate, manipulate, and eventually post their asynchronous message only when they believe the message is satisfactory (a process refered to as rehearsability in MST). In most social media venues, communications are largely text-based and may include symbols or emoticons that attempt to introduce a desired sense of the sender's emotions at the time. Messages can include video and audio enhancements as well.

By its editable and pre-meditated nature, asynchronous communication can effect a reduction in cues available for deception detection. Compared to synchronous face-to-face communication, available cues may be greatly reduced (Daft, Lengel, & Trevino, 1987; Rao & Lim, 2000). For instance, synchronous video-based media can transmit more cues than a text-based asynchronous medium. Likewise, text that has been annotated with non-verbal cues such as sighs, yawns, or more complex emoticons has the capability to transmit more meaning or sentiment (Thelwall, Buckley, Paltoglou, Cai, & Kappas, 2010). Some research has linked a medium's capability to relay the maximum number of cues to more successful deception detection (DePaulo et al., 2003; Rao & Lim, 2000), but this does not consider that the same mechanisms can be used to better disguise deception (Tsikerdekis & Zeadally, 2014b).

Computer mediated asynchronous communication often is characterized by reprocessability, also a media capability cited in MST, which means the medium has the capability to store message contents and allow subsequent access and analysis of messages (Carlson, George, Burgoon, Adkins, & White, 2004). Another feature of many asynchronous communication systems is extensibility. This refers to how well the medium supports tools that aid in message composition and interpretation (Carlson et al., 2004). Most modern asynchronous systems are embedded within an environment intended to facilitate this process. Social media tools are a primary example, featuring sophisticated and easy-to-use interfaces with conventions to aid in communicating.

Text dominates much of the asynchronous communication space with typical applications such as email, text messages, Twitter, Facebook, message forums, and so forth. In text, many, but not all, subtle cues often are not present. For instance, many cues about status, position, and situational norms are missing (Carlson et al., 2004). Other nonverbal cues that often accompany face-to-face communication also may be missing. Among these are speech tempo, hand gestures, expressions, volume changes, emotional signals, body language, eye motions, and others. Some text communication may attempt to replace non-verbal cues with emoticons or 'out-of-proportional' emphasis on particular words or phrase, or the use of capitalization, font changes, or color patterns. Flaming "refers to a message sender's hostile emotional expressions characterized by using insulting, profane, or offensive language" (Cho & Kwon, 2015, p. 364). The practice of flaming, although overtly hostile, may also be incorporated into banter that provides an emotional outlet in a less rich media environment (Alonzo & Aiken, 2004). While MST suggests asynchronous text may not be able to transmit the cues that audio and video carry, some research may suggest otherwise. Lea and Spears (1992) conducted an early study into paralanguage use in text formats (e.g. grunts, pseudo-words like 'umm' and so forth). Their findings suggest paralanguage cues signify socially shared meanings and this could result in more cues being transmitted.

The use of audio messages in asynchronous communication permits the addition of several cues that are not present in text messages. Among these are speech tempo, voice inflections, volume changes, some emotional signals, starts and stops, and other vocalizations. Audio should provide the capability of adding more non-verbal cues and hence be a richer media source than text or even text with emoticons and characteristics found in flaming. In addition, audio messages can be modified through word emphasis, handclaps, and other noises that affect the receiver's perceptions.

Finally, asynchronous video messages convey a wider set of non-verbal cues. Among these would be cues about status, position, and situational norms (Carlson et al., 2004). Additionally, other nonverbal cues, such as those made possible with audio, may be included. In general, video provides capabilities more closely approximating face-to-face

communication. This feature has been called symbol variety, which increases as the number of differing cues and language elements that a medium can simultaneously communicate (Carlson et al., 2004). Video contains several visual cues that enrich symbol variety when compared to audio or text. In asynchronous environments, feedback and adjustments due to interaction would not be present.

### 2.2 Deception Detection

Prior researchers have defined deception in communication as "a message knowingly transmitted by a sender to foster a false belief or conclusion by the receiver" (Buller & Burgoon, 1996, p. 205). This definition includes several key elements. First, deception is intentional. Second, it aims to mislead or create a false perception in a recipient. Third, the definition excludes honest mistakes and non-intentional deceptive behaviors. Deception research often is structured around the specific exchange of information between deceivers (senders) and recipients (targets); and the perceptions of those observing the exchange (Burgoon, Buller, Floyd, & Grandpre, 1996). Additionally, past research suggests deception occurs frequently in everyday communication and other venues (George & Robb, 2008; Ott et al., 2012). In fact, some researchers suggest deception is inherent in human behavior and is rooted in biological processes (Ekman, 2006), although others have challenged this assertion (Serota, Levine, & Boster, 2010).

As might be expected, past research focuses on deceptive behaviors, motivations for engaging in deception, and the ways to enhance successful deceptive detection. One such body of research concentrates on how deceptive communication contrasts with honest communication. Examples include that liars are less forthcoming and tell less compelling stories than truth tellers; and that deceivers tend to make a more negative impression and often are more tense (DePaulo et al., 2003). Deceptive communication often takes longer to formulate and is prone to inconsistencies according to Walczyk et al. (2009). Other research suggests people who attempt to deceive may exhibit indicators. Among these are increased blinking, voice pitch change, passive statement use, an increase of personal grooming, sneers, smiles, negative statement use, nervousness, tenseness, and others (DePaulo et al., 2003).

Other research suggests that these cues may not be readily visible. For instance, DePaulo et al. (2003) report that telling a lie will not automatically affect behavior, and therefore, easily discernable physical responses such as 'Pinocchio's growing nose' do not exist. Neuroscience research supports this view. Sip et al. (2013) in their study, 'When Pinocchio's Nose does not Grow,' state "activity increased during the production of deception when participants believed their false claims could be detected, but not when they believed the lie-detector was switched-off." (n.p.) Sip et al. (2013) tie exhibition of physical cues to brain regions associated "with binding socially complex perceptual input and memory retrieval." (n.p.) This means deceptive behavior is context dependent and is manifested not due to the lie but rather because the liar believes their deception can be detected. This creates a "cognitively taxing effort to reconcile contradictions between one's actions and recollections" (Sip et al., 2013, n.p.).

Using similar logic, Vrij (2000) suggests particular responses are likely to occur during deception because deceivers often experience three processes while lying. Vrij calls these processes *emotional*, *content complexity* and *attempted behavioral control or impression management*. According to Vrij each of these processes may influence the sender and manifest as detectable cues or behaviors. Or as Vrij et al. (2000) suggest in related work: a liar's behavior, voice or speech might be affected not because the person lies but because, for example, s/he experiences certain emotions when s/he is lying.

An alternate but similar view is provided by Ekman (2009). In his book, *Telling lies: Clues to deceit in the marketplace, politics, and marriage*, Ekman suggests telling a lie is likely to evoke one of three different emotions: fear, guilt, or duping delight. Ekman provides a variety of circumstances that may trigger each of these emotions and then states, "Guilt, fear, delight, all can be shown in facial expression, the voice, or body movement, even when the liar is trying to conceal them. Even if there is no nonverbal leakage, the struggle to prevent it may produce a deception clue" (Ekman, 2009, p. 79). Other research suggests cues may emerge from deceptive communication because liars find it difficult to think of plausible stories, avoid contradictions, maintain consistency within the lie, and determine what portions of a fabrication might be discovered as false by an observer---all while avoiding a slip of the tongue. And, the lies have to be carefully committed to memory so the stories can be exactly recounted if necessary and to ensure future communications remain consistent (Burgoon, Buller, & Guerrero, 1995). Burgoon et al. (1995) further report that as sender social skills increase, believability increases and receiver deception detection accuracy decreases. Vrij and Mann (2004) suggest those seeking to detect deception can benefit from reviewing a combination of behavioral, auditory and speech content in a systematic way to uncover cues.

Behavioral researchers suggest that a variety of factors influence deception detection since neither liars nor truth-tellers respond identically to the same situations. Behavior for both sender and receiver depends on their current emotional state (Ekman & Friesen, 1969), the complexity of the communication, and the need to control the impression made on others (Vrij, 2000; Vrij & Mann, 2004). This means initiating a deception is complex for a variety of reasons. It places cognitive demands on the sender in the form of conjectures about his or her pre-existing knowledge, size of gap between message and truth, chances of getting caught, and so forth. Therefore, deceptive behaviors are emotionally taxing and may cause anxiety and other signs of physiological arousal that require effortful self-regulation (Abe, Suzuki, Mori, Itoh, & Fujii, 2007; Sip et al., 2013).

These signs of physiological arousal result in what researchers call leakage (Ekman & Friesen, 1969). Leakage theory suggests deceivers may attempt to hide deception by mimicking honest communication. This emotionally taxing form of impression management places many demands on the deceiver. For instance, the words of the message must be controlled, body language monitored and regulated, voice tone and speed regulated and so forth to the point where control fails and cues to deception leak out (Ekman & Friesen, 1969; George, Carlson, & Valacich, 2013).

Prior research efforts demonstrate deception is widespread and yet receivers have difficulty identifying deceptive messages (Hancock, 2007). Bond and DePaulo (2006) report most people, including those expected to be well-qualified at recognizing truthfulness, such as police officers and judges, generally perform only slightly better than random chance (Bond & Depaulo, 2008). Research suggests every medium is capable of use for deceptive communication. Further, research suggests deception can be detected in all media such that "a written statement may not have nonverbal cues, but inconsistencies in a written narration will reveal deception" (Rao & Lim, 2000, p. 6). This statement subtly reveals a dilemma that affects deception detection in various media forms and as a result, research indicates the potential for contradictory expectations in deception detection. A strategically dishonest sender may use knowledge of known deception indicators to create an illusion which is more difficult to detect (George et al., 2013; Tsikerdekis & Zeadally, 2014a, 2015).

### 2.3 Deception in Online Asynchronous Venues

Deception may arise from a variety of motivations, and some of these are unique to online or other asynchronous environments. For this reason, researchers specifically study deceptive behaviors in online venues and offer insights. For example, a study of 257 Israeli respondents indicated reasons for deceptive behavior included: privacy concerns, identity play, elevating status, and attractiveness (Caspi & Gorsky, 2006). Caspi and Gorsky (2006) report that "[c]ontrary to face-to-face deception, online deception seems to be an enjoyable activity." (p. 58) This is supported by Ekman's concept of duping delight (Ekman, 2009, pp. 76–79). Similarly, a recent global study of 461 Internet users from France, the U.S., India, and South Korea found that individuals are more likely to lie online than face-to-face (Marett, George, Lewis, Gupta, & Giordano, 2017). Caspi and Gorsky (2006) further suggest, "[n]egative emotions, like guilt, shame and fear generally associated with face-to-face deception appear to be lacking in online deception. Very few participants reported negative feelings such as stress or tension" (p. 58). This research validates Crowell et al.'s (2005) premise that computer-mediated communication causes a form of altered ethical sensitivity and that digital objects are not perceived as real objects. This leads to people judging online interaction differently (Crowell et al., 2005) and may enable an individual to disregard or modify the usual social or moral constraints that govern his or her behavior. Deception researchers have suggested a range of motivations, which, in addition to face-to-face venues, also may apply in online environments (Ford, King, & Hollender, 1988). Research by Tsikerdekis and Zeadally (2014b) extends this view and suggests deceivers might view social media as an excellent venue for lies because users have a limited ability to detect lies. Traditionally, receivers pick up cues from the environment in which interactions take place. In face-to-face communications, this can be difficult. But, it may even be more so in an environment where many of the cues do not exist.

### 2.4 Media Synchronicity and Social Presence

Clarification of the concept of synchronicity provides deeper insight into various computer-mediated communication (CMC) -based media. In general, synchronicity is the extent to which individuals are able to simultaneously work towards achieving common ground (Carlson & George, 2004). Synchronicity theory classifies media with lower levels of synchronicity as asynchronous, while media with high levels of synchronicity are synchronous. Examples of asynchronous communication include emails, recorded videos, and audio messages, while synchronous media include videoconferencing, and talking on a mobile phone. Some media exhibit characteristics common to both synchronous and asynchronous communications, depending on the immediacy of the sending and receiving cycle (Choi, Im, & Kim,

2011).

According to Daft and Lengel (1986), communication media should be matched to message content and communication intent in a way that reduces equivocality or possible misinterpretations. Other research has called this tailorability (Carlson et al., 2004). Equivocal messages, inherently less clear, require more cues and information for a correct interpretation. In terms of senders intentionally misleading receivers, a mismatch of an equivocal message with media type might result in a deception that goes undetected, which in some cases could be the goal.

Related to MST, social presence theory suggests that certain media types allow the sender to be more ‘‘present” with the receiver. This in return increases effectiveness in communication and message exchange. Social presence theory classifies media according to a continuum where social presence equates to a receiver’s awareness of the sender during interaction. On this continuum, face-to-face is high in social presence while text-based communication is low. Effective communication has the appropriate social presence required for a message to be appropriated transmitted and understood (Rockmann & Northcraft, 2008; Short, Williams, & Christie, 1976). Research into spontaneous communication such as texting and email suggests lowered social presence can indicate a higher likelihood of deception (Ho, Hancock, Booth, & Liu, 2016). Another media element suggested by MST is convergence (Dennis et al., 2008). Convergence seeks to ensure the information exchanged is understandable as desired. Convergence is stronger when rapid, back and forth transmissions of small quantities of preprocessed information are provided (e.g. synchronous communication). However, for a desired deception, dishonest communication may be better-suited using media with lower convergence (e.g. asynchronous). A further media feature suggested by MST is conveyance or the means of delivering content. According to George et al. (2013), MST posits that for conveyance processes, media supporting lower synchronicity should result in better communication performance (e.g., asynchronous).

So, the dilemma in asynchronous communication becomes the interplay between deception detection and obfuscation. Many reasons and motivations exist for choosing a medium for deception. For instance, a deceiver might want to ensure no record of their deceit remains, so media with reprocessability might be less desirable. On the other hand, advantages related to capabilities which enable a message to be fine-tuned and edited, and the importance of the deceit to the sender may outweigh this concern. In general, there may be no way to truly understand a deceiver’s motivations.

## 3. Hypotheses

Consistent with MST from a receiver’s standpoint, we believe that asynchronous, text-based media have the potential to reveal varying numbers of cues, to those attempting to detect deception. Prior studies have examined deception detection from a variety of perspectives. While much research has focused on MST, and how media synchronicity and its components influence deception detection through the production and notice of various cues, other research has considered asynchronous communications from conceptual and applied perspectives. For instance, researchers investigated motivations for using various media for deception from a strategic perspective (George et al., 2013). Others have suggested theoretical models to explain media’s role in the creation and detection of deception (Carlson & George, 2004). Still other examples provide insight into deceptive approaches in CMC (Carlson et al., 2004), modality effect on deception detection (Zhou & Zhang, 2007), and motivations (Caspi & Gorsky, 2006).

However, most empirical deception detection of media snippets similar to material posted on social media platforms largely has focused on synchronous approaches to communication (Gupta, 2015; Lewis, 2009; McHaney et al., 2015) or having experimental access to the deceivers. Existing asynchronous studies primarily focused on text-based detection (George, Marett, & Tilley, 2004; Zhou & Zhang, 2007). The current research expands the text-based studies into media capable of transmitting more cues and focuses on artifacts specifically related to asynchronous computer-based communication in text-based environments. Consistent with MST from a receiver’s standpoint, we believe that some asynchronous media could reveal more leakages and cues than others to those attempting to detect deception. Therefore, to further examine the concepts of leakage, we added cues back into text snippets, creating annotated text snippets. The snippets attempted to include every non-verbal cue found in recorded video snippets which have more capacity for leakage (DePaulo et al., 2003). Therefore, we believe that annotated text snippets will contain far more cues than are available in regular text snippets. Research into paralanguage (Lea & Spears, 1992) suggests annotated text should provide easier detection than plain text. Our primary hypothesis becomes:

H1: Individuals will be more accurate in deception detection in an asynchronous environment when viewing annotated

text snippets than when viewing plain text snippets.

In similar fashion, we expect audio snippets to contain fewer cues than the annotated text hence resulting in lower deception detection:

H2: Individuals will be more accurate in deception detection in an asynchronous environment when viewing annotated text snippets than when listening to audio snippets.

A further hypothesis was tested as a control to ensure the cues introduced into the annotated text had a significant impact:

H3: Individuals will be no more accurate in deception detection in an asynchronous environment when viewing plain text snippets than when listening to audio snippets.

## 4. Method

In a pre-study phase, a pool of 50 subjects was developed. Researchers screened participants according to job experience, age, and social media use to ensure they had experience in the 'real-world.' Pre-study participants came from campus staff positions, campus classes, online classes, and graduate school. Each participant viewed a random sequence of audio, annotated text, and text snippets. They answered questions about their backgrounds and experience. Based on the results of the pre-study, questions and techniques were fine-tuned to eliminate discrepancies and reduce the potential for misunderstanding.

The primary study commenced in the summer months of 2016 (e.g. July and August) utilizing a sample comprising 850 subjects located in the United States. A Qualtrics panel, developed with the assistance of survey specialists from Qualtrics, with appropriate constraints, ensured a representative respondent group. The respondents received no training, although some research has shown this could improve detection rates (Porter et al., 2000). Researchers stratified respondents according to age (18-70 years old), gender, and social media usage. People with zero social media experience were screened out of the study. All participants received background information about their task and identical sets of instructions regarding deception detection. All treatments received the same information. The sample was 57% female and 43% male. No interaction nor significant effects due to any collected demographics nor collection period were found. Researchers removed two hundred seven respondents from the data set due to poor quality of responses (e.g. not being consistent on filtering questions) or because they rated all snippets as indeterminate. This left 643 respondents that rated at least one media snippet as deceptive or truthful.

The study comprised independent individual experiments. Participants were shown eight media snippets each. Each snippet was randomly displayed (audio, annotated text, and plain text) and showed job interviewees truthfully or deceptively describing their background. The primary artifact for the source material was audio/video. All other media formats were derivations of the original representation. Camtasia Studio rendered audio/video into a purely audio form. A text transcript, derived manually from the audio/video, was checked for accuracy by several researchers. Finally, annotations regarding physical movements, coughs, yawns, pauses, and other cues were coded into the annotated version of the text file. Multiple researchers checked the result to ensure all noticeable cues faithfully translated into readable form. For example, a yawn was represented as <yawn> and an abnormal pause in speaking was represented as <pause>. Paralanguage utterances such as umm, oh, and hmm were also added to the annotated transcript in a consistent manner (Lea & Spears, 1992). For example, the following message was annotated as shown to capture cues visible in the audio/video version of the media but not found in the text version:

*Text*: Absolutely I'll be able to increase it. Once I've enrolled in the school of business my GPA has gone from low all the way up.

*Annotated Text*: Absolutely I'll be able to increase it <pause>. Once I've enrolled in the school of business my GPA has gone, <small sigh> from low all the way up.

The original source material comprised a series of eight snippets taken from recorded face-to-face interviews, in which individuals answered questions about true or false information they had entered on a scholarship application. The source material was edited so only a narrative provided by the interview was seen/heard. All other material was edited out and removed leaving a contiguous comment. The material was titled and described so survey respondents understood the material's context. Participants were instructed to determine the level of deception used by the snippet's subject. Half of

the eight snippets used in this study were honest, and the other half were dishonest. Participants in the interviews were all native speakers of English. Participants viewed each segment and then determined if the subject communicated honestly or deceptively. After each snippet, an embedded survey prompted the individual to record a decision. Time was not constrained, which provided low synchronicity. Individuals assessed the perceived level of deception on a 7-point Likert scale, ranging from 1 for 'very honest' to 7 for 'very dishonest.' This procedure was repeated eight times with randomly selected text, annotated text, or audio clips for each participant.

Although participants judged the veracity of the snippets on a 7-point Likert scale, their responses were collapsed to form uniform judgments being either true (a score of 1 to 3 on the scale) or false (a score of 5 to 7). Scores of 4, which indicated indecisiveness, were ignored for our analysis. A total of 3,958 judgments were rated and used for the data analysis. Participant veracity judgments were compared to actual honesty or dishonesty ratings of the snippet, indicating if the participant had been correct or not. This binary variable measured performance of each participant for each snippet viewed. These data were used to test our hypotheses.

## 5. Results

We used binary regression with repeated measures to assess the data and determine if deception detection accuracy is impacted by media type. We discovered that an overall significant effect based on media type existed for the four treatments [$\chi^2$ (3, N=3958) = 17.23, p = 0.001]. Since the overall model was significant, a series of subsequent pairwise Bonferroni tests were used to assess H1 through H3.

H1 compared plain text to annotated text. As expected, annotated text yielded higher levels of deception detection than plain text, at p=.003. This was consistent with our expectations. When H2 was tested, comparing annotated text to audio, the results were significant at p=.005. Annotated text snippets resulted in higher levels of deception detection than audio snippets. Also as expected, our control hypothesis, H3, was not significant. This further suggests that annotating text snippets using embedded cues from a video source impacted the respondants' ability to detect deception. The same impact was not found in plain text. Table 1 summarizes the results.

| | **Media 1** | **Mean 1** | **SD 1** | **N 1** | **Media 2** | **Mean 2** | **SD 2** | **N 2** | **Mean Diff.** | **df** | **Bonferroni Significance** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H1* | Annotated Text | 0.5824 | 0.4934 | 1001 | Plain Text | 0.5090 | 0.5002 | 998 | 0.07 | 1 | 0.003 |
| H2* | Annotated Text | 0.5824 | 0.4934 | 1001 | Audio | 0.5136 | 0.5001 | 993 | 0.07 | 1 | 0.005 |
| H3 | Plain Text | 0.5090 | 0.5002 | 998 | Audio | 0.5136 | 0.5001 | 993 | 0.00 | 1 | 1.000 |

* Significant at .01 Table 1. Summary of hypotheses testing

## 6. Discussion

Overall evaluation of the data allowed us to conclude that embedding annotated text cues influenced deception detection accuracy. Significance of H1 and H2 suggested that annotated text resulted in higher levels of deception detection than either audio or plain text. This makes logical sense. For instance, in H1, more cues were embedded in the annotated version of the text, and these were used by receivers to make more accurate judgments. Likewise, H2 indicated deception detection in annotated text was more accurate than in the audio snippets. This result implies that annotating a snippet captured additional cues not present in audio format. For instance, some annotations such as <deep breath> may not have been as noticeable when listening to an audio clip but may have been more noticeable as paralanguage in the annotated text. By annotating the text, the judge's attention specifically was drawn to the non-verbal cue. Other factors also may have come into play. For instance, participants may have read an annotated text snippet multiple times. The judge would not need to take a physical action to 'replay' the annotated text snippet, but the audio snippets would need to be physically restarted to listen to more than once. This finding has implications for use of emoticons and other non-verbal, paralanguage which can be embedded in asynchronous communications and are readily available for reinspection without the need for further action.

As mentioned earlier, another possible explanation for annotated text to enable better deception detection relates to the concept of conveyance (Dennis et al., 2008). Conveyance essentially is transmission of new information and subsequent

processing by the receiver to create and modify his or her mental model of current communication. Conveyance is positively enhanced by media that are intrinsically low in synchronicity. According to Dennis el al. (2008), conveyance requires cognitive resources to integrate this information into a mental model, and therefore, lower synchronicity (e.g. asynchronous communication) allows the receiver more time to acquire meaning from the message. Annotated text has very low synchronicity and can be reviewed multiple times, enabling the judge to develop a better mental model of the communication and form an opinion about the presence of deception.

According to the same research, media with higher levels of synchronicity (Dennis et al., 2008) have the capability to transmit a wider variety of both verbal and non-verbal cues. In fact, face-to-face communication, the penultimate example of media exhibiting the highest level of synchronicity, is widely regarded to have all forms of verbal and non-verbal cues available (Rao & Lim, 2000). Research has indicated that this availability of cues positively influences the accuracy of correctly identifying deception and therefore could be translated into higher deception detection rates (Rao & Lim, 2000). Additionally, people are more confident making deception judgments media with higher levels of synchronicity (Carlson & George, 2004; Gupta, 2015).

The current study appears to indicate that asynchronous media, such as annotated text, can carry a variety of verbal and non-verbal cues, and offers additional advantages. Among these are reprocessability or the capacity to store message contents which allows subsequent access, review, and thoughtful analysis of messages (Carlson et al., 2004), or extensibility, which provides mechanisms for composing messages in a thoughtful way. In asynchronous mode, a receiver would have the capacity to review communication and thoughtfully analyze it in a way that leads to good deception detection judgments. This could have a better result than a rushed judgment that takes place during a synchronous exchange. Like a synchronous exchange, receivers could request more information. A time delay would be inevitable, the length of which may also provide data for deception detection according to social presence theory (Ho et al., 2016). This may mean that annotated transcripts of crucial communications could be worth generating and examination by decision makers.

On the downside, a sender could rehearse their message, edit and re-record it until the communication sufficiently disguised their true intent (if deception was the goal). Recent research into fake, asynchronous reviews by Zhang et al. (2016, p. 476) supports this premise saying, "nonverbal features can be more effective for detecting online fake reviews than verbal features." In other words, the deceptive sender would have the ability to review their communication, identify leakage, and edit the message in way that better hides their deception. This creates the impression of honest communication. According to George et al. (2013, p. 1236), "controlling communication in this way makes many demands on the deceiver. The deceiver must control the words of the message, his or her body language, voice pitch, and other paralinguistic aspects of communication." In synchronous communication, this can cause control to break down and allow cues to deception to leak out. In asynchronous communication, the deceiver would have to spend extra time identifying leakage and removing the cues. This aspect of asynchronous communication, called rehearsability, is more readily available than in synchronous communication, because the medium enables the sender to rehearse and fine-tune a message during encoding, before sending (George et al., 2013). In some forms of media, the editing process itself may provide clues to deceptive behavior as "a photograph that looks edited" (Tsikerdekis & Zeadally, 2014a, p. 1312).

From a broad perspective, this study indicated annotating text adds cues which improves deception detection. This idea further was supported because inherently, text transmits fewer cues than audio. We found that regular text and audio were not significantly different in terms of deception detection. This supports the argument that annotating text is a powerful way to add cues and hence to increase detection success.

In general, the data collected for the current study supports earlier findings that more embedded cues enable people more accurately to detect deception, but that other factors related to synchronicity such as conveyance and reprocessability should be considered. A main effect existed, which indicated that embedded cues significantly affect deception detection. Examination of the results in more detail suggested adding cues back into the snippets in lower synchronicity media types led to more accurate detection.

### 6.1 Limitations

Several limitations exist in the design and measurement of this study. First, respondents had little personal stake in deception detection. However, this condition existed across all treatments. Second, generalizability issues may exist. The deception videos and the experimental treatments were developed and administered in the United States using Qualtrics panels and other distribution methods. Current research suggests cultural elements, which were not considered, may

significantly influence deception detection (Marett et al., 2017). Consequently, the current study would benefit from additional data collection opportunities utilizing varied cultural backgrounds. Other limitations relate to the sample size, which was large and might have inflated significance levels. Likewise, the snippets used in this study may have been subject to Internet speed constraints and other issues since the subjects took the survey using their own computing devices.

### 6.2 Future Research

Potential ideas for expansion of this study include utilizing different forms of social media to determine if various venues lend themselves to easier deception detection in work-related settings. This study only used limited forms of online audio, text, and annotated text for this purpose and could benefit from a mix of social media experimentation. Additional cultural backgrounds, demographic features, social media experience and other factors may impact the results. Further research into use of paralanguage and emoticons in asynchronous communication could result in additional insights into this topic area. Likewise, future research could help determine which types of cues can be embedded as annotated text in effective ways. If this can be done systematically, perhaps deception detection in media with higher levels of synchronicity can be improved.

## 7. Conclusion

Synchronicity in asynchronous media appears to affect detection of deceptive messages. The findings of this study suggest embedded cues are only part of a complex mixture of influences that determine whether receivers believe deception is present in communication. For instance, from MST, the concepts of conveyance and rehearsability may be important. Likewise, social presence is an important factor in deception detection. We believe social media and other rich media applications make this issue relevant to managers, decision makers, and those working in business. Asynchronous online interactions may be subject to senders that have strategically selected a channel intended to hide their true intentions. The results suggest that embedded annotated, text-based cues can enhance deception detection. This is helpful to the receiver but, at the same time, it is important to note that asynchronous media can be altered, making detection more difficult.

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