ABSTRACT

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Past research suggests that email recipients form unfavorable dispositional attributions about individuals who send messages that are overly brief or contain typographical errors. The present study sought to determine whether email recipients make allowances for brevity and spelling errors when the email message contains a situational cue (i.e., a tagline) indicating it was sent from an internet-enabled mobile phone, or smartphone. Data from 239 participants were collected to test whether a smartphone tagline reduces the negative effect of (a) spelling errors on perceptions of a communication partner's intelligence and conscientiousness, and (b) brevity on perceived agreeableness and extraversion. Perceptions of the constraints imposed by a smartphone were also explored. Results suggested that email recipients generally recognize that typing on a smartphone imposes constraints with regard to the ease of input. Recipients' own level of experience with smartphones appears to determine whether they assume that others using smartphones for email are operating amid competing demands. Despite perceived constraints, the use of a smartphone did not excuse spelling errors and brevity. Results indicated that people form largely unfavorable dispositional attributions about individuals sending email characterized by brevity and spelling errors, regardless of whether the message was known to be composed with a smartphone.

Attributions in Mobile Computer-Mediated Communication

by
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BIOGRAPHY

Kyle Morgan completed his undergraduate studies at Louisiana State University Honors College in Baton Rouge, Louisiana. He graduated with a Bachelor of Science degree in Psychology in May of 2009. He then began pursuit of a Ph.D. in Industrial/Organizational psychology at North Carolina State University in Raleigh, NC.

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Attributions in Mobile Computer-Mediated Communication

Computer-mediated communication (CMC) is one of the prominent contributions of the digital age. It impacts the way in which people stay in touch with friends and family and has changed the way that business is run. CMC refers to any method of communicating online, such as instant messaging and email (Baron, 2008). This method of communication has been around for decades, with the advent of email occurring in 1971 (Baron, 2008). Its use is rapidly evolving alongside the technologies which facilitate it, so much so that some individuals attribute the degradation of the English language to the technologies through which we communicate (Baron, 2008; Stephens, Houser, & Cowan, 2009).

One notable trend in computer-assisted business is the use of mobile technologies such as smartphones for CMC. Constraints inherent in these technologies have the potential to influence communication styles, with implications for how mobile CMC users are perceived and the relationships they develop with coworkers. The present study considers this practical problem from a theory-driven perspective. The purpose of this study is to investigate whether situational cues conveying the use of a smartphone mitigate negative dispositional attributions that may otherwise result when using mobile technologies during CMC.

CMC's Fundamental Attribution Problem

It is clear that CMC, whether mobile or not, is a boon upon which many workers and employers have come to rely. For example, it allows individuals to communicate almost instantaneously with people on the other side of the world. In addition, it gives people adequate time to deliberate and respond (Jünemann & Lloyd, 2003), potentially reducing the

pressure to make a decision immediately, a benefit one does not have in a face-to-face interaction. These and other advantages make CMC a crucial component of today's work world.

Despite its benefits, there are potential drawbacks that accompany the use of CMC. Challenges stem from a lack of visual and auditory cues that can impede mutual knowledge known to be important for effective collaboration (Cramton, 2001). Mutual knowledge refers to knowledge that two communicating partners share, and know they share, in common (Cramton, 2001). It increases comprehension between partners fostered in part by direct knowledge. Firsthand experience creates direct knowledge with an individual, allowing for predictions about behavior based on knowledge of his or her environment and habits. During face-to-face collaboration, a great deal of information about a collaborator's environment and habits can be acquired through nonverbal signals and other visual and auditory cues. Such cues are often absent during CMC. Virtual collaborators who are geographically dispersed, for example, may implicitly assume a common environment (e.g., computer equipment, office dynamics, scheduling constraints) across sites, even when such an assumption is not warranted. In reality, different work sites often face unique constraints, which may not be immediately visible or detectable to people relying on CMC. In short, auditory and visual cue deprivation puts virtual collaborators at risk for the "mutual knowledge problem," which has been associated with misunderstandings and conflict during collaboration (Cramton, 2001).

Another concern surrounding the use of CMC involves errors and interpersonal missteps that can occur during communication. Examples include typographical errors, poor word choices, a seemingly curt or abrasive tone, or a failure to reply. These issues can be

due to the communicator's disposition (e.g., rudeness, carelessness), but they could also be the result of situational constraints, such as time restrictions and distractions, physical disabilities, or suboptimal equipment – for instance, an unfamiliar keyboard or very small screen upon which to view and edit email.

People are likely to seek explanations when faced with unusual or suboptimal CMC exchanges, such as those marked by misspellings and interpersonal blunders. The explanations they form are affected by the amount of direct knowledge they have about collaboration partners and their environments (Cramton, 2001). Accordingly, the mutual knowledge problem and communication missteps noted above are not isolated issues. They interrelate and operate in tandem. Their effects on interpersonal perceptions and collaboration dynamics can be informed by theory predating the age of virtual collaboration. In particular, attribution theory is relevant.

According to attribution theory, individuals try to understand the causes and implications of the events they witness (Ross, 1977). When these events are the behaviors of others, attributions are typically categorized as situational or dispositional. A situational attribution is one in which an individual sees the actions of another as based on environmental constraints or facilitators. Conversely, individuals make dispositional attributions when they assume that another's actions are based on his or her nature, personality, or disposition.

Attribution theory is especially pertinent to CMC due to the aforementioned issues surrounding cue deprivation. During face-to-face interaction, much of the message is nonverbal or implicit (Carmel, 1999). Individuals using CMC do not have the situational

information present in face-to-face communication because they cannot see facial expressions, hear inflections in their partners' voices, or perceive other potentially relevant cues. Even voice-only communication such as a telephone call can impart certain inflections that convey unspoken meaning which does not get transmitted during text-based CMC. Conversational cues can be anything from nuances of meaning and frame of mind to details that people might infer from their counterpart's demeanor or expression (Kiesler, Siegel, & McGuire, 1984). These cues can also include non-conversational information such as being able to see screaming children in the background or clues suggesting that one's conversation partner is from a different culture. Because of this lack of situational information, individuals are especially likely to attribute CMC counterparts' behaviors to their personality characteristics or disposition (Amichai-Hamburger, 2008; Connell, 2000) rather than taking the environment into consideration. This challenge is compounded by the fact that people are already prone to making dispositional attributions, a phenomenon known as the fundamental attribution error (Ross, 1977). The fundamental attribution error refers to the propensity to underestimate situational factors in favor of dispositional explanations for others' behaviors – explanations that could very well be incorrect. These incorrect attributions can lead to adverse outcomes, ranging from miscommunications to misconceptions during CMC.

In support of the preceding arguments, the literature has documented the inclination to explain misspelled and exceedingly brief communications in dispositional terms. Specifically, past research has shown that spelling errors in CMC can lead to negative attributions about the intellectual ability of the message's composer (Kreiner, Schnakenberg,

Green, Costello, & McClin, 2002; Figueredo & Varnhagen, 2005). Grammatical and typographical errors have also been shown to reduce recipients' views of a sender's rationality (Wilson, 2005), competency (Jessmer & Anderson, 2001) and intelligence (Lea & Spears, 1992). If errors are found consistently during communication, then the sender could also be seen as careless (Lea & Spears, 1992) or lacking in conscientiousness (Vignovic & Thompson, 2010).

The tone and brevity of an email has also been shown to trigger dispositional attributions. Previous studies have shown that individuals who spend more time composing and editing their electronic communication are seen as having greater social orientation (Walther, 2007). Authors of polite messages are also viewed as more likeable (Jessmer & Anderson, 2001). Some individuals only impart the necessary information in a message, without any regard for pleasantries (Carmel, 1999). However, this may be construed as rude (Taylor & Martin, 2004). Individuals who are rude are typically thought to be low in agreeableness (McCrae & Costa, 1987), a construct often associated with warmth and friendliness (Graziano & Eisenberg, 1997). Past research has shown that people who send brief email messages are indeed perceived as low in agreeableness as well as extraversion, which is a disposition characterized as sociable, fun-loving, and talkative (McCrae & Costa, 1987; Vignovic & Thompson, 2010).

In sum, people are prone to forming dispositional explanations for communication characteristics (e.g., misspellings, brevity), which may actually be caused by situational or environmental constraints they cannot see. It is in this context that use of the smartphone – a notable trend in modern day CMC – takes place.

Mobile CMC

Smartphones, or mobile phones that have email and other internet capabilities, are becoming increasingly popular. An early example is the Blackberry™, which was later outsold by the iPhone™ and Android™ systems ("Android surges," 2010). One survey reported that 42% of US respondents owned a smartphone ("Android surges," 2010) with that percentage being about 12% worldwide ("Smartphone Statistics," n.d.). Some estimates, however, place the percentage of Americans owning smartphones at about 17% (Gahran, 2010). Of the reported 12% of individuals worldwide who use smartphones, 48% reportedly use them to aid in their business activities ("Smartphone Statistics," n.d.).

Mobile technologies such as smartphones provide a relatively new medium for CMC. While freeing users from some limitations, smartphones introduce new constraints, presenting unique challenges in addition to those encountered when traditional CMC occurs through a full-sized computer. For example, smartphones typically include a standard QWERTY keyboard either on a small touchscreen or a tactile keyboard that places very small buttons below the screen. As such, they can be more difficult to use than desktop and laptop computers. Not only do smartphones have smaller keyboards, which can make input difficult, they also have smaller screens, which may cause email senders to overlook typographical errors. Finally, people may use smartphones for CMC while they are engaged in other tasks (e.g., travelling, cooking, attending a meeting, watching television) where they do not have immediate access to an office or home computer. The presence of distractions, combined with the difficulty of using a small keyboard and screen, can contribute to

typographical errors and brevity that may in turn adversely affect how email communicators are perceived.

Signaling Situational Constraints During Mobile CMC

In short, smartphones impose constraints that are likely to result in communication missteps that people blame on the user rather than the technology. Past research, however, has shown that email recipients will excuse blunders such as typographical errors when their communication partner's situational constraints are explicitly conveyed (Vignovic & Thompson, 2010). A cue signaling the use of a smartphone could thus reduce the fundamental attribution error during CMC. This premise is depicted in Figure 1, which shows the conceptual model driving the current research study.

One possible way to help email recipients realize the situational constraint imposed on mobile CMC users' communication styles is to include a relevant "tagline" along with email messages sent from a smartphone. Indeed, smartphone software typically comes equipped with a default tagline – a "signature" of sorts included at the bottom of each email. This tagline informs email recipients that a smartphone was used to send the message. For example, at the time of this writing, "Sent from my iPhone" is the default tagline included on messages sent from an Apple$^{®}$ iPhone $^{™}$.

Such default taglines can be easily deleted or turned off so that they no longer appear. When present, they may serve as a situational cue allowing the recipient to infer the constraints the technology imposes on the sender. For many individuals, especially those who do not use smartphone keyboards on a regular basis, inputting text on a smartphone is perceived to be more difficult than typing on a full-sized keyboard (Baron, 2008). Thus, one

of the major constraints imposed by using a smartphone is the difficulty of typing on a scaled-down keyboard, either physical or on a touchscreen. The smartphone tagline is expected to signal this constraint to email recipients.

> H1: A smartphone cue will reduce email recipients' perceptions of the sender's ease of input.

Presumably, individuals who use mobile devices to send email typically do so when they do not have immediate access to a full-sized computer, meaning they are away from their everyday workstation. This increases the likelihood that mobile CMC occurs in the midst of other activities rather than occurring during fully dedicated "computer time." Such multitasking could impose cognitive or attentional constraints in addition to the physical (keyboard, input) constraints indicated above. For example, the mobile CMC sender may be pressed for time, sending a quick email while waiting in line at an airport or coffee shop. Events in his or her environment could also distract the sender. For instance, a parent waiting with a sick child in doctor's office may use a smartphone to keep up with work demands while away from the office.

By indicating the use of a mobile technology, the smartphone tagline is expected to signal attention constraints. This proposition will be tested.

> H2: A smartphone tagline will heighten perceptions of demands on an email sender's attention.

Experience with Mobile Technologies

As indicated above, a smartphone cue is expected to affect perceptions of an email sender's situational constraints. This assumes, however, that the recipient of the email, or the

perceiver, has knowledge of the difficulty associated with using a mobile device to send emails. Experience may influence this knowledge. Individuals who have little or no experience using a smartphone may underestimate or overestimate the difficulty of input as well as the attention constraints surrounding mobile CMC. Perhaps people with experience using mobile devices better appreciate the nontrivial challenges imposed by the technology. Alternatively, practiced users may consider it quite easy to type on a smartphone or may otherwise hold unique perceptions of the attentional demands occurring during mobile CMC. This area warrants exploration.

RQ1-RQ2: Will an email recipient's prior experience with smartphones influence the degree to which a smartphone cue affects perceptions of the sender's ease of input (RQ1), and demands on his/her attention (RQ2)?

Attributions in CMC

As noted earlier, spelling errors in CMC have been shown to reduce perceptions of intelligence and conscientiousness, whereas brevity reduces perceptions of agreeableness and extraversion. However, the negative effect of these communication styles could be attenuated when a contextual cue is added to the message. In a study by Vignovic and Thompson (2010), participants excused typographical errors (though not brevity) when given a cue indicating that the email sender was from a foreign culture. In the case of mobile technologies, a smartphone cue is expected to similarly act as a situational cue indicating the constraints placed on the sender. By offering this situational cue, it is expected that the effect of communication errors on assumptions about the sender's disposition will be reduced. That

is, email recipients are expected to be less prone to making dispositional attributions than they would without the cue.

> H3-H4: There will be an interaction between situational information and spelling errors such that a smartphone cue will reduce the negative effects of spelling errors on recipients' perceptions of an email sender's intelligence (H3) and conscientiousness (H4).

> H5-H6: There will be an interaction between situational information and brevity such that a smartphone cue will reduce the negative effects of brevity on recipients' perceptions of an email sender's agreeableness (H5) and extraversion (H6).

Method

Participants

Participants ($N = 239$) for this study were recruited through Amazon's Mechanical Turk Service. This service gives researchers access to a large number of participants around the world through an online survey system. For the purpose of this study, respondents were limited to those who live in the US and speak English as their first language. Participants in the current study were 65.5% female, and 53.4% had an associate's degree or higher. The average age of participants was 34.1 ($SD = 12.6$). Participants were paid $0.15 for their participation in this study.

Design

The current study used a 2 (smartphone cue) x 2 (spelling errors) x 2 (brevity) fully crossed design, resulting in 8 conditions. The cue variable's two levels were: (a) present, where the participant reads an email message accompanied by a smartphone tagline and (b)

not present, where no such cue is given. The spelling error manipulation also had two levels corresponding to: (a) an email that contained no spelling errors and (b) an email that contained spelling errors. Finally, the brevity condition's two levels were: (a) a very brief email that was short and to the point and (b) a lengthier email that included non-substantive conversational verbiage. In addition to the three manipulated independent variables described above, this study included a subject variable, prior experience, which refers to the participants' experience with a smartphone. The six dependent variables included in this study were perceptions of the email sender's: ease of input, demands on attention, intelligence, conscientiousness, agreeableness, and extraversion. The first two dependent variables pertained to perceptions of the email author's situation, and the last four correspond to perceptions of his disposition.

Procedure

Participants were informed that the purpose of this study was to examine individuals' perceptions of coworkers they meet through email. After providing informed consent, participants were randomly assigned to one of eight websites corresponding to the eight study conditions. Participants read an email exchange between two people who work for the same organization but have never met. The first employee, Luis Hagan, sent an email message to the second, David Hanson, referred to later as the "target," who replies. The context was one in which Luis contacts David to set up a meeting for a project the two were asked to work on together. The initial email, from Luis, contained 161 words with no typographical errors.

The first email message was identical across conditions. The manipulations were contained in the target's reply. Participants saw the reply corresponding to the condition to which they were randomly assigned. The brief reply contained 7 words, compared to the 37 words included in the lengthier (i.e., non-brief) reply. The additional text in the lengthier email was not substantive; that is, it did not introduce information that would influence participants' perceptions beyond that of the manipulation. For instance, whereas "Let's meet in your office" appeared in the lengthier email, in the brief email it was shortened to "Your office."

Half of the brief replies contained one misspelling and half were error-free. Half of the standard (non-brief) replies contained five misspellings and half were error free. Misspellings used in the emails were typographical, not grammatical, in nature. For instance, omitted letters or incorrect capitalizations were used, whereas homophones were not. Half of all replies included the following tagline: "Sent from my iPhone."

Participants were allowed to spend as much time as they wished reading the email exchange. They were informed that they were going to be asked to rate their perceptions of David (i.e., the target individual who replied to the initial email) once they finished reading the correspondence. When they finished reading the correspondence, participants were asked to click "next," after which they no longer had access to the email exchange. They then rated the target on the six dependent variables of interest. Afterwards, they responded to demographic items, including those that asked about their own experience with smartphones. Three items with only one obviously correct answer were also included to ensure that participants were paying attention (e.g., "Mark 'Agree' for this question", "True or False:

David refused to meet with Luis"). Finally, participants were thanked, debriefed, and dismissed.

Prior to commencing the main study, a pilot study was conducted to determine whether the experimental manipulations would be noticed. Participants ($N = 215$) were recruited through Mechanical Turk. Participants were 57.7% female and were on average 33.7 years old ($SD = 12.9$). They were randomly assigned to review one of the sets of email exchanges described above. That is, the stimulus materials used in the pilot study were identical to those used in the subsequent experiment. Results of the pilot study demonstrated that individuals who were presented with the smartphone tagline used in this experiment were more likely than those who were not shown the tagline to report that the sender was using a smartphone, $t(64) = 2.46$, $p = .02$. Those who were presented with an email containing spelling errors were also more likely to report that the email contained errors than those who did not receive an email containing spelling errors, $t(210) = 5.41$, $p < .001$.

Measured Variables

Participants were asked to respond to a variety of items pertaining to the email sender's situation and disposition. A 1 (*very inaccurate*) to 5 (*very accurate*) response scale was used to assess conscientiousness, agreeableness, and extraversion. All other items used a 1 (*strongly disagree*) to 5 (*strongly agree*) Likert-type rating scale. Responses to any negatively worded statements were reflected prior to aggregating the items comprising each scale.

Perceived ease of input (3 items, $\alpha = .74$). Three items were created for the purpose of this study to assess participants' perceptions of the target's ease of input. A sample item

is: "David probably had difficulty typing the email message he sent to Luis" (reverse scored). Higher scores on this scale represented heightened perceptions of the ease with which the target email sender composed his message.

Perceived demands on attention (6 items, α = .92). Six items were created to assess participants' perceptions of the target's available attention. A sample item is: "David probably was distracted while typing his reply to Luis." Higher scores indicated increased perceptions of demands on the target's attention while he composed his message.

Perceived intelligence (7 items, α = .92). Seven items were created for the purpose of this study to assess participants' perceptions of the target's intelligence. A sample item is: "David probably is good at solving problems."

Perceived conscientiousness (10 items, α = .93). Ten items from Goldberg's (1999) International Personality Item Pool (IPIP) were modified to assess participants' perceptions of the target's conscientiousness, rather than participants' own conscientiousness as in the original scale. A sample item is: "David probably pays attention to detail."

Perceived agreeableness (10 items, α = .92). Ten items from the IPIP were modified to assess participants' perceptions of the target's agreeableness. A sample item is: "David probably makes people feel at ease."

Perceived extraversion (10 items, α = .90). Ten items from the IPIP were modified to assess participants' perceptions of the target's extraversion. A sample item is: "David probably knows how to captivate people."

Prior experience (7 items, α = .94). Seven items were created to assess participants'

experience using smartphones. A sample item is: "I use a smartphone as part of my daily

routine."

Manipulation checks (6 items). Participants responded to 6 items which were

designed to assess detection of the experimental manipulations – smartphone cue (2 items),

brevity (2 items), and spelling errors (2 items). Examples include: "David used an iPhone to

reply to Luis," "David's reply was very brief," and "David's reply contained spelling errors."

These items were included at the end of the survey to prevent influencing participant

responses on the other response scales.

Results

Data Cleaning

As mentioned, attention check items were embedded in the study to detect random or

careless responding, which has been shown to be a problem in psychological research

(Meade & Craig, in press). Participants who answered the attention check items incorrectly

were removed from the dataset. Data collection was terminated after 239 usable cases were

obtained. A power analysis (G*Power 3; Faul, Erdfelder, Lang, & Bucner, 2007) indicated

that this produced adequate statistical power of .97 at α = .05 to detect a medium effect size

of .25.

A JavaScript code embedded in the online informed consent form was used to

randomly assign participants to conditions at the beginning of the study. This method of

random assignment contributed to the unequal sample sizes across the tagline (*N* = 127; 53%)

and no tagline conditions (N = 112; 47%). All analyses had individual cell sizes higher than 32, which was the minimum sample size per condition deemed necessary by an a priori power analysis (G*Power 3; Faul et al., 2007) in order to achieve adequate statistical power of .8 at α = .05 to detect a medium effect size of .25.

Prior to conducting hypothesis tests, measured variables were assessed for violations of normality assumptions. All measures were within the acceptable range for skewness and kurtosis. In addition, all between-group comparisons were preceded by a test of the homogeneity of variance assumption. The degrees of freedom were adjusted downward and a separate variances test was employed when the conditions being compared failed to demonstrate homogeneity of variance.

Manipulation Checks

In order to test the success of the experimental manipulations (inclusion or exclusion of the tagline, presence or absence of spelling errors, and a brief or longer email), three independent-samples t-tests were conducted. The results shown in Table 1 demonstrated that respondents who received the tagline were significantly more likely than those who did not to agree with the tagline manipulation check items, which stated that the email was sent from a smartphone. Those who read an email containing spelling errors were particularly likely to answer affirmatively to the spelling errors manipulation check items, which stated that the message contained spelling errors. Finally, those who read an email which was brief were significantly more likely than those who read an email that was not brief to endorse manipulation check items indicating that the message was brief. These results indicate that

those individuals who received a tagline, spelling errors, or a brief email perceived these manipulations.

Tests of Hypotheses and Research Questions

The first two hypotheses were tested by examining the main effect of a smartphone cue on perceptions of the target's ease of input (H1) and perceptions of the demands on the target's attention (H2). An independent samples t-test indicated significant differences between the no tagline ($M = 3.38$, $SD = .78$) and tagline ($M = 3.16$, $SD = .77$) conditions on perceptions of the sender's ease of input (H1), $t(237) = 2.26$, $p = .01$; thus, hypothesis 1 was supported. There were no significant differences between the no tagline ($M = 3.31$, $SD = .92$) and tagline ($M = 3.26$, $SD = .76$) conditions on perceptions of demands on the sender's attention, $t(237) = .52$, $p = .60$; thus, hypotheses 2 was not supported.

Two multiple regression analyses were conducted to answer this study's research questions. Prior experience with smartphones served as a continuous predictor variable, and smartphone cue was dummy-coded for the purpose of these analyses. The criterion of interest varied by research question. To investigate RQ1, perceived ease of input was regressed onto (a) prior experience with smartphones, (b) the presence of a smartphone cue, and (c) the interaction between these two predictors. Results of this analysis, shown in Table 2, indicated that the interaction between experience and the presence of a tagline was not a significant predictor of perceived ease of input. Furthermore, although experience did not significantly predict ease of input in this analysis, its inclusion in the analysis did reduce the aforementioned tagline's effect on perceived ease of input to non-significant.

The multiple regression analysis conducted to test RQ2 included the same predictors indicated above but a different criterion - perceptions of the demands on the target's attention. The regression to test RQ2 showed that the interaction between experience and tagline was a significant predictor of perceived demands on attention, as seen in Table 2. To explore the nature of this interaction, participants were divided into high and low experience groups based on whether their experience score fell above or below the median. As shown in Figure 2, relatively inexperienced individuals were more likely to perceive demands on attention in the tagline condition than the no tagline condition, while those who are high in smartphone experience were more likely to perceive demands on attention in the no tagline condition than in the tagline condition.

Next, the manipulations' effects on attributions about the email sender's disposition were examined. Table 3 provides descriptive statistics which show how the email sender with and without spelling errors was perceived. As indicated by the two-way ANOVAs shown in Table 4, the data revealed main effects such that spelling errors adversely affected perceptions of the email sender's intelligence and conscientiousness. The tests of hypotheses 3 and 4 entailed an examination of the interaction between a smartphone cue and spelling errors on perceptions of the target's intelligence (H3) and conscientiousness (H4). As shown in Table 4, there was no significant interaction between tagline and spelling errors on the dependent variables. Thus, hypotheses 3 and 4 were not supported.

Table 5 provides descriptive statistics showing how the author of the brief and non-brief email message was perceived. As indicated by the two-way ANOVAs shown in Table 6, the data revealed main effects such that brevity significantly lowered perceptions of the

email sender's agreeableness and extraversion. The tests of hypotheses 5 and 6 entailed an examination of the interaction between a smartphone cue and brevity on perceptions of the target's agreeableness (H5) and extraversion (H6). As shown in Table 6, there was no significant interaction between tagline and brevity on the dependent variables. Thus, hypotheses 5 and 6 were not supported.

Discussion

The use of mobile phone technologies has increased in recent years (IDC, 2012), with 27% of these mobile devices qualifying as smartphones (comScore, 2011). This issue becomes even more pertinent when one considers that 25% of internet users in the US only access the web with a smartphone. This number increases to as high as 70% in developing countries (mobiThinking, 2012). Based on these factors, increased research on communication via smartphone is essential. Though there has been research on the topic of attributions made during CMC (Cramton, 2001; Vignovic & Thompson, 2010), no prior work has focused on attributions linked to users of emerging mobile technologies. This study highlights one of the potential pitfalls of mobile CMC use that could put smartphone users at a disadvantage.

The current study sought to determine the effect that experience with smartphones has on individuals' perceptions about the situational constraints confronted by those using smartphones to communicate. Individuals seem to note the physical constraint that typing on a smartphone keyboard imposes. Contrary to expectation, smartphone usage did not significantly heighten the overall perception that the email sender's attention was divided among competing demands. Rather, the data suggested a more nuanced effect, which

depends on the "eyes of the beholder," so to speak – that is, the degree to which the email recipient him or herself possesses experience with a smartphone. Individuals with relatively little smartphone experience appear to be especially likely to view email senders as having other demands on their attention when they know that a smartphone is being used. Contrariwise, individuals with relatively high experience with smartphones are less likely to perceive such demands when they know that a smartphone is being used; if anything, they appear to associate lower demands on attention with smartphone usage (see Figure 2). Though it is apparent that aspects of the recipient affect perceptions of the email sender, more research is needed to explain this interaction. Perhaps it has something to do with different usage habits among those with low and high mobile computing experience.

Consistent with previous research (Cramton, 2001; Vignovic & Thompson, 2010), this study showed that emails that were brief or contained spelling errors prompted negative attributions about the sender. Specifically, individuals who wrote a brief email were perceived to be less agreeable and extraverted than individuals who wrote a longer email. Also, individuals who sent an email that contained spelling errors were perceived to be less conscientious and intelligent than those who composed an email that did not contain spelling errors.

Results indicated that even though participants noted the ease of input constraints that operating a smartphone involves, the smartphone tagline did not significantly mitigate the negative effects of spelling errors and brevity. This finding can be viewed in the context of early research on the fundamental attribution error. One such seminal study is the so-called "Castro Study" in which participants rated others who wrote essays in favor of Fidel Castro

as being pro-Castro, even knowing that the writers were assigned to take this position in the essay (Jones & Harris, 1967). Jones and Harris's (1967) study demonstrated that individuals made attributions based on the most salient, or prominent, information available (in this instance, the essay), and ignored the context in which it was presented. Smith and Miller (1979) also found that the salience of situational information affected attributions, especially after a delay period. In the current context, a smartphone tagline though perceptible, may not be a salient enough cue to outweigh or alter the effects of spelling errors and brevity.

Whereas situational information did not significantly attenuate the negative effects of spelling errors in the current study, Vignovic and Thompson (2010) found that a cue indicating an individual was from another culture did attenuate unfavorable attributions. This discrepancy warrants consideration. Perhaps culture is a more salient feature than a smartphone tagline and thus plays a role in the attributions being made, or is seen as a more forgivable cause of spelling errors. Brevity, however, is not excused in either case, perhaps because it is an even more salient feature of communication than culture is, or it is not seen as forgivable regardless of the context. Another possibility is that spelling errors are viewed as more preventable or under the email author's control when faced with a smartphone constraint relative to a foreign language constraint. This theoretical implication should be explored. As such, this study serves as a potential catalyst for theory development pointing to a potential moderator (i.e., "preventability") which may shape the degree to which people explain errors in dispositional rather than situational terms. To this end, it should be noted that the spelling errors in Vignovic & Thompson's (2010) study were grammatical mistakes that would not be detected by an English spell checker (e.g., "back round" instead of

"background"), whereas the current study's spelling errors consisted of unambiguous typos –
that is, words that were misspelled in any context (e.g., "yuo" instead of "you").

Limitations and Future Research

One potential limitation of the current study is the imbalance in the gender of
participants, with almost twice as many women responding as men. This seems to be
consistent with the general demographic trends of Mechanical Turk users, which is likely due
to the number of females who are unemployed, underemployed, or stay-at-home parents
(Ipeirotis, 2010). There were, however, no differences in measured variables between men
and women in this study.

Another limitation of the study is the generalizability of the findings to all CMC
contexts. The study uses the context of two individuals who have never previously
corresponded and thus are relying on the text of the email to convey first impressions. The
results may not generalize to correspondence between two individuals who have experience
with each other from previous occasions.

An additional limitation may be that the rater of the email was not the one to whom
the email was addressed, but rather a third party who read the correspondence. Though this
could potentially change the way in which the participant views the sender of the email, it
does not signify a total absence of external validity in the study. There are many contexts in
which individuals read emails not directly addressed to them, such as virtual teams who
communicate via email while cc'ing others who are not direct recipients. Many times, first
impressions are formed during such exchanges.

Future research should focus on determining whether further manipulations of the smartphone tagline would affect the attributions being made. For the purpose of this study, the tagline "sent from my iPhone" was used, which gives an indication that the email was being sent from a mobile device. However, it may be too implicit of a cue. A tagline similar to "This message was sent using a portable device. Please excuse any brevity or typos" could potentially be used as an explicit cue to make the context more salient to the recipient, which may affect the attributions made. Taglines similar to this are becoming prevalent, and sometimes even recommended (Bradley-Banta, n.d.; Dial, 2009; Standss, 2010) by web log (blog) users.

Future research could also focus on attributions made using other forms of communication technologies, such as speech-to-text programs. These are used for hands-free communication while driving, as well as for simplified dictation. It would be interesting to determine whether the same effects found in this study would be found when these other sorts of technology are used. Additional research could also look at attributions made about emails sent from other forms of mobile devices, such as tablet computers. A tagline on an email sent from a tablet may convey a much different message than one sent using a smartphone. For example, email recipients may not view these technologies as being quite as limiting as smartphones because their screens and keyboards are much larger.

Practical Implications

The findings of this study indicate that individuals need to be cognizant of the hidden messages that they may be imparting in their CMC exchanges. The fundamental attribution error tells us that people will form dispositional attributions regarding an individual based on

the available information, and if an email is very brief or contains spelling errors, then the sender of the email may be judged negatively. Even with the addition of a contextual cue conveying a situational constraint, email recipients may still make these negative attributions.

Because the use of mobile devices to conduct business will likely increase in the near future, individuals should be aware that the taglines included in emails sent from these devices do not necessarily mitigate the effects of spelling errors or brevity on the attributions that may be made based on the content and form of their emails. While previous research has demonstrated that a contextual cue can sometimes allow forgiveness of these mistakes (Vignovic & Thompson, 2010), the current study demonstrates that this effect cannot always be relied upon. This is particularly a concern because of the number of individuals, both in the US and abroad, whose only access to the internet is through a smartphone. These individuals could potentially be disadvantaged when seeking jobs (i.e., corresponding with prospective employers) or communicating with business partners who are likely to make attributions based on the content of their emails.

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Table 1

Manipulation Checks

		Tagline			Spelling Errors			Brevity		
		No Tagline	Tagline	$t(df=231)$	No Errors	Errors	$t(df=237)$	Not Brief	Brief	$t(df=237)$
Perceived Tagline	*M*	3.10	4.10	-10.06*						
	SD	.66	.88							
Perceived Spelling Errors	*M*				2.67	4.39	-15.13*			
	SD				.81	.94				
Perceived Brevity	*M*							4.01	4.64	-7.60*
	SD							.71	.54	

*Note: * p < .001*

Table 2

Effect of Previous Experience on Perceptions of Constraints

	R^2	β	p
Criterion: Perceived ease of input	.030		.069
Previous Experience		.05	.826
Tagline		-.12	.523
Previous Experience x Tagline		-.08	.770
Criterion: Perceived demands on attention	.033		.049
Previous Experience		.56	.007
Tagline		.39	.039
Previous Experience x Tagline		-.65	.017

Note: N = 239

Table 3

Descriptive Statistics Tagline and Spelling Error Conditions

	No Errors	Spelling Errors
Perceived Intelligence		
No Tagline		
N	53	59
M	3.57	3.25
SD	.55	.71
Tagline		
N	63	64
M	3.58	3.17
SD	.52	.64
Perceived Conscientiousness		
No Tagline		
N	53	59
M	3.63	3.16
SD	.53	.81
Tagline		
N	63	64
M	3.58	3.05
SD	.65	.73

Table 4

ANOVAs Examining the Interaction of Spelling Errors and the Presence of a Smartphone Tagline on Perceptions of an Email Sender

Independent Variable	Dependent Variable	F	df (b/w, w/in)	p	η^2_p
Spelling Errors	Perceived Intelligence	21.49	1, 235	<.001	.08
	Perceived Conscientiousness	31.20	1, 236	<.001	.12
Tagline	Perceived Intelligence	.20	1, 237	.653	.00
	Perceived Conscientiousness	.78	1, 238	.378	.00
Spelling Errors x Tagline	Perceived Intelligence	.28	1, 239	.596	.00
	Perceived Conscientiousness	.14	1, 240	.710	.00

Table 5

Descriptive Statistics by Tagline and Brevity Conditions

	Not Brief	Brief
Perceived Agreeableness		
Not Tagline		
N	65	47
M	3.70	3.11
SD	.52	.55
Tagline		
N	66	61
M	3.54	3.12
SD	0.61	.54
Perceived Extraversion		
No Tagline		
N	65	47
M	3.32	2.84
SD	.63	.49
Tagline		
N	66	61
M	3.34	2.89
SD	0.59	.60

Table 6

ANOVAs Examining the Interaction of Brevity and the Presence of a Smartphone Tagline on Perceptions of an Email Sender

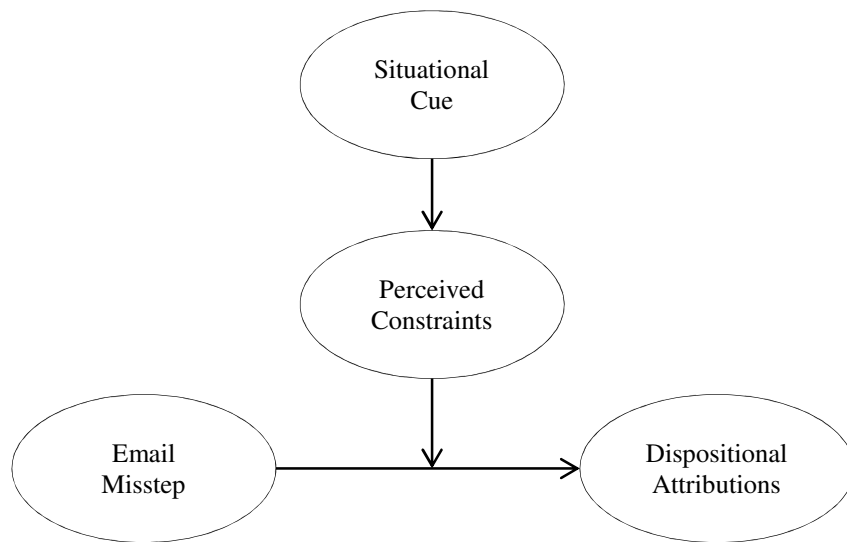| Independent Variable	Dependent Variable	F	df (b/w, w/in)	p	η^2_p
Brevity	Perceived Agreeableness	48.34	1, 235	<.001	.17
	Perceived Extraversion	37.18	1, 236	<.001	.14
Tagline	Perceived Agreeableness	.95	1, 237	.331	.00
	Perceived Extraversion	.28	1, 238	.598	.00
Brevity x Tagline	Perceived Agreeableness	1.44	1, 239	.231	.01
	Perceived Extraversion	.02	1, 240	.877	.00

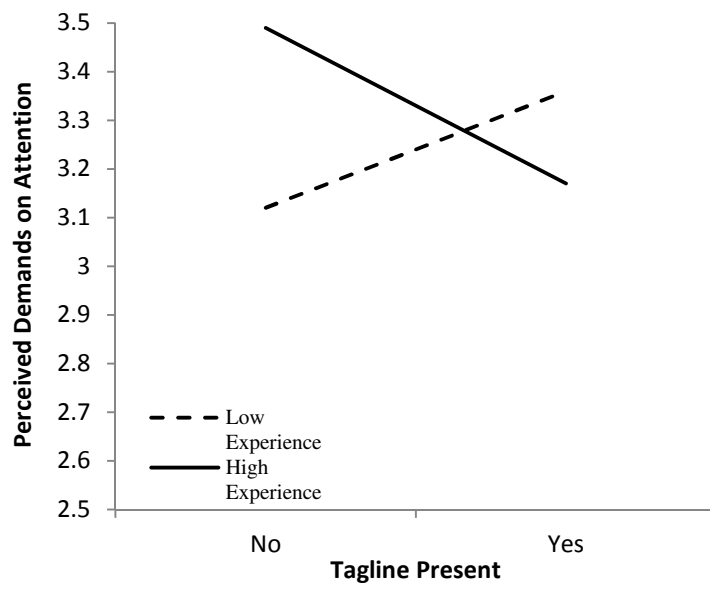*Figure 1.* Factors influencing attributions formed during CMC

Figure 2. Interaction of Smartphone Experience and Tagline on Perceived Demands on

Attention

APPENDICES

Appendix A

Thesis Proposal Manuscript

Attributions in Mobile Computer Mediated Communication

by
Kyle Edward Morgan

A proposal submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the degree of
Master of Science

Psychology

Raleigh, North Carolina

2011

APPROVED BY:

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Dr. Lori Foster Thompson
Chair of Advisory Committee

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Attributions in Mobile Computer Mediated Communication

Computer Mediated Communication (CMC) is one of the prominent contributions of the digital age. It impacts the way in which people stay in touch with friends and family and has even changed the way that business is run. CMC refers to any method of communicating online, such as instant messaging and email (Baron, 2008). Though this method of communication has been around for decades, with the advent of email occurring in 1971 (Baron, 2008), its use is rapidly evolving alongside the technologies which facilitate it, so much so that some individuals attribute the degradation of the English language to the technologies through which we communicate (Baron, 2008; Stephens, Houser, & Cowan, 2009).

One notable trend in computer-assisted business is the use of mobile technologies such as smartphones for CMC. Constraints inherent in these technologies have the potential to influence communication styles, with implications for how mobile CMC users are perceived and the relationships they develop with coworkers. The present study considers this practical problem from a theory-driven perspective. The purpose of this study is to investigate how to mitigate negative dispositional attributions which may otherwise result when using mobile technologies during CMC.

CMC's Fundamental Attribution Problem

It is clear that CMC, whether mobile or not, enables benefits upon which many workers and employers have come to rely. For example, it grants individuals the ability to communicate almost instantaneously with the other side of the world. In addition, it gives people adequate time to deliberate and respond (Jünemann & Lloyd, 2003), potentially

reducing the pressure to make a decision immediately, which they may experience during face-to-face interaction. These and other advantages make CMC a crucial component of today's work world.

Despite its benefits, there are potential drawbacks that accompany the use of CMC. Challenges stem from a lack of visual and auditory cues which can impede mutual knowledge known to be important for effective collaboration. Mutual knowledge refers to knowledge that two communicating partners share, and know they share, in common (Cramton, 2001). It increases comprehension between partners and is fostered in part by direct knowledge. Direct knowledge is created through firsthand experience with an individual, allowing for predictions about behavior based on knowledge of his or her environment and habits. During face-to-face collaboration, a great deal of information about a collaborator's environment and habits can be acquired through nonverbal signals and other visual and auditory cues. Such cues are often absent during CMC. Virtual collaborators who are geographically dispersed, for example, may implicitly assume a common environment (e.g., computer equipment, office dynamics, scheduling constraints) across sites, even when such an assumption is not warranted. In reality, different work sites often face unique constraints, which may not be immediately visible or detectable to people relying on CMC. In short, auditory and visual cue deprivation puts virtual collaborators at risk for the "mutual knowledge problem," which has been associated with misunderstandings and conflict during collaboration (Cramton, 2001).

Another concern surrounding the use of CMC involves errors and interpersonal missteps that can occur during communication. Examples include typographical errors, poor

word choices, a seemingly abrasive tone, or a failure to reply. These issues can be due to the

communicator's disposition (e.g., rudeness, carelessness), but they could also be the result of

situational constraints, such as time restrictions and distractions, physical disabilities, or

suboptimal equipment – for instance, a foreign keyboard or very small screen upon which to

view and edit email.

People are likely to seek explanations when faced with unusual or suboptimal CMC

exchanges, such as those marked by misspellings and interpersonal blunders. The

explanations they form are affected by the amount of direct knowledge they have about

collaboration partners and their environments (Cramton, 2001). Accordingly, the mutual

knowledge problem and communication missteps noted above are not isolated issues. They

interrelate and operate in tandem. Their effects on interpersonal perceptions and

collaboration dynamics can be informed by theory predating the age of virtual collaboration.

In particular, attribution theory is relevant.

According to attribution theory, individuals try to understand the causes and

implications of the events they witness (Ross, 1977). When these events are the behaviors of

others, attributions are typically categorized as situational or dispositional. A situational

attribution is one in which an individual sees the actions of another as based on

environmental constraints or facilitators. Conversely, a dispositional attribution is made

when an individual assumes that another's actions are based on the other's nature,

personality, or disposition.

Attribution theory is especially pertinent to CMC due to the aforementioned issues

surrounding cue deprivation. During face-to-face interaction, much of the message is

nonverbal or implicit (Carmel, 1999). Individuals using CMC do not have the situational

information present in face-to-face communication because they cannot see facial

expressions, hear inflections in their partners' voices, or perceive other potentially relevant

cues. Even voice-only communication such as a telephone call can impart certain inflections

that convey unspoken meaning which does not get transmitted during text-based CMC.

Conversational cues can be anything from nuances of meaning and frame of mind to details

that people might infer from their counterpart's demeanor or expression (Kiesler, Siegel, &

McGuire, 1984). These cues can also include non-conversational information such as being

able to see screaming children in the background or clues suggesting that one's conversation

partner is from a different culture. Because of this lack of situational information,

individuals are especially likely to attribute CMC counterparts' behaviors to their personality

characteristics or disposition (Amichai-Hamburger, 2008; Connell, 2001) rather than taking

the environment into consideration. This challenge is compounded by the fact that people

are already prone to making dispositional attributions, a phenomenon known as the

fundamental attribution error (Ross, 1977). The fundamental attribution error refers to the

propensity to underestimate situational factors in favor of dispositional explanations for

others' behaviors – explanations which could very well be incorrect. These incorrect

attributions can lead to adverse outcomes, ranging from miscommunications to

misconceptions during CMC.

   In support of the preceding arguments, the literature has documented the inclination

to explain misspelled and exceedingly brief communications in dispositional terms.

Specifically, past research has shown that spelling errors in CMC can lead to negative

attributions about the intellectual ability of the message's composer (Kreiner, Schnakenberg, Green, Costello, & McClin, 2002; Figueredo & Varnhagen, 2005). Grammatical and typographical errors have also been shown to reduce recipients' views of a sender's rationality (Wilson, 2005), competency (Jessmer & Anderson, 2001) and intelligence (Lea & Spears, 1992). If errors are found consistently during communication, then the sender could also be seen as careless (Lea & Spears, 1992) or lacking in conscientiousness (Vignovic & Thompson, 2010).

The tone and brevity of an email has also been shown to trigger dispositional attributions. Previous studies have shown that individuals who spend more time composing and editing their electronic communication are seen as having greater social orientation (Walther, 2007). Authors of polite messages are also viewed as more likeable (Jessmer & Anderson, 2001). Some individuals only impart the necessary information in a message, without any regard for pleasantries (Carmel, 1999). However, this may be construed as rude (Taylor & Martin, 2004). Individuals who are rude are typically thought to be low in agreeableness (McCrae & Costa, 1987), a construct often associated with warmth and friendliness (Graziano & Eisenberg, 1997). Past research has shown that people who send brief email messages are indeed perceived as low in agreeableness as well as extraversion, which is a disposition characterized as sociable, fun-loving, and talkative (McCrae & Costa, 1987; Vignovic & Thompson, 2010).

In sum, people are prone to forming dispositional explanations for communication characteristics (e.g., misspellings, brevity), which may actually be caused by situational or

environmental constraints they cannot see. It is in this context that the smartphone – a notable trend in modern day CMC – takes place.

Mobile CMC

Smartphones, or mobile phones that have email and other internet capabilities, are becoming increasingly popular. An early example is the Blackberry™, which was only recently outsold by the iPhone™ and Android™ systems ("Android surges," 2010). One survey reported that 42% of US respondents owned a smartphone ("Android surges," 2010) with that percentage being about 12% worldwide ("Smartphone Statistics," n.d.). Some estimates, however, place the percentage of Americans owning smartphones at about 17% (Gahran, 2010). Of the reported 12% of individuals worldwide who use smartphones, 48% use them to aid in their business activities ("Smartphone Statistics," n.d.).

Mobile technologies such as smartphones provide a relatively new medium for CMC. While freeing users from some limitations, smartphones introduce new constraints, presenting unique challenges in addition to those encountered when traditional CMC occurs through a full-sized computer. For example, smartphones typically include a standard QWERTY keyboard either on a small touchscreen or a tactile keyboard which places very small buttons below the screen. As such, they can be more difficult to use than desktop and laptop computers. Not only do smartphones have smaller keyboards, which can make input difficult, they also have smaller screens, which may cause typographical errors to be overlooked. Finally, people often use smartphones for CMC while they are engaged in other tasks (e.g., travelling, cooking, attending a meeting, watching television) where they do not have immediate access to an office or home computer. Smartphones are thus often used in

the midst of other activities. The presence of distractions, combined with the difficulty of using a small keyboard and screen, can contribute to typographical errors and brevity which may in turn adversely affect how email communicators are perceived.

Signaling Situational Constraints During Mobile CMC

In short, smartphones impose constraints which are likely to result in communication missteps that get blamed on the user rather than the technology. It should be noted, however, that past research has shown that email recipients will excuse blunders such as typographical errors when their communication partner's situational constraints are explicitly conveyed (Vignovic & Thompson, 2010). A cue signaling the use of a smartphone should thus reduce the fundamental attribution error during CMC. This premise is depicted in Figure 1, which shows the conceptual model driving the current research study.

One possible way to help email recipients realize the power of situational constraints on mobile CMC users' communication styles is to include a relevant "tagline" along with email messages sent from a smartphone. Indeed, smartphone software typically comes equipped with a default tagline – a "signature" of sorts included at the bottom of each email. This tagline informs email recipients that a smartphone was used to send the message. For example, at the time of this writing, "Sent from my iPhone" is the default tagline included on messages sent from an Apple® iPhone ™.

Such default taglines can be easily deleted or turned off so that they no longer appear. When present, they may serve as a situational cue allowing the recipient to infer the constraints imposed by the technology on the sender. For most individuals, especially those who do not use mobile phone keyboards on a regular basis, inputting text on a smartphone is

perceived to be more difficult than typing on a full-sized keyboard (Baron, 2008). Thus, one

of the major constraints imposed by using a smartphone is the difficulty of typing on a scaled

down keyboard, either physical or on a touchscreen. The smartphone tagline is expected to

signal this constraint to email recipients.

H1: A smartphone cue will reduce email recipients' perceptions of the sender's ease

of input.

Presumably, individuals who use mobile devices to send email typically do so when

they do not have immediate access to a full-sized computer, meaning they are away from

their everyday workstation. This increases the likelihood that mobile CMC occurs in the

midst of other activities rather than occurring during fully dedicated "computer time." Such

multitasking could impose cognitive or attentional constraints in addition to the physical

(keyboard, input) constraints indicated above. For example, the mobile CMC sender may be

pressed for time, sending a quick email while waiting in line at an airport or coffee shop.

The sender could also be distracted by things in his or her environment. Perhaps a parent

who is waiting with a sick child in the doctor's office wishes to keep up with work demands

and so is sending emails from his or her phone.

By indicating the use of a mobile technology, the smartphone tagline is expected to

signal time and attention constraints. These propositions will be tested.

H2: A smartphone cue will increase email recipients' perceptions of a sender's time

constraints.

H3: A smartphone tagline will heighten perceptions of demands on an email sender's

attention.

As noted earlier, spelling errors in CMC have been shown to reduce perceptions of intelligence and conscientiousness, whereas brevity reduces perceptions of agreeableness and extraversion. However, congruent with attribution theory, the negative effect of these communication styles can be attenuated when a contextual cue is added to the message. In a study by Vignovic and Thompson (2010), participants excused typographical errors (though not brevity) when given a cue indicating that the email sender was from a foreign culture. In the case of mobile technologies, a smartphone cue is expected to similarly act as a situational cue indicating the constraints placed on the sender. By offering this situational cue, it is expected that the effect of communication errors on assumptions about the sender's disposition should be reduced. That is, email recipients will make fewer dispositional attributions than they would without the cue.

> H4-H5: There will be an interaction between situational information and spelling errors such that a smartphone cue will reduce the negative effects of spelling errors on recipients' perceptions of an email sender's (H4) intelligence and (H5) conscientiousness.

> H6-H7: There will be an interaction between situational information and brevity such that a smartphone cue will reduce the negative effects of brevity on recipients' perceptions of an email sender's (H6) agreeableness and (H7) extraversion.

Experience with Mobile Technologies

As indicated above, a smartphone cue is expected to reduce the dispositional perceptions associated with spelling errors and brevity. This assumes, however, that the recipient of the email, or the perceiver, has knowledge of the difficulty associated with using

a mobile device to send emails. Individuals who have no experience using a mobile phone may underestimate or overestimate the difficulty of input as well as the time and attention constraints surrounding mobile CMC. Perhaps people with experience using mobile devices better appreciate the nontrivial challenges imposed by the technology. Alternatively, practiced users may consider it quite easy to type on a smartphone or may otherwise hold unique perceptions of the time and attentional demands occurring during mobile CMC. This is an area which needs exploration.

> RQ1-RQ3: Will an email recipient's prior experience with smartphones influence the degree to which a smartphone cue affects perceptions of the sender's (RQ1) ease of input, (RQ2) time constraints, and (RQ3) demands on his/her attention?

Email recipients' personal experience with smartphones may also affect how they perceive email messages marked by misspellings and brevity. Experienced people could attribute spelling errors and pithy replies to the situation even in the absence of clues indicating what kind of device was used to compose and send a message. In their study on the email communication between students and professors, Stephens, Houser, and Cowan (2009) found that students were likely to attribute the casual messages of other students to their frequent use of text and instant messaging. This suggests that some people are inherently aware of the effects technology imposes on social communication, even in the absence of explicit cues signaling technological constraints. Perhaps email recipients with experience using smartphones attribute spelling errors and brevity to the situation without being given a situational cue, in this case, the tagline. If so, a smartphone cue would have a

reduced effect on the dispositional attributions formed by experienced users. This possibility will be explored.

RQ 4-RQ5: Is there a three-way interaction between experience with smartphones, the presence of a smartphone cue, and spelling errors on (RQ4) perceived intelligence and (RQ5) perceived conscientiousness?

RQ 6-RQ7: Is there a three-way interaction between experience with smartphones, the presence of a smartphone cue, and brevity on (RQ6) perceived agreeableness and (RQ7) perceived extraversion?

Method

Participants

Participants for this study were recruited through Amazon's Mechanical Turk Service. This service gives researchers access to a large number of participants around the world through an online survey system. For the purpose of this study, respondents will be limited to those who live in the US and speak English as their first language. Participants in the current study were ##% male, and ##% had a bachelor's degree or higher. Overall, ##% were Caucasian, ##% were African-American, ##% were Asian, and ##% were of another ethnicity. The average age of participants was ## ($SD = \#.\#\#$). Participants were paid $.05 for their participation in this study.

Design

The current study used a 2 (smartphone cue) x 2 (spelling errors) x 2 (brevity) fully crossed design, resulting in 8 conditions. The cue variable's two levels are: (a) present, where the participant reads an email message accompanied by a mobile phone cue and (b)

not present, where no such cue is given. The spelling error variable also has two levels

corresponding to: (a) an email which contained no spelling errors and (b) an email which

contained spelling errors. Finally, the brevity condition's two levels were: (a) a very brief

email which was short and to the point and (b) a lengthier email which included non-

substantive conversational verbiage. In addition to the three manipulated independent

variables described above, this study includes a subject variable, prior experience, which

refers to the participants' experience with a smartphone. The seven dependent variables

included in this study are perceptions of the email sender's: ease of input, time constraints,

demands on attention, intelligence, conscientiousness, agreeableness, and extraversion.

Procedure

Participants were informed that the purpose of this study is to examine individuals'

perceptions of coworkers they meet through email. After providing informed consent (See

Appendix A), participants were randomly assigned to one of eight websites corresponding to

the eight study conditions. Participants read an email exchange between two people who

work for the same organization but have never met. The first employee, Luis Hagan, sent an

email message to the second, David Hanson, referred to later as the "target," who replies.

The context was one in which Luis contacts David to set up a meeting for a project the two

were to be working on together. The initial email, from Luis, contained 161 words with no

typographical errors. See Appendix B.

The first email message, from Luis, was identical across conditions. The

manipulations were contained in the target's reply. Participants saw the reply corresponding

to the condition to which they have been randomly assigned. The replies corresponding to

each study condition are shown in Appendix B. The brief reply contained 7 words, compared to the 40 words included in the standard (i.e., non-brief) reply. The additional text in the lengthier email was not substantive, that is, did not add additional information which may influence participants' perceptions beyond that of the manipulation. For instance, whereas "Let's meet in your office" appeared in the lengthier email, in the brief email it was shortened to "Your office."

Half of the brief replies contained 2 misspellings and half were error-free. Half of the standard (non-brief) replies contained 6 misspellings and half were error free. Misspellings used in the emails were typographical, not grammatical, in nature. For instance, omitted letters or incorrect capitalizations were used, whereas homophones were not. Half of all replies included the following tagline: "Sent from my iPhone."

Participants were allowed to spend as much time as they wished reading the email exchange. They were informed that they were going to be asked to rate their perceptions of David (i.e., the target individual who replied to the initial email) once they finished reading the correspondence. When they finished reading the correspondence, participants were asked to click "next," after which they will no longer had access to the email exchange. They then rated the target on the seven dependent variables of interest. Afterwards, they were asked to respond to items that gather information about their demographics and their experience with smartphones. Finally, participants were thanked, debriefed, and dismissed.

Data collection was terminated after 16 surveys are completed in each of the 8 condition. An *a priori* power analysis was conducted using G*Power 3 (Faul, Erdfelder, Lang, & Buchner, 2007). The results of the power analysis indicated that in order to

appropriately test the hypotheses, a sample size of 128 would have an adequate statistical power of .8 for α = .05 to detect a medium effect size of .25 (see Cohen, 1998).

Measured Variables

      Manipulation checks (6 items, Appendix C). Participants responded to 6 manipulation check items which were designed to assess detection of the stimulus conditions – cue (2 items), brevity (2 items), and spelling errors (2 items). Examples include: "David used an iPhone to reply to Luis," "David's reply was very brief," and "David's reply contained spelling errors."

      Perceived ease of input (8 items, α = .##, Appendix D)**.** Eight items were created for the purpose of this study to assess participants' perceptions of the target's ease of input. A sample item is, "David probably had difficulty typing the email message he sent to Luis" (reverse scored). Higher scores on this scale represented heightened perceptions of the ease with which the target email sender composed his message.

      Perceived time constraints (6 items, α = .##, Appendix E). Six items were created for the purpose of this study to assess participants' perceptions of the target's time constraints. A sample item is, "David probably took his time when writing the email" (reverse scored). Higher scores indicated increased perceptions of time constraints imposed on the target email sender while he composed his message.

      Perceived demands on attention (6 items, α = .##, Appendix F). Six items were created for the purpose of this study to assess participants' perceptions of the target's available attention. A sample item is, "David probably was distracted while typing his reply

to Luis." Higher scores indicated increased perceptions of demands on the target's attention while he composed his message.

Perceived intelligence (7 items, α = .##, Appendix G). Seven items were created for the purpose of this study to assess participants' perceptions of the target's intelligence. A sample item is, "David probably is good at solving problems."

Perceived conscientiousness (10 items, α = .##, Appendix H). Ten items from Goldberg's International Personality Item Pool (IPIP; 1999) were used to assess participants' perceptions of the target's conscientiousness. Items were rated on a 1 (Very Inaccurate) to 5 (Very Accurate) scale. A sample item is, "David probably pays attention to detail."

Perceived agreeableness (10 items, α = .##, Appendix H). Ten items from Goldberg's International Personality Item Pool (IPIP; 1999) were used to assess participants' perceptions of the target's agreeableness. Items were rated on a 1 (Very Inaccurate) to 5 (Very Accurate) scale. A sample item is, "David probably makes people feel at ease."

Perceived extraversion (10 items, α = .##, Appendix H). Ten items from Goldberg's International Personality Item Pool (IPIP; 1999) were used to assess participants' perceptions of the target's extraversion. Items were rated on a 1 (Very Inaccurate) to 5 (Very Accurate) scale. A sample item is, "David probably knows how to captivate people."

Prior experience (6 items, α = .##, Appendix I). Six items were created for the purpose of this study to assess participants' experience using smartphones. A sample item is, "I have experience using a smartphone."

A 1 (Very Inaccurate) to 5 (Very Accurate) scale was used for the conscientiousness, agreeableness, and extraversion items. All other items used a 1 (*strongly disagree*) to 5

(*strongly agree*) Likert-type rating scale. Responses to any negatively worded statements were reflected prior to aggregating the items comprising each scale.

Proposed Analyses

A 2 x 2 x 2 MANOVA with follow-up univariate analyses was conducted to test hypotheses 1-7. The three independent variables were presence of cue, spelling errors, and brevity. The seven dependent variables were: ease of input, time constraints, demands on attention, intelligence, conscientiousness, agreeableness, and extraversion. The first three hypotheses were tested by examining the main effect of a smartphone cue on (H1) perceptions of the target's ease of input, (H2) perceptions of the demands on the target's attention, and (H3) perceptions of the demands on the target's attention. The tests of hypotheses 4 and 5 entailed an examination of the interaction between a smartphone cue and spelling errors on perceptions of the target's (H4) intelligence and (H5) conscientiousness. The tests of hypotheses 6 and 7 entailed an examination of the interaction between a smartphone cue and brevity on perceptions of the target's (H6) agreeableness and (H7) extraversion.

Seven multiple regression analyses were conducted to examine this study's research questions. Prior experience with smartphones served as a continuous predictor variable, and this study's manipulated variables (cue, spelling errors, and brevity) were dummy coded for the purpose of this analysis. The criterion of interest varies by research question, as follows. To investigate RQ1, perceived ease of input was regressed onto (a) prior experience with smartphones, (b) the presence of a smartphone cue, and (c) the interaction between these two predictors. The multiple regression analyses conducted to test RQ2 and RQ3 included the

same predictors indicated above but different criteria. Perceived time constraints served as the criterion in the multiple regression conducted to investigate RQ2, and perceptions of the demands on the target's attention served as the criterion in the multiple regression conducted to investigate RQ3. The following three predictor variables and their interaction terms were included in the multiple regression analyses conducted to examine RQ4-RQ5: experience with smartphones, the presence of a smartphone cue, and spelling errors. Perceived intelligence was the criterion included in the analysis conducted to test RQ4, and perceived conscientiousness was the criterion included in the analysis conducted to test RQ5. The two final multiple regression analyses included the following predictor variables and their interaction terms: experience with smartphones, the presence of a smartphone cue, and brevity. Perceived agreeableness (RQ6) and perceived extraversion (RQ7) served as the two criterion variables of interest.

Appendix A-1
INFORMED CONSENT FORM for RESEARCH

Principal Investigator: Kyle Morgan   Faculty Sponsor: Dr. Lori Foster
Thompson

Introduction
You are being asked to take part in a research study directed by Kyle Morgan from North
Carolina State University. The study has been designed to test individuals' perceptions
regarding email messages.

Information
If you agree to participate in this study, you will be asked to read and evaluate an email
message and then answer follow-up questions about yourself and your perceptions of the
email sender. The survey should take no longer than ## minutes to complete.

Risks and Discomforts
None foreseeable

Benefits
This study is intended to further the body of knowledge surrounding the topic of computer
mediated communication.

Confidentiality
Your participation in this study is confidential. Only the primary investigators will have
access to your individual data. All results will be reported in an aggregated format (e.g., as
averages). Under no circumstance will any individual participant be identified in a
publication or presentation describing this study**.**

Costs, Responsibilities, and Compensation
For your participation, you will receive $.05 upon completion of the study. Mechanical Turk
is designed so that payment / HIT approval are contingent on study completion. However, no
further negative consequences will be incurred by participants who choose to withdraw from
the study prior to completing it. Several items will be embedded in the study to ensure that
participants are paying attention to the stimuli. Participants who consistently answer these
items incorrectly may not receive compensation.

Contact
If you have questions about this study or the procedures, you may contact Kyle Morgan at
kmorgan@ncsu.edu. If you feel that you have not been treated according to the descriptions
in this form, or your rights as a participant in research have been violated during the course
of the project, you may contact Ms. Deb Paxton, NCSU's IRB Administrator, 919.515.4514
or Arnold Bell, NCSU's IRB Chair, 919.515.4420.

Participation

Your participation in this study is voluntary. If you decide to participate, you may withdraw from the study at any time should you wish to do so. If you choose to withdraw from the study before data collection is completed, your data will not be recorded.

CONSENT
I have read and understand the above information. Continuing this study indicates, "I agree to participate in this research with the understanding that I may withdraw at any time."

Appendix A-2
Email Stimuli

Initial email:

From: Luis Hagan
To: David Hanson
Subject: Upcoming Publicity Campaign
Date: Mon, 14 Mar 2011 9:36 AM

David,

We haven't met, but I got your contact information from Erik Gillmore, the head of our public relations department.   He told me to get in touch with you so that we can work together on the upcoming publicity campaign. The objective of the campaign is to get our company's name out into the community and foster a sense of good-will towards the firm.

I'd like to set up a meeting with you for some time in the near future so that I can fill you in on some of the details and we can start on a plan of action for the campaign. I suggest that we meet next Thursday at 9:00 a.m. We can either meet in my office (I'm in the Parkside Office Center, Suite 375), or in yours, whichever is more convenient for you. Let me know if these arrangements work. If not, we can make others. I look forward to working with you.

Best,
Luis Hagan

Replies

	Not Brief	Brief
Not Misspelled	**From:** David Hanson **To:** Luis Hagan **Subject:** Re: Upcoming Publicity Campaign **Date:** Mon, 14 Mar 2011 3:17 PM Yes, Erik mentioned that you'd be contacting me. A meeting next Thursday at 9 works for me. Let's meet in your office. Mine would be a bit noisy since there is remodeling scheduled for that day. See you soon, David	**From:** David Hanson **To:** Luis Hagan **Subject:** Re: Upcoming Publicity Campaign **Date:** Mon, 14 Mar 2011 3:17 PM Thursday at 9 works. Your office. David
Misspelled	**From:** David Hanson **To:** Luis Hagan **Subject:** Re: Upcoming Publicity Campaign **Date:** Mon, 14 Mar 2011 3:17 PM Yes, Erik mentioned that youd be contacting me. A meeting next thrusday at 9 works for me. Lets meet in your office. Mine would be a bit noisy since there is remodeling shceduled for that day. See yuo soon, David	**From:** David Hanson **To:** Luis Hagan **Subject:** Re: Upcoming Publicity Campaign **Date:** Mon, 14 Mar 2011 3:17 PM 9 on thrusday works. yuor office. David

Half of the email replies above were accompanied by the following tagline:
Sent from my iPhone

Appendix A-3
Manipulation Checks

Please answer the following questions:

Cue:
1. David was probably using a smartphone when he replied.
2. David used an iPhone to reply to Luis.

Brevity:
1. David's reply was very brief.
2. David's reply was short and to-the-point.

Spelling Errors:
1. David's reply contained spelling errors.
2. David did not use a spell-checker before sending his emails.

Response Options:
1. Strongly Disagree
2. Disagree
3. Neither Agree nor Disagree
4. Agree
5. Strongly Agree

Appendix A-4
Perceived Ease of Input

On a scale of 1 to 5, please indicate how accurate you believe the following statements are in reference to David, the author of the second email:

David probably…
1. Had difficulty typing the email message he sent to Luis. (R)
2. Was frustrated by the keyboard he was using. (R)
3. Was using a familiar personal computer.
4. Had to spend some time searching for the correct letters when typing. (R)
5. Was comfortable typing the message.
6. Needed very little effort to type the reply to Luis.
7. Had difficulty typing carefully on the keyboard he was using. (R)
8. Had to look at his keyboard when typing. (R)

Response Options:
1. Strongly Disagree
2. Disagree
3. Neither Agree nor Disagree
4. Agree
5. Strongly Agree

*(R) indicates item is reverse scored.

Appendix A-5
Perceived Time Constraints

On a scale of 1 to 5, please indicate how accurate you believe the following statements are in reference to David, the author of the second email:

David probably…
1.   Was in a hurry when typing the email.
2.   Took his time when typing the email. (R)
3.   Did not rush to finish typing the email . (R)
4.   Had to finish typing his email quickly.
5.   Felt few time constraints when typing his email to Luis. (R)
6.   Rushed to another necessary task right after finishing his email to Luis.
7.   Felt a sense of urgency when typing his email to Luis.

Response Options:
   1. Strongly Disagree
   2. Disagree
   3. Neither Agree nor Disagree
   4. Agree
   5. Strongly Agree

*(R) indicates item is reverse scored.

Appendix A-6
Perceived Demands on Attention

On a scale of 1 to 5, please indicate how accurate you believe the following statements are in reference to David, the author of the second email:

David probably…
1.   Was multitasking while typing his reply to Luis.
2.   Found it difficult to pay attention to the email he was writing.
3.   Was able to dedicate his attention to the message. (R)
4.   Was preoccupied with something else.
5.   Was distracted while typing his reply to Luis.
6.   Had his attention divided between composing his reply and something else he was doing at the time.

Response Options:
1. Strongly Disagree
2. Disagree
3. Neither Agree nor Disagree
4. Agree
5. Strongly Agree

*(R) indicates item is reverse scored.

Appendix A-7
Perceived Intelligence

On a scale of 1 to 5, please indicate how accurate you believe the following statements are in reference to David, the author of the second email:

He probably…
- Knows how to deal with new, challenging situations.
- Is good at solving problems.
- Is a slow learner. (R)
- Is intelligent.
- Is capable of thinking abstractly.
- Is quick to grasp new concepts.
- Has trouble understanding basic concepts. (R)

Response Options:
1. Strongly Disagree
2. Disagree
3. Neither Agree nor Disagree
4. Agree
5. Strongly Agree

Appendix A-8
Modified International Personality Item Pool (Goldberg, 1999)

On a scale of 1 to 5, please indicate the extent to which you find accurate the following statements about David, the author of the second email:

Extraversion Items:

He probably...
1. Feels comfortable around people.
2. Makes friends easily.
3. Is skilled in handling social situations.
4. Is the life of the party.
5. Knows how to captivate people.
6. Has little to say. (R)
7. Keeps in the background. (R)
8. Would describe his experiences as somewhat dull. (R)
9. Doesn't like to draw attention to himself. (R)
10. Doesn't talk a lot. (R)

Agreeableness Items:

He probably...
1. Has a good word for everyone.
2. Believes that others have good intentions.
3. Respects others.
4. Accepts people as they are.
5. Makes people feel at ease.
6. Has a sharp tongue. (R)
7. Cuts others to pieces. (R)
8. Suspects hidden motives in others. (R)
9. Gets back at others. (R)
10. Insults people. (R)

Conscientiousness Items:

He probably ...
1. Is always prepared.
2. Pays attention to details
3. Gets chores done right away.
4. Carries out his/her plans.

5.   Makes plans and sticks to them.
6.   Wastes time. (R)
7.   Finds it difficult to get down to work. (R)
8.   Does just enough work to get by. (R)
9.   Doesn't see things through. (R)
10. Shirks his duties. (R)

Response Options:
1.   Very Inaccurate
2.   Moderately Inaccurate
3.   Neither Inaccurate nor Accurate
4.   Moderately Accurate
5.   Very Accurate

*(R) indicates item is reverse scored.

Appendix A-9
Smartphone Experience Questions

On a scale of 1 to 5, please indicate how accurate you believe the following statements to be in reference to your experience with a smartphone:

1.   I am familiar with using a smartphone.
2.   I have used a smartphone before.
3.   I have experience using a smartphone.
4.   I know what it is like to type on a smartphone.
5.   I use a smartphone as part of my daily routine.
6.   My friends would say I'm always on my smartphone.

Response Options:
1. Strongly Disagree
2. Disagree
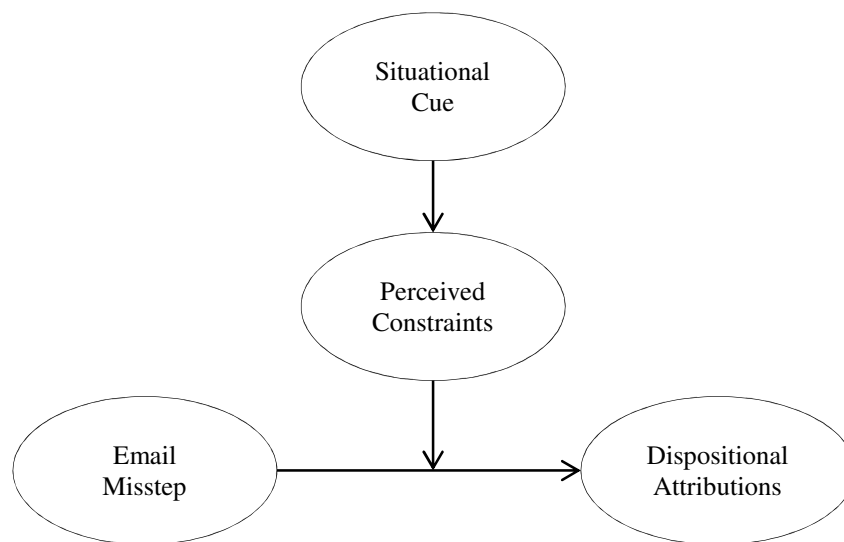3. Neither Agree nor Disagree
4. Agree
5. Strongly Agree

Figure 1a. Factors influencing attributions formed during CMC