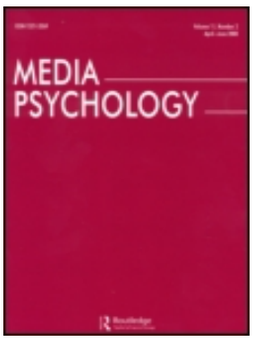

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# Computer-Mediated Communication Versus Vocal Communication and the Attenuation of Pre-Interaction Impressions

JOSEPH B. WALTHER
*Department of Communication and Department of Telecommunication, Information Studies & Media, Michigan State University, East Lansing, Michigan, USA*

DAVID C. DEANDREA and STEPHANIE TOM TONG
*Department of Communication, Michigan State University, East Lansing, Michigan, USA*

*Conflicting theoretical approaches yield divergent predictions about the effects of telephones versus computer-mediated communication (CMC) in the persistence or dissipation of pre-interaction expectancies. Moreover, different theoretical orientations and their underlying assumptions often invoke different methodologies, which can bias the results of research. The current studies articulate and assess rival hypotheses from alternative theoretical paradigms to uncover how CMC and vocal communication affect interpersonal impressions. Methodological issues in past CMC research are evaluated that limit the generalizability of previous findings in the area. Experiments employing alternative assumptions and methods indicate that CMC is functionally equivalent to vocal communication in its ability to ameliorate expectancies and that in some cases it can be superior in transmitting positive impressions.*

How Internet communication affects users' impressions of other people online is an issue that has been at the center of much computer-mediated communication (CMC) research, yet understanding about technology's effects remains divided. Do the characteristics of text-based CMC exaggerate or

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Address correspondence to Joseph B. Walther, Department of Communication, 473 Communication Arts Building, Michigan State University, East Lansing, MI 48824-1212. E-mail: jwalther@msu.edu

ameliorate expectations about conversational partners in comparison to interaction involving multiple cue systems? Some researchers argue that because CMC occludes nonverbal cues, CMC users are unable to recognize when the pre-interaction expectancies they hold about a conversational partner's personality are not accurate. Even bogus expectancies that are invoked prior to interaction have been predicted to persist throughout CMC interaction because of the absence of vocal cues on which communicators rely in order to detect discrepancies between their preconceptions about a partner and that person's actual nature (Epley & Kruger, 2005). Other perspectives argue that CMC users employ and detect various verbal and textual cues within written communication to overcome the loss of nonverbal cues. Using these transformations, CMC users can achieve relatively normal interpersonal impressions, or even construct impressions more favorably than they might in face-to-face (FtF) interaction (Walther, 1996).

The potential effects of CMC on interpersonal perceptions continue to capture societal concern (e.g., Rosenbloom, 2008), and understanding about the capacities and affordances of text-based interaction versus multimodal channels remains conflicted. It may be the case, as some have observed (e.g., Baym, 2009), that people less often meet through text-based systems, such as discussion lists and text-based role-playing games, than they used to. Many new Internet platforms allow individuals to garner minimal first impressions of one another through photos and biographical statements. Yet, many of these systems offer follow-up interactions through text rather than voice. When encountering a friend of a friend on Facebook, for instance, or especially when sighting a prospective date on Match.Com, pictures and descriptions may provide stereotyped first impressions. But text-based synchronous chat or asynchronous message exchanges are the channels that these systems provide for users to interact, refine impressions, and evaluate the prospect of continued interaction (Baker, 2008; Fiore & Donath, 2004). It is precisely because this combination has become so common—minimal pictorial and biographic information and text-based follow up—that research on the capacity of text-based systems to modify first impressions remains important.

In addition to theoretical conflicts over the nature of CMC, comparative media research involving CMC has also exhibited disagreements over research methods and their hidden effects. Some researchers suggest that otherwise quite defensible experimental strategies used in other settings may overly control online interaction in ways that limit internal and external validity of some studies (e.g., Spears & Lea, 1992; Walther, 1992, 2010). Even in the last decade, in which CMC has become quite commonplace, disparate conceptualizations about its fundamental nature have led to research operationalizations of CMC that reflect conflicting fundamental assumptions about the nature of electronic communication.

These two issues—the perseverance of expectancies via different interactive media and assumptions about the nature of CMC—were brought

together most recently in experiments by Epley and Kruger (2005), which found that CMC leads to the persistence of pre-interaction stereotypes for different levels of intelligence and extraversion to a greater extent than does voice-based communication. Their studies not only provide a prototypical example of a "cues-filtered-out" (CFO) theoretical approach to the effects of CMC (see Culnan & Markus, 1987; Walther & Parks, 2002). They also present certain methodological approaches that reflect assumptions about technology that make great sense from one perspective, yet raise questions from other perspectives. Their prototypical approach, from one perspective, offers an opportunity to highlight discrepancies in the extant literature about the nature of CMC and how it is studied. The present work focuses on three theoretical approaches—the lack of social context cues, social information processing theory, and the hyperpersonal model of CMC—in the context of the persistence of pre-interaction expectancies. It highlights different assumptions about communication, the operationalizations of which have the potential to bias findings in favor of one theoretical approach versus another. The research presents two empirical studies of textual CMC versus a voice-enabled channel, and an examination of naturally occurring language differences between media. The current research provides a reversal of conclusions about the effects of CMC in the persistence or amelioration of pre-interaction expectancies.

## CMC THEORIES

Detailed summaries of prominent, competing perspectives on the interpersonal nature of CMC have appeared in several sources (e.g., Walther, 1996, 2006), and therefore relatively brief synopses are presented here.

### Lack of Social Context Cues

As alluded to above, some CMC research posits that the medium's lack of nonverbal cues constrains its ability to support interpersonal communication. These CFO approaches suggest that when nonverbal cues are absent, the interpersonal functions that nonverbal cues generally perform are eliminated, including the formation of individuating impressions (Hiltz, Johnson, & Turoff, 1986), the ability to convey status or charisma (Sproull & Kiesler, 1991), and the display of credibility and attractiveness sufficient to exert peripheral influence in online persuasive appeals (Guadagno & Cialdini, 2002). As a result, CMC may be more impersonal and less relationally oriented than in FtF communication (Kiesler, Siegel, & McGuire, 1984). Such positions have received empirical support in several experimental settings, primarily in time-limited small group decision-making studies, with groups communicating FtF or via real-time (synchronous) CMC. Such studies have shown

less socioemotional communication, fewer episodes of consensus, greater hostility, and other impersonal effects as a result of CMC (see for review Walther, 2006). From this perspective, Epley and Kruger (2005) argued, it is too difficult to recognize the falsity of a bogus, pre-interaction impression.

## Social Information Processing

The social information processing (SIP) theory of CMC (Walther, 1992) characterizes CMC as adapting to the absence of nonverbal cues. It posits that users change their language and timing to express affective and socioemotional messages. Research has demonstrated that when CMC users are sufficiently motivated, they (a) adapt into discourse information about themselves, their emotions, and their attitudes (e.g., Walther, 2007; Walther, Loh & Granka, 2005), and (b) draw inferences based on others' uses of such cues in order to form impressions and develop relationships (e.g., Ramirez, Zhang, McGraw, & Lin, 2007). Other work has identified language cues that evoke a variety of personality impressions online, including extraversion (Gill & Oberlander, 2003), power and status (Adkins & Brashers, 1995; Selfe & Meyer, 1991), and sarcasm and irony (Hancock, 2004).

## Hyperpersonal CMC

The hyperpersonal model of CMC (Walther, 1996) suggests that several aspects of the medium facilitate particularly positive interpersonal dynamics online. This model offers the greatest distinction from the lack of social context cues hypothesis. When CMC users confront the absence of nonverbal cues, rather than experience depersonalization, they may actually create very positive impressions by capitalizing on several capabilities the channel offers. CMC allows senders to construct and edit messages more deliberatively than offline channels do, giving them heightened control over their self-presentation and the social desirability of their messages (Walther, 2007). Receivers of such messages adapt to the exclusion of visual and vocal information by constructing impressions of partners based on the cues to similarity and attractiveness that senders selectively convey (Ramirez & Zhang, 2007; Walther, Slovacek, & Tidwell, 2001). Receivers' feedback to senders reinforces the cycle of exaggerated performance and perception, transforming online encounters to reflect more positive impressions and greater intimacy in CMC than in some FtF settings (Walther, 1997).

As the preceding discussion should make clear, different positions exist regarding the effects of CMC on the generation of impressions, relative to other media. Each position has been supported in empirical research in different contexts, as well. As a result, it is important to examine whether and what contextual factors were present in these studies that may lead to disparate results. This objective is facilitated by a review and replication

of a recent study on stereotypes and CMC (Epley & Kruger, 2005) that was informed by a CFO approach. That particular work offers a paradigm case in how certain ontological and theoretical assumptions led to certain methodologies and results. Contrasting assumptions about CMC guided by SIP and the hyperpersonal model are presented to exemplify how these theoretical approaches differ, and empirical studies ultimately provide a test of their merits.

## PREVIOUS RESEARCH

Epley and Kruger (2005) examined the difference between vocal communication and CMC during brief interviews to dispel falsely instilled expectations about another person. They argued that because e-mail has no nonverbal cues it is too ambiguous to convey people's intended meaning, which they equated with creating an impression of who they are individually. This makes CMC ineffective for recognizing the falsity of a bogus, pre-existing expectation about a partner. Epley and Kruger's (2005) experiments instilled expectancies among naïve "interviewers" by providing them pre-interaction profiles featuring bogus racial and biographical cues of "interviewees" that led to different impressions of intelligence. In all cases, the interviewees were actually randomly assigned males. Interviewers were provided six standardized interview questions to ask.

Interviews were conducted using two different media conditions. Half the interviewers asked the interviewees the questions and heard their responses via a telephone-like audio system. Interviewers were instructed to ask their questions one at a time before each interviewee's answer and to say nothing else. The other condition was a synchronous CMC chat system,[1] with several notable constraints. Rather than communicate with real dyadic partners, a confederate transcribed "the responses of each target in the voice condition ... and e-mailed (them) to an interviewer in the e-mail condition"; the purpose of this strategy was to "ensure that these responses did not systematically differ between the e-mail and voice conditions" (Epley & Kruger, 2005, p. 416). Interviewers rated their partners' intelligence afterward. CMC interviewers' ratings of their ostensible partners' intelligence showed significant differences reflecting the direction of the pre-interaction expectancy, whereas no differences persisted in the voice condition. Moreover, a significant difference obtained between the ratings of the targets in the unintelligent conditions, where the CMC condition was much lower than the voice condition; no differences obtained between ratings of the ostensibly intelligent partners.

These methods raise several issues about the research approach, its implicit assumptions about communication and technology, and the effects to which they contributed. These issues go beyond issues of construct validity

in a single research effort (see Brewer, 2000); they help to surface assumptions about communication processes and the nature of technology, with particular regard to synchrony, interactivity, and the linguistic differences and similarities between CMC and speech.

## Interactivity

One strategy in Epley and Kruger's (2005) research has to do with their prevention of interactivity in voice and electronic channels. Interviewers were instructed to transmit the questions only, and presumably interviewees transmitted only a whole answer (in voice; in CMC a confederate transcribed a voice-interviewee's response). Is the lack of interactivity a valid feature of vocal interaction, or CMC chat? Might its absence differentially affect perceptions?

Interactivity involves a range of responsive behaviors, from simple backchanneling (e.g., "uh huh") to conversational adjacency pairs and beyond. Rafaeli (1988) defines interactivity as the accumulation of communicative utterances in such a way that meaning emerges as further messages implicitly refer back to prior messages. Interactivity requires exchanges beyond linguistic adjacency pairs (such as question-and-answer): a series of related exchanges in which subsequent messages refer to prior messages and are interpretable in that context. Interactivity is expected to increase acceptance, satisfaction, task performance, motivation, fun, and sociability (Rafaeli & Sudweeks, 1998). Similarly, Burgoon et al.'s (2000) definition of interactivity also mentions "contingency" (or "interdependent message exchange"; Burgoon et al., 2002, p. 660) in which each message depends on prior contributions. Interactions with greater levels of contingent interactivity lead to more positive social outcomes (i.e., sociability, trust, involvement, task attraction, etc.; Burgoon, Buller, & Floyd, 2001).

The interviews in Epley and Kruger's (2005) research were prevented from achieving interactivity in two ways. First, interviewers were admonished not to add any statements beyond asking questions. This research strategy imposes a constraint that questionably reflects the natural use of e-mail or chat, which offers the potential for give-and-take, follow-up questions or remarks, affirmations, confirmations, and transitions (e.g., "okay, next question . . . "). Second, interactivity was constrained because there was no actual interviewee in the CMC conditions (while there were in the voice conditions) who could provide interactive responses. Even if they did not change their words, the voice-condition partners might make up for these constraints by altering their vocalic behaviors in terms of stress, pitch, timing, and the like. Actual CMC users modify their words and keyboarding cues to achieve similar effects, using intentional misspellings, emoticons, language variations, and timing, and other cues (for review, see Walther, 2006). Without actual CMC interviewees, no such accommodation could be made. Thus the occlusion

of interactivity may have affected one condition differently than the other, challenging the internal validity and raising questions about the external validity of the procedures. Regarding generalizability, Epley and Kruger (2005) concluded that, "given the ubiquity of electronic communication, the effects we have documented may have both frequent and far-reaching implications for the nature of impressions formed in everyday life" (p. 421). However, the question remains, when interactive communication takes place among actual partners, do impressions become more individuated and less prone to preconceived expectations, or does the absence of nonverbal cues prevent the amelioration of expectancies even when other factors are less artificially constrained?

## CMC as "Speech Minus Voice"

The next assumption that can be identified from previous research focuses on the relationship between CMC and spoken communication. Transcribing the voice condition's interviewees' responses into text in order to provide replies to the CMC interviewers suggests that naturally occurring CMC messages are comprised of the same language that an individual produces in speech, simply denuded of voice. The research strategy ensuring that interviewees' "responses did not systematically differ between the e-mail and voice conditions" begs the question of how to compare CMC and voice, if not for systematic differences. Epley and Kruger (2005) considered this a critical methodology with which to establish that voice carries more information than words that are typed rather than spoken, and that potential variation in verbal content between speech and CMC might comprise a confound rather than a realistic and systematic difference between these channels. Their treatment eliminated potential natural differences between speaking and writing, showing keenly how methods reflect assumptions about the nature of communication and media.

The underlying question of whether the same words influence impressions when they are written as much as they do when spoken, is only the same question as "What is the difference between e-mail and speech?" if and only if CMC users write the same words that they speak. This is a fundamental question about speaking and electronic discourse. We suggest that CMC users, knowing there is no vocal component to CMC, do not simply type out the same words they would have spoken, but rather they choose different words, symbols, and statements to express themselves online in a manner that compensates for the nonverbal cues they do not have.

In order to address these concerns, the present research allowed dyads to interact freely within question-and-answer interviews. We conducted two studies, and supplemented our research with analyses of the participants' messages to explore further the nature of voice-based versus written online communication.

## STUDY 1

An experiment was conducted to re-examine the effects of CMC versus voice-based communication on the perseverance of bogus intelligence expectancies. Competing hypotheses were drawn from the theoretical perspectives described above.

### Hypotheses

The hyperpersonal model of CMC suggests that interviewees may exploit CMC to optimize their self-presentation and particularly to overcome negative expectations to a greater extent than individuals communicating in vocal channels, resulting in a different medium-by-expectancy effect:

H1: Post-discussion intelligence ratings are more positive in CMC than in voice communication, while a main effect of expectancy also persists such that high-expectancy conditions yield more positive intelligence ratings than do low-expectancy conditions.

Alternatively, SIP theory lends the proposition that CMC users construct normal interpersonal impressions by using language and other symbols in CMC in order to overcome the absence of nonverbal cues. Additionally, SIP specifies that, in CMC, the accumulation of social information into an impression requires a greater number of message exchanges over time than in multimodal communication, since messages comprised of typewritten language alone transmit less information in a single utterance than words plus nonverbal cues transmitted via voice. Thus, for CMC partners, message accumulations are crucial in facilitating the individuating information that may disconfirm pre-interaction stereotypes:

H2: As the number of verbal messages interviewees generate increases, the difference declines between post-interaction ratings of interviewees' intelligence due to different pre-interaction stereotype inductions. This effect of verbal message frequency is greater in CMC than in voice communication.

Finally, we articulated a hypothesis based on the CFO position that voice and words provide more individuating information than words via text can do, even when CMC is interactive and authentic. It reflects Epley and Kruger's (2005) hypothesis, predicting that

H3: Pre-interaction inductions of expectancies for greater versus lesser intelligence generate greater post-discussion differences on intelligence ratings in CMC than in voice communication.

## Method

### Participants

Fifty-seven students from a large Midwestern university participated in exchange for course credit. Nineteen males were assigned to answer interview questions (interviewees). Their ages ranged from 18 to 26 ($M = 20.3$, $SD = 1.89$). They identified themselves as being African American (11%), Hispanic (5%), Caucasian (79%), and Asian/Pacific Islander (5%).[2] Each of these subjects was interviewed by two interviewers, one via voice and one via CMC. The remaining participants served as interviewers, among whom 20 were female, 17 were male, and one participant failed to report gender. Their mean age was 19.8 ($SD = 2.05$), and they were African American (18%), Caucasian (71%), and Asian/Pacific Islander (11%).

### Procedure

The procedures mirrored Epley and Kruger's (2005). Half the participants were escorted to a small room and informed they would be interviewers. Their pictures were taken and they were given a short personal information questionnaire to complete. They were told that their picture and personal information would be exchanged with the person they were interviewing. In actuality, the information was never exchanged; the exercise was done to increase the believability of the stimulus material the interviewers received.

Interviewers were randomly assigned to either an intelligent- or unintelligent-expectancy condition, which was achieved in a manner duplicating Epley and Kruger's (2005). Interviewers were provided a brief biographical form and a photo that they were told reflected their interviewee. The form featured the actual name of the interviewee in each session, but it also featured additional, "planted" information. The intelligent-expectancy stimulus contained a picture of a professionally dressed, Asian-American male who double majored in Physics and Philosophy and had a 3.85 grade point average (GPA). His greatest achievement in high school was being the valedictorian of his class. The unintelligent-expectancy stimulus consisted of a picture of a European-American male wearing a Metallica tee shirt, who had a 2.30 GPA and majored in hospitality management; being voted "most valuable player" of the football team was his greatest achievement.[3] No effort was made to match or control race or background of the interviewees with the characteristics that portrayed them in the expectancy stimuli. Interviewers were also randomly assigned to either a voice (wireless microphone system) or computer-based chat condition. For CMC, a real-time chat room was created using the Chatzy.com system. Interviewers were instructed to ask their conversation partner questions from a list (from Epley & Kruger, 2005), including, "If you had the opportunity to meet one U.S. President, either living or dead, who would it be and why?", "What would be your favorite

way to spend Spring Break?", and "If you could ask a genie to grant you any wish, what would you wish for?" Unlike Epley and Kruger's protocol, interviewers were not prohibited from (nor encouraged to) making statements other than the questions. After concluding the interview, interviewers completed a questionnaire with the dependent measures.

The males who were randomly assigned to the interviewee condition were led to a small, private research room. Epley and Kruger (2005) attempted to minimize extraneous variance due to individual differences between voice and CMC responses by simulating CMC messages using the verbal portion of interviewees' responses in the voice condition. In the present study, interviewees were interviewed by two different individuals, in turn, once by voice and once using online chat. This technique also minimized the potential effect of random individual differences between voice and chat interviewees, by controlling them rather than by occluding actual communication, in order to render a more realistic CMC conversation environment. The ordering of the interviews (voice/chat) was counterbalanced throughout the study.

### Measures

Perceptions of interviewees' intelligence was assessed using nine bipolar adjective items measured on 7-interval response scales, including the three items described in Epley and Kruger (2005) and six additional scales measuring intelligence (from McCroskey, Holdridge, & Toomb, 1974). Examples include "dumb/smart" and "uninformed/informed." Cronbach's alpha reliability for the combined scales was .92.

### Message unitizing

In order to address Hypothesis 2, related to the number of utterances, all remarks exchanged by participants were recorded for later analysis, either as audio recordings that were transcribed, or as native CMC transcripts. Two trained coders unitized the transcripts into thought units, that is, independent clauses or utterances with independent semantic meaning or that marked a shift in topical focus. Both coders unitized 50% of the transcripts, for which reliability achieved Cohen's *kappa* .89. Disagreements between coders were resolved through subsequent discussion, but given the acceptably high reliability, the remaining 50% of the transcripts were unitized individually by one or the other coder.

## Results

Although each interviewee responded to both voice and CMC interviews, no significant main effects of the order of medium occurred, nor did interaction effects of order with other independent variables affect interviewers' ratings

of interviewees' intelligence. Consequently, medium order was excluded from further analysis.

### Hypothesis 1

The test of the hyperpersonal hypothesis employed a contrast analysis reflecting the general prediction that CMC interviewees would be perceived as more intelligent than voice interviewees. Contrast coefficients were derived in a two-step procedure: First, weights were derived to reflect the intelligent and unintelligent expectancy conditions vector. Second, CMC users' scores were weighted to reflect the medium's greater capabilities for selective self-presentation of intelligence. This procedure resulted in the following contrasts: intelligent (+1)/CMC (+1), intelligent (+1)/voice (−1), unintelligent (−1)/chat (+1), and unintelligent (−1)/voice (−1). Combining the terms from each vector, the resulting coefficients were intelligent/CMC (+2), intelligent/voice (0), unintelligent/CMC (0), unintelligent/voice (−2). Applying these contrasts to the scores on perceived intelligence, results were consistent with the hyperpersonal prediction, $t(34) = 2.0$, $p = .027$ (one-tailed), $r_{\text{contrast}} = .32$ (see Furr, 2004). See Table 1.

### Hypothesis 2

A dynamic notion from SIP theory is that as the exchange of utterances becomes more frequent in CMC, the more that the information provided in these messages refines one's interpersonal impression of a partner: As messages are more numerous, the greater the amelioration of false prediscussion expectancies should be. In the present case, when the intelligent stereotype is instantiated prior to discussion, the more messages that are exchanged, the less intelligent the interviewee appears to be; when the unintelligent stereotype is activated, the more messages that are exchanged, the smarter the interviewee is perceived to be. Thus, the hypothesis that as message frequency increases, interviewees' impressions become less stereotypical, implies a bidirectional change. A single variable was created to reflect these two trajectories. Interviewers' ratings of interviewees' intelligence in the

**TABLE 1** Means and Standard Deviations for Perceived Intelligence by Medium and Expectancy

| Medium | CMC | | | | Voice | | | |
|---|---|---|---|---|---|---|---|---|
| Expectancy | Smart | | Dumb | | Smart | | Dumb | |
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Perceived intelligence | 5.50 | .72 | 4.67 | .93 | 4.88 | 1.53 | 4.52 | .75 |
| *n* | 8 | | 11 | | 9 | | 10 | |

*Note.* The greater the score, the greater the perceived intelligence.

unintelligent-expectancy condition were imported into the new variable as is, since higher scores on this measure reflected movement away from the dumb expectancy. However, before importing interviewers' ratings of their partners' intelligence in the smart induction, scores were recoded so that lower intelligence scores reflected a higher value on the new variable, to reflect movement away from the smart pre-discussion stereotype. As such, higher scores on this new variable, impression change, indicated deviation from a pre-discussion stereotype.

Impression change scores correlated with the total number of messages generated by interviewees in CMC, as predicted, $r(19) = .55$, $p = .01$. The relationship did not appear in the voice condition, $r(19) = .06$, $p = .80$. It seems likely that voice-based communicators relied on vocalic cues to adjust interpersonal impressions, rendering verbal messages less critical in the multimodal setting. However, it also appears that when no vocalic cues were available, in CMC, communicators relied on verbal messages in order to adjust impressions, refining impressions as cues became more numerous.

### Hypothesis 3

This hypothesis test involved a replication of the analyses by Epley and Kruger (2005), which compared differences within each medium using pairwise *t* tests. Within the voice condition, no difference was detected on perceived intelligence, $t(17) = .651$, $p = .26$ (one-tailed). However, perceived intelligence was significantly greater for the intelligence-expectancy stimulus within the CMC chat condition than for the unintelligent-expectancy/CMC condition, $t(17) = 2.10$, $p = .026$ (one-tailed), $r_{\text{contrast}} = .45$. Although the discrepancy between the within-voice and within-CMC findings support Hypothesis 3 as it was literally stated, the pattern of means departs from Epley and Kruger's (2005) findings in the nature of the effect. As reflected in Table 1, the pattern of means reveals that interviewers' high perceived intelligence for the CMC/intelligent condition is the source of the effect, a "magic cell" so to speak. The highest perceived intelligence ratings occur in the CMC/intelligent condition, followed by the voice/intelligent, CMC/unintelligent, and voice/unintelligent conditions, among which the latter three did not significantly differ. These results contrast those reported by Epley and Kruger (2005), in which the magic cell was the CMC/unintelligent condition, which received the lowest ratings on perceived intelligence. Their findings suggest that interviewers perceived the ostensible (but unreal) CMC/unintelligent interviewees to be the dumbest. In the present study, with fewer artificial constraints on interaction, that same condition produced relatively high intelligence scores, situated among the means from the two voice conditions. Therefore, although Hypothesis 3 is supported in statistical comparisons, the underlying cause appears to be much different from the previous study's conclusion.

In sum, CMC enables interactants to impart more favorable impressions than a phone-like system does, especially when they get a head start from a positive pre-interaction expectancy. The dumb-expectancy CMC users overcame the initial expectancy as well as voice communicators did. When allowed to be used naturally and interactively, CMC may be an especially useful way to ameliorate a negative bogus expectancy, and not persevere it.

## STUDY 2

Epley and Kruger's (2005) second experiment focused on extraversion. Stimuli instantiating introversion/extraversion stereotypes consisted of bogus photos of Asian or African-American females, with no biographies. Once again, the experiments involved non-interactive interview exchanges in a voice condition, with transcriptions of voice-interviewee responses sent as responses to interviewers who sent questions by "e-mail." Results mirrored their intelligence experiment, with greater extraversion attributed when interviewers were presented the African-American photo than the Asian photo, in the CMC condition only. We attempted a replication of this experiment using real partners in both voice and CMC, and without constraints on interactivity.

### Hypotheses

The hyperpersonal model suggests that CMC interactants take advantage of the medium in order to selectively self-present more desirable personality characteristics to others than is accomplished via audio. We hypothesized that CMC interactants would be perceived as more extraverted than voice interactants.

No hypothesis was advanced in this study reflecting SIP theory. SIP presupposes that effects in CMC correspond to the number of messages exchanged in the medium, and because a greater number of utterances is also associated with extraversion rather than introversion, the analysis would be confounded on this factor.

A CFO hypothesis predicted a pattern consistent with Epley and Kruger's (2005): a greater disparity in extraversion versus introversion ratings due to the bogus expectancy induction in the CMC conditions than in the voice condition.

### Method

Procedures resembled those of the previous study. Once again, actual partners were involved in each interview using a voice apparatus or real-time CMC chat, and they were not constrained to stick to a script. No effort was

made to match or control race or background of the interviewees with the characteristics that portrayed them in the expectancy stimuli.

### Participants

Forty-eight students from the same campus as Study 1 participated. Among the females who reported to the research facility, 16 were assigned to be interviewees in both CMC and voice conditions with the order of medium counterbalanced through the experiment. Other participants were assigned to ask the standard interview questions, half by voice and half using CMC, in the methods presented regarding Study 1. The mean age for all participants was 20.36 ($SD = 1.50$), ranging from 18 to 33 years old. Half the interviewers were male; 6% of the interviewers were African American, 6% were Asian/Pacific Islanders, 78% were Caucasian, 6% were Hispanic, and 3% was Native American. Interviewers' photos were taken but no biographical forms were collected and interviewers were then given photos ostensibly depicting their interviewee, consistent with Epley and Kruger's (2005) second study, in which photos depicted an Asian or an African-American college-age female, in order to instill introversion/extraversion stereotypes, respectively. Interviewees were unaware of the photo manipulations. Half the interviews took place via voice and half used CMC chat. Interviewers rated interviewees on posttest measures including sociability and extraversion subscales from McCroskey et al.'s measure ($\alpha = .88$).

### Results

Preliminary analysis of variance (ANOVA) revealed an order-by-medium effect and a main effect for order of media on extraversion judgments: Interviewees' behavior was perceived as more extraverted in whichever medium the interviewee used for the second of her two interviews. This higher-order interaction effect precludes further formal analysis of the hypothesis. No effects for medium alone, or a medium-by-condition effect, obtained significance (see Table 2 for $F$ values). The order by medium interaction, while unexpected, suggests a potentially interesting interpretation that both

**TABLE 2** Analysis of Variance Results for Perceived Extraversion

| Effect | $F$ | $p$ |
|---|---|---|
| Photograph | 9.37 | .005 |
| Medium (CMC vs. voice) | .01 | .952 |
| Order | 4.86 | .040 |
| Photograph × Order | 1.74 | .199 |
| Photograph × Medium | .25 | .624 |
| Medium × Order | 13.51 | .001 |

*Note.* All $df = 1, 25$. The three-way interaction effect was not significant and the reduced model is reported.

**TABLE 3** Means for Perceived Extraversion by Medium and Expectancy

| Medium | CMC | | | | Voice | | | |
|---|---|---|---|---|---|---|---|---|
| Photo | African-American | | Asian-American | | African-American | | Asian-American | |
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Perceived extraversion | 4.82 | .75 | 3.98 | .43 | 4.71 | .93 | 4.08 | 1.20 |

*Note.* The greater the score, the greater the perceived extraversion.

voice and CMC are capable of conveying different degrees of extraversion depending on other causal factors (such as practice or repetition).

### Informal CFO analyses

Although qualified by the order by medium interaction, for the sake of replication of the CFO hypothesis, scores were examined for simple effects due to expectancy conditions within each medium. There was a significant effect for the expectancy condition, across both media. The African-American expectancy materials led to perceptions of being more outgoing than the Asian-appearing photos in CMC, $t(14) = 2.84$, $p = .01$, $r = .60$, but not in the voice condition, $t(14) = 1.16$, $p = .27$. Although these results appear consistent with the significance tests reported in Epley and Kruger's (2005) second study, the resemblance is once again elusive: There were no differences between CMC versus voice among those interviewers who were shown the Asian-American's photo, $t(14) = -.236$, $p = .817$, nor was there a difference between CMC and voice among those shown the African-American's photo, $t(14) = .321$, $p = .753$. The overall pattern of means illuminates a large change in direction (see Table 3). In Epley and Kruger's second study, scores in the Asian-American/CMC stimulus condition yielded extraversion ratings that appeared to be drastically lower than those in the introverted/voice condition. In the present study, the means did not reflect that pattern. All things considered, CMC did not appear to suffer the shortcomings attributed to the medium as it did when it was tested in a noninteractive, nonspontaneous manner.[4]

## ANALYSIS OF MESSAGES

One of the major questions driving this research pertained to whether the words that individuals use in CMC are the same as those they would use in oral speech. Epley and Kruger's (2005) methods equate CMC to speech without voice, with language adaptation between media considered a potential confound. The SIP perspective argues that people employ different words

and messages precisely in order to create a kind of functional equivalence in meaning when they use CMC rather than voice. These views reflect fundamentally different ontologies about the way humans use symbols and their ability to use alternative media effectively (see Kock, 2004).

The current studies allowed for an empirical exploration of these competing assumptions. Because a single interviewee interacted with both a voice-based and a CMC-based interviewer in our research, we were able to analyze potential differences in the messages that those interviewees created using different media. A coding scheme was devised to analyze the messages that were expressed by both interviewers and interviewees, applied by six coders who, after training to achieve acceptable reliability (average $\kappa$ = .87), worked in pairs on a third of the transcripts each, and resolved all disagreements. Categories included the questions that interviewers asked, and interviewees' answers which were coded multiple times for as many reasons interviewees offered in their responses (e.g., John F. Kennedy [1] because he was cool [2] and he could have done a lot if he wasn't assassinated [3]). Other categories identified during the coding process included follow-up feedback, questions and statements unrelated to interview questions, procedural statements, technical system comments, vocalized pauses in voice and typed pauses (i.e., ellipses) in CMC, false starts or corrections, references to biographical content, and laughter which included vocal laughter as well as typed-out laughs ("ha ha" and "LOL").

The coded message data from Study 1 and Study 2 were subjected to a mixed multivariate analysis of variance (MANOVA) to examine variation in message outputs, in which medium (CMC vs. voice) was a within-subjects factor, and expectancy condition (smart, dumb, extroverted, introverted) was a between-subjects factor. The first analysis indicated a significant effect for medium on the number of messages (thought units) individuals generated, $F(1, 30) = 6.96$, $p = .013$. There was no interaction effect between medium and expectancy condition, and no effect for expectancy condition alone. Additional analyses examined the coded message types to discern in what particular ways the two media may have differed. Analysis for the simple effects of medium were conducted within each language category using paired sample $t$ tests. Results indicated that interviewees produced significantly more answers in response to interview questions in CMC ($M = 16.66$, $SD = 5.92$) than in their voice interviews ($M = 13.60$, $SD = 7.32$) $p = .038$. When communicating by voice, however, there were more false starts and filled pauses (such as "um"; $M = 6.11$, $SD = 6.21$) than the average number of ellipses, typed-out "um," and false starts in CMC ($M = 1.60$, $SD = 3.22$) $p = .001$.

A final analysis to determine whether interviewees used the same language in CMC and voice conditions involved an analysis of their verbiage using the Linguistic Inquiry and Word Count v. 2007 (LIWC) software program. Developed by Pennebaker, Booth, and Francis (2007), LIWC is a text

analysis system that calculates the frequencies with which various linguistic categories are reflected by words and phrases in samples of discourse (see Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007; for specific categories see http://www.liwc.net/descriptiontable1.php). LIWC was used to generate percentage coefficients for the observed frequency of words in each linguistic category in the voice and CMC conditions. Since no *specific* language categories were hypothesized to differ as a result of medium, the analysis strategy followed previous research that examined whether language use differs between two media across the range of LIWC categories (Newman, Groom, Handelman, & Pennebaker, 2008). A MANOVA test was performed with media as a within-subjects independent variable; dependent variables were scores for each medium on each language category detected by LIWC that exhibited frequencies greater than zero in the current sample. A significant multivariate effect for communication medium was obtained, Wilks' $\lambda = .520$, $F(45, 80) = 1.64$, $p = .026$, indicating that language use differed between voice and CMC interviews. Significant univariate differences between CMC and voice emerged such that, in CMC, there were relatively more prepositions, causation words, and death references, and there were relatively fewer present tense verbs, adverbs, exclusion words, and references to perceptual processes, than in the voice conditions. We do not believe that these findings suggest *specific* generalizable differences in the language that is typical of all CMC versus vocal media. They represent non-chance differences in the ways interviewees expressed themselves in response to the same particular questions in the same context, as adaptations to different media.

## OVERALL DISCUSSION

What is the nature of CMC and how does it affect impressions? Much research exists, yet there remains dissensus within and across fields. Some see CMC as a meager substitute for multimodal communication, assuming that CMC messages are those that people might speak, but lack the information from nonverbal cues that are critical for a variety of interpersonal functions. Is the language of CMC in its native form the same as that of speech? Or does foreknowledge of the absence of paralanguage from CMC lead users to adapt and overcome the loss of paralanguage in the presentation of self? Are users' adaptations purposeful, so that they are able to dispel bogus expectations or achieve more desirable impressions in others when there are fewer cues than when there are more? Each of these questions reflects different beliefs about the characteristics of CMC and of human abilities as symbol-using creatures.

The present research provides two important contributions to extant work on CMC: First, these findings support theoretical assumptions about the adaptive nature and use of CMC in the process of refining impressions.

Second, this work demonstrates how methodological decisions may (unintentionally) obscure findings relevant to understanding the nature of CMC.

The results of the current studies indicate that CMC use is fairly adaptive. When one cannot be heard, one uses other communicative strategies to make oneself known. Consistent with the SIP paradigm, the first study showed that increases in the number of messages exchanged during CMC discussion ameliorated bogus pre-interaction perceptions. In addition and in line with the hyperpersonal model, CMC interviewees were able to make themselves appear more intelligent when they had only text and not voice with which to influence their partners. In the second study, the effect of which medium came first—CMC or voice—affected judgments of extraversion more strongly than any other factor. The effects of medium-by-expectancy were nil. Comparisons between media regarding the nature and number of interviewees' responses indicated that interviewees expressed more verbal messages in CMC than in vocal communication, presumably as compensation for the absence of other nonverbal messages. Rather than giving just single-message responses to each part of questions like "Which President would you want to meet and why?", CMC interviewees provided more explanatory clauses or embellishments. The fact that CMC interviewees were able to adapt to a reduced-cue environment provides further support for the SIP perspective. Finally, the language deployed in CMC and voice conditions was different, as the LIWC analysis showed.

The findings also suggest that certain strategies in CMC research that are made for admirable reasons can nevertheless hide other effects. Epley and Kruger's (2005) research constrained the potential generation of alternative wordings by CMC dyads. By lifting this restriction and employing actual CMC interviews, the current research showed different patterns of impressions due to media/expectancy combinations. Preventing spontaneous message composition may not provide a context that fairly generalizes to CMC as it is commonly used. The over-control of various conditions in CMC experiments is a long-standing problem. Often one potentially extraneous variable interacts with other, active variables in the communication process (see for review Walther, 2010). For instance, early CMC studies have limited generalizability by having equalized relatively short periods of time across media conditions. Even though these efforts were originally undertaken for the sake of experimental control, CMC involves mechanical and temporal factors that can defy comparisons using short-term observations. Through replication, difficulties of this kind have been and should continue to be resolved.

Interactivity and spontaneity also provided the potential for mutual influence and conversational synchrony between interviewers and interviewees. By transcribing and unitizing interviewers' comments in the same manner as interviewees' we can examine whether their verbiage corresponded to interviewees' response patterns. Indeed, interviewers' message frequency

correlated with their interviewees' in both the CMC conditions, $r(35) = .59$, $p < .001$, as well as audio, $r(35) = .40$, $p < .016$. Research that does not allow for actual interaction, of course, precludes the potential detection of reciprocal influence in CMC. In the present study, partners appear to have influenced each other's expressiveness, which may have had some role in interviewers' own perceptions of the targets. Such would be consistent with the naïve hypothesis-testing view of impression formation depicted in much contemporary psychology (e.g., Snyder & Haugen, 1994).

Future research should explore expectancy effects on interviewers' behaviors, and their subsequent effects on target interviewees, for prospective behavioral confirmation or disconfirmation effects (see Ickes, Patterson, Rajecki, & Tanford, 1982; Walther, 2007), as well as the potential for changes in immediacy as a response to expectancy violations (e.g., Ramirez & Wang, 2008; see for review Burgoon & Burgoon, 2001). Positive consequences from the dissipation of expectancies, or from expectancy violations, deserve further examination in the context of CMC's potential to bridge differences among otherwise antagonistic interactants. The dissipation of negative pre-interaction expectancies may contribute to CMC's potential to facilitate hyperpersonal relations among participants that otherwise foster negative expectations and prejudices toward online partners who they presume to be different from themselves (see Amichai-Hamburger & McKenna, 2006; Walther, 2009). Although it may be more cautious to investigate such questions using simulated conversations, it seems apparent that actual interactions, and research designs that can reveal their effects, may render different conclusions.

## NOTES

1. Epley and Kruger (2005) describe their research and the interface they used as "e-mail" (see p. 416), although the software that they employed, Chatter 2.03, "is a program that allows more or less real time text message communication with other computers" (InfoMac, 1996). They argue that it represents e-mail because "participants were not actually engaged in a fully interactive chat session, but were instead trading fully formed messages back and forth, just as they would in e-mail" (Personal correspondence, N. Epley, June 12, 2009). Nevertheless, messages were exchanged immediately rather than asynchronously over some extended period of time. E-mail is widely considered asynchronous and in this way distinct from real-time chat (e.g., Herring, 2001; Honeycutt, 2001; Kalman, Ravid, Raban, & Rafaeli, 2006; Kiesler et al., 1984; Latane & L'Herrou, 1996; Riva & Galimberti, 1998; Zhou, Burgoon, Nunamaker, & Twitchell, 2004). By having a real-time discussion, cues that e-mail users employ to help form impressions, such as the lag time between responses (Kalman et al., 2006; Walther & Tidwell, 1995) were unavailable. The current study also employed a synchronous chat system in order to control this factor, since differences between e-mail and chat are not inherently interactivity-related and are beyond the scope of the current investigation.
2. The demographic diversity of participants in Studies 1 and 2, albeit small, represents another departure from Epley and Kruger (2005). That research limited participation to Caucasians in order to control for the potential influence of subjects' actual race in the

process of impression change, because the bogus stereotype inductions relied in part on racial cues. In the present study, interviewees' sex determined whether they participated in Study 1 or 2, but they were randomly assigned to conditions demographic characteristics notwithstanding. All analyses reported in the remainder of this research were repeated but without the data from cases in which interviewees were not Caucasians, and no changes occurred among the patterns of findings which obtained when all participants' data were included.

3. Although the same characteristics were used by Epley and Kruger (2005), the utility of the picture and descriptions' effects in arousing stereotyped expectancies was pretested in a 2 × 2 × 2 × 2 between-subjects factorial experiment using different subjects ($N$ = 173), reflecting 16 different combinations of race, GPA, major, and greatest high school achievement. While the attributes did not each produce a main effect on intelligence perceptions, comparisons indicated that the combination of attributes described above generated both the largest significant differences on intelligence ratings, $t(20) = 5.22$, $p < .001$, and the greatest absolute differences between respective means (intelligent $M = 5.66$, $SD = .38$, $n = 10$, compared to unintelligent $M = 4.14$, $SD = .85$, $n = 12$).
4. Epley and Kruger (2005) reported one additional experiment in which actual persons acted as interviewees in the CMC condition, rather than using transcriptions of voice-condition interviewees. They report no differences from their other experiments. However, in this experiment (and others), interviewers and interviewees were directed not to say anything during their conversations aside from the questions and answers, constraining interactivity in the manner discussed throughout this article.

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