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The Effect of Feedback on Identity Shift in Computer-Mediated Communication

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The hyperpersonal model of computer-mediated communication (CMC) suggests manners by which online communication transforms relational communication and self-perception. Criticism of the model includes concerns over the linkage among its four theoretical components. Recent research on identity shift in CMC suggests that senders' online selective self-presentation provides sufficient dynamics to modify individuals' personality following an online identity performance. The present research extends these findings by examining effects on identity shift due to the influence of feedback to an individual following a self-presentation that deliberately emphasizes a specific personality characteristic. Results support hypothesized interaction effects and illuminate the

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personality-modification effects of feedback on someone in a public blog setting, as well as feedback in a private expressive condition. Major implications for the status of the hyperpersonal model are presented, with additional questions regarding the computers-as-social-actors effect.

The Internet's capacity to facilitate selective self-presentation, and its consequences, is a central feature in numerous societal and research discussions about online behavior. From selective online dating profiles (e.g., Ellison, Heino, & Gibbs, 2006) to enhanced virtual group relations (e.g., Walther, 1997) and social interaction online (Turkle, 1995), the ability for individuals to exaggerate, accommodate, or embellish oneself to others not only affects online partners, it may affect the individuals themselves.

The hyperpersonal model of computer-mediated communication (CMC; Walther, 1996) provides a framework that helps explain dynamic transformations of relational communication and participants' characters through online interactions. The model explains how CMC users are able to present themselves selectively, and how these controlled self-presentations become the matter by which online partners come to know one another. Reciprocal interactions based on these performances may lead to exaggerated levels of affect and intimacy compared to those that typically arise in parallel offline conversations (see, for review, Walther, 1997, 2007). Although these efforts and actions are undertaken to serve interpersonal goals, there are side effects on intrapersonal perceptions and attitudes that arise as a result (Walther, Van Der Heide, Tong, Carr, & Atkin, 2010), which may modify the presenters' self, both online and sometimes across modalities (see, e.g., Zimmerman, 1987).

There are four components of the hyperpersonal model: selective self-presentation, idealization, channel management, and feedback. This last component, feedback, is conceptualized as reciprocal interaction with others that reinforces one's online performance by bringing together the identity-transforming potentials of the other theoretical components. Although recent studies that examined various components of the hyperpersonal model have generally received empirical support (e.g., Anderson & Emmers-Sommer, 2006; High & Caplan, 2009; Yao & Flanagin, 2006), little research has examined the feedback component specifically. Moreover, criticism of the hyperpersonal model has suggested a need for research to examine whether its multiple elements are theoretically interdependent or merely coincidental (Walther & Parks, 2002). Very little research has addressed this concern and tested the necessity of more than one theoretical component at a time in achieving the kinds of transformations posited by the model overall (see, for exception, Walther, Slovacek, & Tidwell, 2001).

The results of recent research focusing on the sender processes of the hyperpersonal model raise questions about the role of feedback with

regard to its theoretical necessity in rendering personality transformations online. Gonzales and Hancock (2008) examined hyperpersonal effects on CMC users' self-perceptions following specific selective self-presentations online, without any other component of the hyperpersonal model. They found that individuals who posted messages in a public blog in a manner that emphasized a certain personality characteristic later described themselves as more like that characteristic on follow-up personality measures, a phenomenon they called *identity shift*. Given that the theoretical connection of the feedback component of the model is not clearly substantiated in previous research, and the question of its necessity raised by this recent study, the current research was undertaken to determine whether identity shift online is greater when CMC users are provided feedback about their public online identity performances compared to when they simply post their messages.

A central part of Gonzales and Hancock's (2008) work was the notion that identity shift is triggered by *public* self-presentations (such as blogs), but that *private*, unobserved self-presentations (such as private documents) would not elicit the residual change in self-perception. The perceived publicness of media postings becomes a critical issue in the study of feedback effects, since feedback generally follows others' observation of an individual's performance, that is, a performance that occurs publically. Yet, feedback can also be delivered without other people involved, such as performance evaluations generated by a computer analysis. Although this kind of feedback is not an aspect of the hyperpersonal model, which is premised on dynamic interactions among human actors, a thorough investigation of feedback effects should include investigation of feedback provided in a private setting as well. Research on social responses to computational actors as if they were human (Reeves & Nass, 1996) complicates this issue: If people respond to computational feedback as if it came from a human, an otherwise private setting may be construed as public even if only a computer analyzed the actor's behavior. Although the *computers-as-social-actors* approach is not a primary focus of the present research, recognizing its precepts and findings allows a more thorough investigation of feedback's effects on identity shift in private media settings.

The present research investigates the role of feedback accompanying selective self-presentation within the hyperpersonal model to determine the interaction of a) feedback versus no feedback, b) selective self-presentations (in this case, extraverted versus introverted performances), and c) public versus private media, on individuals' identity shift. The work builds on Gonzales and Hancock (2008), which used identity shift as a means of modeling hyperpersonal effects on self-perception and personality. Secondarily, it examines the broader effects of feedback beyond human-human interaction by delivering feedback not only to a blogger but also to a solitary writer in order to assess the boundaries of the public and private performance effect on identity shift.

FEEDBACK AND THE HYPERPERSONAL MODEL OF CMC

Feedback Effects in CMC

There is abundant speculation about the effects of online social interaction and its potential to transform personality. Virtual worlds have been described as "identity workshops" (Bruckman, 1992; Bruckman, 1993) where feedback to individuals' invented personae contributes to their offline development of self. Turkle (1995) described psychoanalytic benefits deriving from inventing a character in a virtual space and observing others' reactions to its behavior, improving one's real-life perspective-taking abilities and empathy. Social psychology has also touched on the dynamic effects of interaction with online partners in transforming personalities. According to McKenna and Bargh (2000), individuals may find contacts online from whom they can elicit feedback that validates presentation of their "true" selves, and these episodes can lead to shifts in their subsequent offline self-presentations as well (Bargh, McKenna, & Fitzsimmons, 2002). More recently, in their study of 881 Dutch teens who used social networking Web sites, Valkenburg, Peter, and Schouten (2006) found that teens who received positive feedback on their profiles from friends showed significantly greater self-esteem, while negative feedback caused a decrease. Other research has explored the effects of feedback on participation frequency (Cheshire & Antin, 2008) and quality (Lampe & Johnston, 2005). Miura and Yamashita (2007) found that receiving positive feedback from others on one's blog affected blog authors' satisfaction and feelings of acceptance, but Birnie and Holmberg (2007) found no effect from feedback on the perceived therapeutic value of writing electronic personal narratives.

The hyperpersonal model of CMC provides one approach to explaining the media affordances and communication behaviors that transform social and interpersonal dynamics online. There are four components of online communication that are theorized to affect hyperpersonal transactions. First, *selective self-presentation* is premised on the notion that because partners cannot see or hear each other, may not know each other offline, yet can control messages constructed via language and text more deliberately than is afforded by face-to-face communication, CMC users are able to present themselves in selective and self-serving ways. This allows them to exaggerate intended characteristics and diminish unwanted ones. Second, *idealization* pertains to the tendency to fill in the blanks in the development of impressions of online partners via text, by drawing on characteristics of group identities, personality stereotypes, or other projections. Third, *channel management* pertains to using media at times that allow relatively greater engagement with others, and to groom message construction very deliberately using the editing features of the medium. Fourth, *feedback* among

communicators engaging these affordances of CMC is expected to reinforce, further promote, and intensify the effects of self-presentation, idealization, and channel exploitation, potentially shaping communicator characteristics to the point of affecting the participants' own attitudes and perceptions (see, for review, Walther, 2006, 2007; Walther, Van Der Heide, Tong, et al., 2010).

The notion that feedback reinforces and extends idealized perceptions of partners in CMC draws on the behavioral confirmation dynamic described in the work of M. Snyder, Tanke, and Berscheid (1977). As it was originally developed, behavioral confirmation involves a "perceiver" who believes a "target" to be physically attractive (or unattractive) and develops expectations about the person's personality and behavior on the basis of the attractiveness impression. The perceiver then communicates in ways that transmit these expectations (by telephone in the original and in most subsequent studies) and rewards his partner's confirming responses in such a way that the partner, in turn, comes to act in ways that are associated with the perceiver's stereotyped expectation (M. Snyder & Haugen, 1994, 1995; M. L. Snyder & Swann, 1978; M. Snyder et al., 1977). Since the research describing this effect used photographs to arouse perceivers' attractiveness expectations experimentally that did not actually depict the targets (who were randomly selected), the most dramatic aspect of this phenomenon is that reciprocal interaction transforms targets, leading them to behave in ways that may not actually have been their nature.

The hyperpersonal model posits that similar dynamics take place in CMC interaction. Research has found that people who are experimentally assigned to interact in online dyads like each other more, and believe their partners to be more attractive, than face-to-face partners do (Ramirez & Wang, 2008; Ramirez & Zhang, 2007). Over time, CMC partners become more affectionate and attractive than face-to-face members of the same groups (Walther, 1997) and members of virtual groups who see one another's photos (Walther, Slovacek, & Tidwell, 2001). Online interaction can lead to a shift in the gender style of one's writing, so that men write more like women, and vice versa, when interacting with an ostensible opposite-sex partner (Thomson, Murachver, & Green, 2001). In these instances, it has been assumed that selective self-presentation coupled with feedback, idealization, and message management contributes to a self-fulfilling prophecy. In this way, feedback was conceptualized as an important theoretical component with the potential to contribute to the modification of a person's behaviors and perceptions of self and other.

Despite its importance, feedback has received the least direct attention in research on the hyperpersonal model of CMC. While feedback is expected to have been an active component in the results reviewed above, research has not specifically examined the potentially causal role that feedback is conceived to perform. Moreover, recent work on identity shift by Gonzales and Hancock (2008) suggests that selective self-presentation may be a sufficient

cause of identity transformations, consistent with the hyperpersonal model's predictions but without the feedback component.

Identity Shift in CMC

Transformation without feedback

Gonzales and Hancock (2008) determined that identity shift takes place following an identity performance in such a way that the performer's self-concept is actually modified in the direction of the performed characteristic. In other words, it is a phenomenon in which selective self-presentation alone may cause transformation of one's self-construed personality. The phenomenon is contingent on differences between media contexts that affect the publicness or privacy of one's communicative actions. Computer-mediated environments such as blogs, discussion forums, e-mail lists, and social network sites offer a variety of venues for individuals to engage in CMC publicly.

The primary explanation for the effect of public rather than private self-presentations on identity shift on which Gonzales and Hancock drew is based on a notion of public commitment to an identity (Kelly & Rodriguez, 2006; Schlenker, Dlugolecki, & Doherty, 1994). Intrapsychic processes during public and private self-presentation differ, according to Tice (1992). Private self-presentation may be disregarded easily, but when one is publically identifiable, one's self-presentation links the characteristics that one performs to one's identity. According to Tice (1992), when behavioral performances are accompanied by disclosure of individually identifying information, the identifiable nature of public behavior leads people to internalize that behavior to a greater extent than its private counterpart. Internalization refers to molding one's self-concept into consistency with one's recent behavior. Ample research has documented the importance of social interaction in the establishment of self-concept (see Baumeister, 1982), consistent with several intellectual traditions, particularly the symbolic interactionist work of Cooley (1992) and Mead (1934).

Following the principles outlined above, Gonzales and Hancock (2008) tested their predictions by prompting participants to alter their self-presentations by portraying themselves as particularly introverted or extraverted as they answered four questions about themselves in one of two kinds of electronic formats: a blog or a private document. Subjects preparing to answer the questions in the blog format were reminded that their responses would be observable by anyone with access to the Internet. In contrast, those responding in the private, word-processing document format were told that their responses would not be read by the researchers immediately present, but saved for analysis by a graduate student in another department at a later date. After finishing their introverted or extraverted responses, all

subjects completed personality scales measuring their native introversion/extraversion levels. Results comparing those who had been prompted to write as though extraverted versus introverted in the public blog setting revealed a significant difference in posttest extraversion scores, whereas subjects who wrote in the private documents were not affected by the extraversion/introversion induction. The results were interpreted as support for the hyperpersonal model's predictions about the effects of selective self-presentation in light of the anticipation of an expected audience, without recourse to the interactionally based feedback dynamics in the original hyperpersonal model.

As discussed previously, the hyperpersonal model of CMC (Walther, 1996) suggests that multiple factors combine to effect, among other outcomes, a transformation of an actor's online personality. Feedback from other social actors should be expected to magnify the shift in self-concept that was attributed in previous research solely to public selective self-presentation processes.

H1: Individuals who receive feedback consistent with their deliberate online self-presentations experience greater identity shift than those who do not receive feedback.

Because the hypothesis predicts a magnification as a result of feedback to a certain online self-presentation, experimentation requires eliciting some particular performance for which feedback may or may not be delivered. The hypothesis is, therefore, best examined as an interaction effect of feedback with variation in self-presentations. In this sense, it is reasonable to involve opposing types of self-presentations, as did Gonzales and Hancock's (2008) employment of self-presented introversion versus extraversion. Although any personality characteristic would suffice, introversion/extraversion also reflects longstanding speculations and analyses about how CMC affects this trait in particular, such as the social compensation hypothesis that introverts use the Internet to overcome shyness and social isolation (Bargh et al., 2002; Hamburger & Ben-Artzi, 2000) or the social augmentation hypothesis that primarily extraverts benefit from the Internet to enhance and expand their social contacts (see, for review, Valkenburg, Schouten, & Peter, 2005). Indeed, by encouraging experimental participants to enact these specific forms of self-presentation, and using the public versus private media aspect also employed in that same previous study, research may examine whether the provision or absence of feedback further interacts with selective self-presentation of introversion versus extraversion and the public or private context of such self-presentations. This approach not only extends the findings of Gonzales and Hancock (2008), but also provides the potential to examine interrelationships among several factors in the hyperpersonal model, rather than merely attempt to identify the presence of an isolated feedback effect.

With this in mind, Hypothesis 1 can be further articulated in terms of specific, directional effects that are derived from the interaction of feedback with selective self-presentation of extraversion versus introversion and the public versus private context of that presentation, on the participants' subsequent self-perception of their level of introversion-extraversion: Extraverted self-presentations lead to greater self-perceived extraversion when presented in public with feedback than when presented in private or with no feedback; introverted self-presentations lead to less self-perceived extraversion when presented in public with feedback than when presented in private or with no feedback.

It may also be the case that the effect of feedback on one's self-concept occurs only when there is a public display of that self-presentation, qualifying the hypothesis expressed above, and limiting feedback's effects to public identity performances. The second hypothesis repeats the first except that it limits its prediction to public rather than private performances. The limitation of feedback's predicted effect to public (rather than private) media is not only a reflection of the public commitment principle underlying the notion of identity shift in previous research. It may also provide an important degree of realism to the investigation of feedback, since it may be more plausible for feedback to occur when there is, in fact, some audience to generate it; that is, feedback generally only occurs when behavior are observable by other social actors (not performed in private), which is the focus of the hyperpersonal model.

H2: *When posting to a public blog*, there is a greater identity shift between individuals who receive feedback consistent with their deliberate online self-presentations and those who do not receive feedback, than when posting similar self-presentations in private.

More specifically, following a public performance, introverted self-presentations with feedback lead to less self-perceived extraversion than when presented with no feedback, and extraverted self-presentations lead to greater self-perceived extraversion when presented with feedback than when presented with no feedback, but not following private performances of a similar nature, with or without feedback.

Feedback in Private

Despite the general notion that behavior must be observed by some spectators in order to elicit feedback, there are nevertheless settings in which individuals receive feedback without exposing themselves to public scrutiny. Such is the case when some scoring mechanism, such as a computer-based evaluation, reports on an individual's performance. Therefore, we may also

investigate whether feedback affects identity shift in a private behavior setting. Previous work on identity shift without feedback relied on theoretical principles suggesting that, if a performance was not public, identity shift would not occur. Computer-generated feedback to a nonpublic performance resurrects the question about the necessity of a publically-observable performance. At the same time, the *computers as social actors* phenomenon (see, for review, Reeves & Nass, 1996) raises the possibility that computer-generated feedback to an otherwise private performance may affect identity shift, not because of being feedback, but because a message from a computer may lead to the construal of the performance as being public rather than private.

Computers as social actors

Under certain circumstances, despite being fully cognizant that computers "simply generate their output as programmed," people "seem to be oblivious to the asocial nature of interaction and rather automatically apply the same social heuristics toward inanimate machines as they do in human-human interaction" (Lee, 2009, p. 628). The computers as social actors (CASA) response is likely to occur when computers simulate prototypical aspects of human communication, such as using words for output, interactivity (responses based on another's input), and the fulfillment of social roles traditionally enacted by humans (see, for review, Nass & Moon, 2000). When computers exhibit these characteristics, human responses toward computers include the application of politeness rules, treating computers as though they have personalities similar to human personalities, and being susceptible to feedback from computers (Nass, Moon, Morkes, Kim, & Fogg, 1997).

CASA research focusing specifically on computer feedback toward humans is especially noteworthy in the present context. Fogg and Nass's (1997) experiment informed subjects that a computer would provide performance feedback on subjects' online game-playing. In one condition, subjects were (falsely) told that the feedback would be based on subjects' performance, while in another condition subjects were told that the computer-generated feedback was random and completely noncontingent on subjects' game play. In both these conditions, the computer presented 10 positive and 2 somewhat negative evaluations during the subjects' play. In a third condition, the computer provided only generic feedback to subjects, stating "hit button to continue to the next round." Results showed that performance feedback had a significant impact on how subjects viewed themselves and the computer, with no differences between the ostensibly sincere or random feedback systems. Subjects reported significantly more positive affect, power, and satisfaction when they received mostly positive feedback, and they rated their game performance more successful than those who received only

activity prompts. Furthermore, subjects who received sincere or flattering feedback indicated a greater willingness to continue working with the same computer in the future compared to those subjects who received generic feedback.

All things considered, it is difficult to predict what the effect of feedback from a computer might be on identity shift following a private rather than public performance. Fogg and Nass's (1997) study suggests that we might expect feedback to exert an effect on individuals' self-construals, no matter whether it comes from a person or a machine. On the other hand, it may be the case that if computer feedback affects identity shift, it may be because it increases the perceived publicness of an otherwise private performance. Alternatively, perhaps subjects in Fogg and Nass's (1997) study believed that the researchers and/or other people, in addition to the computer, witnessed their game performance, in which case the effects from computer feedback were enabled by a public performance in front of other human actors, a dynamic suggested by Tice (1992) and Gonzales and Hancock (2008) to be a requisite for identity shift, without which computer feedback would have made no difference. Therefore, we explore whether feedback affects identity shift in private computer-based settings as well, with the proviso that expectations are less theoretically clear in that context. If computer feedback to a private performance stimulates identity shift, this should lead to the rejection of Hypothesis 2. Therefore, a research question is appropriate focusing specifically on private performances only.

RQ1: Does identity shift take place when individuals receive feedback consistent with their deliberate online self-presentations more than among individuals who do not receive feedback, when posting self-presentations in private?

The CASA model suggests a competing hypothesis: that identity shift may occur following computer feedback to an otherwise private performance, because the computer—perceived as a social actor—makes the performance feel as though it was public after all. The most focused way to investigate this possibility is through the following research question:

RQ2: What is the effect of computer feedback provided to private deliberate self-presentations on actors' perceived publicness of that performance?

The predictions and questions, above, recommend replication of the identity shift research using additional communication elements (feedback) and sources (humans and computers) with which to extend knowledge about media and their public/private dimensions, and hyperpersonal effects within them.

METHOD

Participants ($N = 212$) were students at a large, Midwestern American university who participated in exchange for credit as part of a departmental subject pool. Forty-four percent of the participants were male, and participants' mean age was 19.5 years ($SD = 2.38$). Participants were randomly assigned to one of eight stimulus conditions reflecting a $2 \times 2 \times 2$ experimental design for the factors of personality self-presentation, publicness, and feedback: Participants were requested to self-present as an introvert or an extravert, to write comments in a blog or submit them privately to a computer program, and they received feedback or no feedback about the introversion/extraversion reflected in their writing. They completed a posttest measure of self-reported extraversion and perceived publicness of their performance, from which hypothesis tests and evaluations of research question were calculated.

Introversion/Extraversion

Drawing on Gonzales and Hancock's (2008) approach, each participant was instructed that researchers were working with partners at other universities to study how well personality traits could be detected from people's writing. Subjects were asked to provide writing samples by answering four questions: describing their past friendships and what they did for fun with friends, what types of activities they did with their families, what extracurricular activities they were involved in, and what the most important thing is that they think they have learned in college so far. Half of the participants were asked to portray themselves as "an outgoing, extraverted person," as they wrote the responses, while the other half of participants were instructed to portray themselves as shy, introverted persons. Participants were instructed to construct their portrayals not by lying but by drawing on examples from their lives that would exemplify these traits.[1]

Public/Private

To instill the perception that participants' responses were either made public or kept private, oral and written directions instructed them that they would post their comments on one of two different media. Within each of the introversion/extraversion conditions, half the participants received an induction to arouse a sense of publicness. They were told that they would initially write their answers using a word processor, and then copy and publish their responses in an online blog. Following Gonzales and Hancock (2008), these participants were asked if they knew what a blog was, and regardless of their response, were reminded that a blog is an online diary that anyone with Internet access, including the research partners at the other

universities, could see. They were shown the blog to which they were to post their responses—an actual blog on a public blog hosting system—which had been prepopulated with (fictitious) sample entries in order to enhance the credulity of the induction.

The other half of the participants were instructed to copy their responses to the four questions from a word processor into a form that appeared to be the interface for a computer-driven analysis system, the Linguistic Inquiry and Personality Analysis 2.1 program ("LIPA," a fictitious system that was invented for the present experiment). This step diverged from Gonzales and Hancock's (2008) strategy; those researchers informed subjects that their word-processor document would be saved using a random identification number for inspection by a graduate student in another department at some time in the future, and not seen by experimenters involved in the data collection. That strategy would not plausibly allow for the generation and delivery of feedback, as required in the present research, so the LIPA program was developed as an alternative. The LIPA system also provided the means by which to assess the potential CASA response, in which participants may respond to the computer-based feedback as they would to a person. Nevertheless, it was expected that users would perceive no greater sense of a public audience from a computer application than they would attribute to a remote graduate student, as Gonzales and Hancock (2008) had purported in their "private" media condition. Therefore, posting the comments to LIPA was expected to remain a private performance.

Feedback/No feedback

To manipulate whether or not participants received feedback to their responses, within each of the public/private conditions half of participants did not receive feedback about their responses. After receiving confirmation of their submission to either the online blog or LIPA software, these participants proceeded to the posttest questionnaire. The other half of the participants received feedback regarding their responses through one of two mechanisms depending on whether their posting was ostensibly public or private.

In experimental conditions involving a blog posting all participants had been told their responses would be read by a psychology graduate student at a partner institution who would make assessments as to the author's extroversion or introversion. In the feedback condition, participants were instructed, both orally and in writing, to refresh their blog post periodically until feedback from the remote analyst appeared in the system. In actuality, there were no graduate students at other universities reading, assessing, or replying to blog posts. When participants' postings appeared in the blog, a lab assistant submitted one of two prescripted responses

to the blog as a comment on the participant's posting, which evaluated the participants' level of extroversion or introversion consistent with the experimental condition to which they were assigned (see Appendix A). Once the subjects read the feedback message, they proceeded to the posttest questionnaire.

In the private conditions, 5 seconds after half the participants submitted their answers to the LIPA system, a Java script program automatically presented participants with a purported analysis of levels of extroversion and introversion (see Appendix B). In actuality, the LIPA system did not perform any genuine analysis, and the system automatically returned a message affirming participants' self-presentation as either extroverted or introverted in line with the experimental condition to which they were assigned. LIPA responses were similar to responses entered into blog comments. They used the identical adjectives to describe the subject's personality (none of which appeared verbatim in the instructions or the posttest scales), although the blog feedback employed second-person rather than third-person constructions and was more conversational in style. After reading the LIPA results, participants proceeded to the posttest questionnaire.

Assessing extraversion

To assess participants' self-construed introversion-extraversion level, after their written responses (and the feedback for those who received it) they completed ten 11-point semantic differential scales used previously by Gonzales and Hancock (2008). Items included talkative/quiet, unsociable/sociable, friendly/unfriendly, poised/awkward, extraverted/introverted, enthusiastic/apathetic, outgoing/shy, energetic/relaxed, warm/cold, and confident/unconfident. Several items' scores were recoded so that higher scores on all items indicate greater extraversion. Cronbach's $\alpha = .92$.

Perception of public/private performance

Participants also completed Gonzales and Hancock's posttest questionnaire items assessing the publicness of their online postings, which scores from which were expected to differ as a result of whether participants posted their answers to a blog or to the computer analysis system. Items included, "To what extent do you think your written content in this experiment is publically identifiable?" with a 7-interval response scale anchored by 1 = *not at all identifiable* to 7 = *very publicly identifiable*; and "What is the likelihood that other people can see the content you've written?" and "What is the likelihood that researchers can read the content you've written?" anchored by *very unlikely* and *very likely*. Analysis of these items indicated that the first item detracted from the Cronbach *alpha* reliability of the scale. After removal of that item, $\alpha = .70$.

RESULTS

Manipulation Checks

Identity performance

It was important to verify that participants adjusted their behavior as they had been instructed to do, that is, to present themselves as extraverted or introverted. Without behavioral differences between extravert and introvert conditions, the contribution to the hypothesized interaction effect due to differences in introverted/extraverted behavior could be attributed to a reinforcement of the induction instructions, rather than the self-presentation behavior that was expected to result from those instructions. To see if the writing differed between participants in the introverts versus extraverts condition, participants' verbal responses from the blogs and documents were analyzed using the Linguistic Inquiry and Word Count v. 2007 (LIWC) system developed by Pennebaker, Francis, and Booth (2007). LIWC is a computer-based linguistic analysis program that counts and classifies words and expressions in order to identify "various emotional, cognitive, and structural components present in individuals' verbal and written speech samples" (Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007, p. 3; see this source for a complete description of LIWC's operations and classifications). Previous research has used LIWC to identify language differences that differentiate *actual* introverts from extraverts (Pennebaker & King, 1999): greater scores for *extraverts* on total words, social process terms, positive emotion words, and inclusives; and greater scores for *introverts* on negations, tentative words, exclusives, causation words, negative emotion words, and articles. The transcripts of the participants' writing from the present experiment were examined to see if their language differed in any of the ways that actual introverts and extraverts have been found to write. The LIWC program analyzed the participants' writing from the present experiment, yielding coefficients for each subject with regard to every specific language feature.

Multivariate analysis of variance compared the experimental conditions, with the induction for extraversion/introversion as the independent variable. Results were significant, Wilks' $\lambda = .89$, $F(9, 174) = 2.38$, $p = .015$. Univariate effects in the expected directions obtained on seven of the 10 dimensions mentioned above (with no differences on social terms, causations, and articles). Given that we asked participants to present themselves *as if* they were extraverts or introverts, assuming they were randomly distributed on this characteristic, they appear to have complied behaviorally with the induction very well, and feedback can be interpreted as feedback toward their behavior, and not merely to the instructions themselves.

Public versus private

The next analysis examined whether the participants in different conditions

perceived different degrees of publicness on the basis of whether they wrote their responses in a blog versus a document/form. Participants' scores on perception of publicness were compared on the basis of whether participants composed their answers to the four questions using these different media. The two conditions were significantly different, $t(208) = 7.52$, $p < .001$. Subjects who posted to the blog perceived significantly greater publicness ($M = 5.61$, $SD = 1.21$) than did those who posted to a private document ($M = 4.01$, $SD = 1.80$). Whether subjects posted their responses as if they were extraverted or introverted did not affect their feeling of publicness, $t(208) = .004$, nor did the presence or absence of feedback, $t(208) = -1.69$, $p = .092$. Analysis of variance revealed no three-way or two-way interactions of these factors on publicness. These results reinforce Gonzales and Hancock's (2008) research premise, that blog postings are perceived as publicly observable more than private document creations are.

Hypothesis Tests and Research Questions

The next analysis tested the influence of feedback, along with other factors, on identity shift (i.e., an influence on the expression of self-concept in congruity with one's deliberate online performance). As proposed above, the hypothesis was tested in a manner that explored the effects of feedback in the context of both introversion/extraversion performances, along with the facilitating effect of public versus private performances. Contrast analysis was employed in order to test the specific, directional effects of the interaction of these three variables (see Rosenthal & Rosnow, 1985). The $2 \times 2 \times 2$ design of this experiment called for specification of eight contrast weights. Weights were determined by taking into consideration preliminary contrast weights that reflected each of these factors' influence in each cell, and then adding these preliminary weights into a combined set of weights that reflected the gross effects of all factors (see Table 1). First, the baseline effect predicted by the introversion/extraversion yielded preliminary -1 weights for all cells in which introverted performances were stipulated, and preliminary $+1$ weights for cells in which extraverted responses were prompted. Second, since the public/private dimension has no main effect value of its own, but was expected to magnify introverted/extraverted performances only when they are public, preliminary weights of -1 were assigned to public/introverted conditions, $+1$ was assigned to public/extraverted conditions, and weights of zero were assigned to all four private performance conditions. Likewise, feedback was not expected to exert a main effect, but rather to magnify introversion or extraversion. Therefore, preliminary values of -1 were applied to conditions where introverted performances received feedback, $+1$ to conditions where extraverted performances received feedback, and zero to conditions in which no feedback was delivered. These preliminary values were then summed for the overall interaction contrast weights.

TABLE 1 Contrast Effects for Producing Hypothesis 1 Contrast Weights, and Descriptive Statistics for Introversion/Extraversion Induction, Public/Private, and Feedback/No Feedback Effects on Self-Reported Extraversion

	Private				Public			
	Introvert		Extravert		Introvert		Extravert	
	Feedback	No feedback	Feedback	No feedback	Feedback	No feedback	Feedback	No Feedback
Introvert/extravert	−1	−1	+1	+1	−1	−1	+1	+1
Private/Public × Intro/Extra	0	0	0	0	−1	−1	+1	+1
Feedback/No Feedback × Intro/Extra	−1	0	+1	0	−1	0	+1	0
Contrast total for H1	−2	−1	+2	+1	−3	−2	+3	+2
Mean	7.49	7.94	8.69	8.58	7.88	8.50	8.83	8.62
SD	1.76	1.93	1.89	1.33	1.80	1.36	1.27	2.05
n	25	26	25	29	24	27	29	27

Scores reflecting participants' posttest self-administered extraversion ratings were subjected to contrast analysis using the summed weights determined above. The predicted effects were supported, $t(204) = 3.09$, $p = .001$ (one-tailed), $r_{\text{contrast}} = .211$.[2] Descriptive statistics also appear in Table 1. The results indicate the interaction involving all factors, including feedback and public versus private self-presentations of introversion versus extraversion results in systematically different self-evaluations of extraversion, as expected. In terms of the specific effects of feedback, each pair of comparable scores shows that feedback magnified the effect of the introversion/extraversion self-presentation on self-assessed extraversion. Among each pair of cases in which participants self-presented as if they were introverted (whether public or private), means reflected more introverted self-ratings in the cells with feedback than in those without feedback. In each pair of extraverted self-presentation cells, the with-feedback cells reflected more extraversion than the no-feedback cells. The contrast analysis supports the prediction that feedback to selective self-presentations magnifies identity shifts.

The second hypothesis focused on feedback effects in public performances, without consideration of private settings, based on the conventional assumption that there is no (human) audience in private settings. As such, it predicted that feedback accentuated identity shift construals in line with introverted versus extraverted performances in public settings alone. In contrast, Research Question 1 inquired whether the hypothetical identity-shifting effects of feedback on personality take place in private settings when feedback is delivered by a computer.

Two orthogonal sets of contrast weights were derived to reflect the interaction of feedback/no feedback and introverted/extraverted self-presentations with which to analyze self-reported extraversion, first, in the public conditions only, and second, in the private conditions only. To test feedback × self-presentation effects in only the public (blog) condition, contrast weights of zero were applied to all private condition cells. Public/introverted/with feedback was weighted −2, public/introverted/no feedback was weighted −1, public/extraverted/no feedback was weighted +1, and public/extraverted/with feedback was weighted +2. The test of this contrast analysis supported Hypothesis 2, $t(204) = 1.93$, $p = .028$ (one-tailed), $r_{\text{contrast}} = .13$. Feedback significantly amplifies identity shift due to public self-presentations.

A similar contrast test was conducted focusing on self-reported extraversion scores from participants who wrote documents which they submitted to a computer analysis system in private, half of which received confirming feedback from the computer system. In this analysis, all cells involving public (blog) performances were assigned a weight of zero. Private/introverted/with feedback was weighted −2, private/introverted/no feedback was weighted −1, private/extraverted/no feedback was weighted +1, and private/extraverted/with feedback was weighted +2. This test, too, reflected a significant

effect, $t(204) = 2.89$, $p = .004$ (two-tailed), $r_{contrast} = .20$. It is apparent that feedback from a computer has no less strong an effect on identity shift as feedback from a CMC blog partner. This is not to say that there is no effect on identity shift due to public versus private settings; that effect has not been ruled out in any analyses so far. It does suggest that other forces—feedback from a computer, in this case—may also arouse an identity shift effect within private settings.

That interpretation, however, is subject to whether or not an otherwise-private setting is still perceived as private when a computer provides feedback, as questioned in Research Question 2. This issue was analyzed using contrast analysis focusing again on cells within the four private conditions (assigning weights of zero to all public condition cells), comparing those who received feedback (weighted +1) to those who received no feedback (−1) on their reports of perceived publicness. This test did not generate a significant effect, $t(202) = -.41$, $p = .682$. Although computer feedback stimulated identity shift, it does not appear to have done so by raising the degree of perceived publicness of otherwise private performances.

Additional analyses were conducted post hoc to assess the relative proportions of variance in self-construed extraversion accounted for by each of the predictors in the study. These comparisons were nonorthogonal, which may correlate error, and are to be interpreted cautiously when they do not reflect a priori hypotheses. Notwithstanding, the $r_{contrast}$ effects associated with these tests did not significantly differ from those presented above.[3] The most appropriate interpretation appears to be that all factors—self-presentation, blog versus document, and feedback/no feedback—operated in conjunction to produce identity shift. Finally, multiple regression analysis explored which interaction factors, if any, were the most influential predictors of self-reported extraversion: the two-way interaction of extraverted/introverted performance-by-feedback, or extraverted/introverted performance-by-public/private, or the three-way interaction effect. Using a forward entry approach, the interaction of extraverted/introverted performance-by-feedback/no feedback was the only factor that entered the model, R^2 adj $= .04$, $F(1, 210) = 10.55$, $p = 001$.

DISCUSSION

The present results indicate that hyperpersonal effects of CMC on identity shift are due to more than one factor, that is, the interaction effects among selective self-presentation and feedback from some other. The hyperpersonal model posits a "feedback loop" that occurs as the sender receives feedback on selective self-presentations, prompting subsequent identity presentations and the transformation of identity online (Walther, 1996). Previous research (Gonzales & Hancock, 2008) suggested that identity shift

is brought about by one's selective self-presentation alone, provided that selective self-presentation occurred in a public CMC setting such as a blog rather than private settings. The current study found that feedback from another source heightens the effect of selective self-presentation in bringing an individual's self-perception into line with his or her identity performance. These findings add credence to the theoretical foundation that informs the model's conceptualization of feedback effects, the behavioral confirmation syndrome (Snyder et al., 1977). When we include the confirmation of an identity performance by some externality, in addition to the enactment of an identity performance, this provides a more comprehensive account for the adjustment in self-concept that can accrue from online messaging.

This study contributes to our understanding of the hyperpersonal model of CMC (Walther, 1996) by demonstrating the connection between the sender and feedback components of the model. Although it does not attempt to extend the scope of the model, it provides additional verification to the model. Moreover, it does so in a very specific way, generating and demonstrating precise, directional interaction predictions about how the particular self-presentations and the provision of feedback combine, also taking into account the publicness or privacy of the performance. It reinforces the notion established in Gonzales and Hancock's (2008) previous work that selective self-presentation online contributes to a modification of self-concept, especially in publicly visible channels. Departing from Gonzales and Hancock (2008), it provides important validation of an aspect of the model that has been lacking in previous research: As Walther and Parks (2002) noted, although the hyperpersonal model holistically explains behavior in CMC, the theoretical linkages among the four major components of the model—selective self-presentation, distorted impressions, channel exploitation, and feedback—have been under-researched. This study begins to address that gap by providing evidence that some of the components of the hyperpersonal model are theoretically linked, and when tested together, they produce more complex effects than single components in isolation. It remains to be seen whether other components of the model would do as much or more, or if simultaneously and systematically varying all four components of the model would magnify identity shift or other processes and outcomes as the model suggests. In these respects, the present research adds another important step in understanding hyperpersonal transformations in CMC, while showing where additional research is needed.

With respect to feedback in the private performance setting, it is not entirely clear why the computer-generated feedback promoted identity shift in that condition. Several possibilities arise. First, LIPA may have been experienced as if it was a social actor, and it may have provided a modicum of co-presence but not a sufficient level to prompt the subjects' perception that the interaction was a public setting. It may be that the measures we used

to assess publicness were not sensitive to the presence of a small audience rather than a large one. Second, it may have been that the LIPA system was *not* seen as a social actor. Most CASA research involves the presence of the source computer in the same room with subjects, rather than the source being a remote computer system somewhere in the Internet, as this study featured. Not being a social actor, but being a computer, it may have been a credible linguistic analyst nevertheless, prompting attributions of objectivity in its analysis of the participants' exaggerated presentations. Social actor or not, Internet lore is replete with stories of individuals whose online behavior has been affected by conversational robots (Turkle, 1995).

There are limitations of the current study that future research should address. As previously mentioned, hyperpersonal effects were originally posited to occur through reciprocal interactions. Participants in the current study received one-time static feedback. Future research would benefit from extended conversational feedback that does not constrain reciprocal influence (see, e.g., Walther, Van Der Heide, Tong, et al., 2010). Such examinations would provide a more potent test of feedback effects and more directly test behavioral confirmation assertions of the hyperpersonal model. Extended feedback may also have implications for the persistence of the identify shift effects. Future research investigating how feedback characteristics (i.e., amount of message exchanges, source of feedback, and confirming versus disconfirming feedback) impact the occurrence/persistence of identity shift effects would be valuable. Moreover, although we are inclined to explore multiple rather than single causes, an exploration of feedback applied to random, unmanipulated performances—such as those appearing in original behavioral confirmation research (Snyder et al., 1977)—may be informative.

Another limitation is the modest effect sizes generated by the interactions obtained in this study. Effect sizes (r_{contrast}) were near .20 for hypothesis tests. In previous work on identity shift in CMC, the results of Gonzales and Hancock's (2008) primary test of the effects of public/private by extraverted/introverted factors on self-reported extraversion produced an effect size of $r = .29$, which is no different from that of the present study. Although it would be informative to see effect sizes increase with the inclusion of an additional variable (feedback/no feedback), this did not occur. One mitigating factor may be that the current experiment did not attempt to partial out additional variance in the same conditions that were used in the previous research. Rather, the complete cross of feedback/no feedback (unique to this experiment) along with the public/private by introvert/extravert conditions employed in the previous work created conditions that were not present in Gonzales and Hancock's (2008) effort. The results are more complex and specific in the present study, and the three-way interaction overrides the two-way effect in the previous research, although the lack of an additional incremental variance accounted for is disappointing.

Future research might account for greater variance by assessing and partialling out base-rate, trait levels of introversion/extraversion among participants and the further interaction effects with identity performance and feedback on identity transformation. There may be a stronger inclination or ability to project a personality characteristic that fits (or, alternatively, contrasts) a user's initial disposition, upon which feedback may have differential effects. Although the present research detected effects based on a random distribution of extraversion among participants, a more focused approach may contribute to the debate between the social compensation (poor to get richer) or social augmentation (rich get richer) interpretations about the benefits of social interaction online (see Hamburger & Ben Artzi, 2000; Valkenburg, Schouten, et al., 2005).

Although this study was intended to provide a validation of aspects of the hyperpersonal model, the interaction of these components suggests applications of the model to additional CMC settings and processes. For instance, Valkenburg and Peter's (2009) Internet enhanced self-disclosure hypothesis describes the relationships between Internet use (primarily by adolescents) and the disclosure it promotes, prompting feedback from others, leading to improvements in psychosocial well-being. These dynamics are reflected in survey research (Valkenburg, Schouten, et al., 2005) indicating that young people intentionally enact certain personality characteristics online, obtain online feedback from others, and modify their personalities as a result. The present results suggest the social psychological processes by which this chain of events comes to be.

There are other circumstances under which the effects of self-presentation together with feedback from others have the potential to affect self-perceptions, which warrant further research. Many studies have documented the selective self-presentation that occurs on social media such as Facebook profiles and status updates (e.g., DeAndrea & Walther, in press). Users display information on these sites to present a desirable self-image to a relatively large audience of friends. It is clear that the comments, pictures, and total number of friends that others contribute to their friends' profiles affect other viewers' perceptions of the profile owner (Tong, Van Der Heide, Langwell, & Walther, 2008; Walther, Van Der Heide, Hamel, & Shulman, 2009; Walther, Van Der Heide, Kim, Westerman, & Tong, 2008). Future research should investigate the conditions and extent to which these elements, as feedback, have residual effects on profile owners' personality or self-esteem.

In conclusion, the current research established the importance of feedback to self-presentation in CMC-based identity shift, and it demonstrated the theoretical utility of combining both components of the hyperpersonal model. Future research should attempt to look at multiple components of the model, not only for the sake of advancing theory, but also to better understand the potential of CMC on the psychosocial effects of the users of traditional and developing social media systems.

NOTES

1. These induction procedures mirror Gonzales and Hancock's (2008) methods (which appropriated aspects of Tice's, 1992, offline identity shift research), with one important difference. Both Tice (1992) and Gonzales and Hancock (2008) induced publicness using two simultaneous strategies: by making salient the presence of a graduate researcher within earshot of the subject, and by having subjects identify themselves by name, major, hometown, age, and dormitory name when they began their recordings. In the private condition, subjects were provided identification numbers and instructed that they would *not* be identified, and that no one would witness them recording their responses (see also Kelly & Rodriguez, 2006). Tice (1992) explicitly asserts that public behavior is specifically that which can be linked to a person's identity, and private behavior is that which cannot. However, Gonzales and Hancock's (2008) argued that a blog engenders the activation of public commitment to an identity whereas a private electronic document does not and, therefore, selectively self-presenting in blogs stimulated identity shift because of the public nature of the medium. In that case, having the public/blog participants identify themselves, while keeping word-processing subjects anonymous, provides a potential confound: It is not discernable whether the blog versus private word-processor media conditions caused the differences in perceived publicness and identity shift, or whether differences arose due to the self-identification procedure that was embedded in only the public condition. The present research did not employ the self-introduction elements used in previous studies, relying on only the blog versus private document to differential perceptions of public versus private media.
2. Furr (2004) defines r_{contrast} as reflecting "the unique association between the contrast and that part of the outcome variable that is unrelated to other known sources of variance"; it partials out "variability in the outcome that is associated with any possible contrasts other than the give contrast" (p. 11).
3. Additional contrast tests included the sets of weights depicted in the first three rows of Table 1, representing the following effects on self-reported extraversion: First, contrast weights reflected the main effect of introverted/extraverted self-presentation alone, $t(204) = 3.12$, $p = .001$ (one-tailed), $r_{\text{contrast}} = .214$. A second test reflected only the Feedback/No Feedback × Introversion/Extraversion factors, without consideration of public/private, $t(204) = 3.23$, $p < .001$ (one-tailed), $r_{\text{contrast}} = .221$. A third test examined only the Public/Private × Introversion/Extraversion factors, without consideration of feedback, $t(204) = 1.61$, $p = .054$ (one-tailed), $r_{\text{contrast}} = .112$. The most disparate of these effect sizes do not differ significantly from each other, $z = 1.01$ (see Howell, 2007).

REFERENCES

Anderson, T., & Emmers-Sommer, T. (2006). Predictors of relationship satisfaction in online romantic relationships. *Communication Studies*, *57*, 153–172.

Baumeister, R. F. (1998). The self. In D. T. Gilbert, S. T. Fiske, & G. Lindzay (Eds.) *The handbook of social psychology* (4th ed., Vol. 2, pp. 680–740). Boston, MA: McGraw-Hill.

Bargh, J. A., McKenna, K. Y., & Fitzsimons, G. M. (2002). Can you see the real me? Activation and expression of the "true self" on the Internet. *Journal of Social Issues, 58*, 33–48.

Birnie, C., & Holmberg, D. (2007). The impact of receiving feedback on women's relationship narratives. *Narrative Inquiry, 17*, 231–258.

Bruckman, A. (1992). *Identity workshop: Emergent social and psychological phenomena in text-based virtual reality*. Retrieved January 30, 2003, from ftp://ftp.cc.gatech.edu/pub/people/asb/papers/identity-workshop.rtf

Bruckman, A. S. (1993, August). *Gender swapping on the Internet*. Paper presented at the meeting of the Internet Society, San Francisco. Retrieved October 19, 1999, from ftp://ftp.cc.gatech.edu/pub/people/asb/papers/gender-swapping.txt

Cheshire, C., & Antin, J. (2008). The social psychological effects of feedback on the production of Internet information pools. *Journal of Computer-Mediated Communication, 13*, 705–727.

Cooley, C. H. (1922). *Human nature and the social order* (Rev. ed.). New York: Charles Scribner's Sons.

DeAndrea, D. C., & Walther, J. B. (in press). Attributions for inconsistencies between online and offline self-presentations. *Communication Research*.

Ellison, N., Heino, R., & Gibbs, J. (2006). Managing impressions online: Self-presentation processes in the online dating environment. *Journal of Computer-Mediated Communication, 11*, 415–441.

Fogg, B. J., & Nass, C. (1997). Silicon sycophants: The effect of computers that flatter. *International Journal of Human-Computer Studies, 46*, 551–561.

Furr, R. M. (2004). Interpreting effect sizes in contrast analysis. *Understanding Statistics, 3*, 1–25.

Gonzales, A. L., & Hancock, J. T. (2008). Identity shift in computer-mediated environments. *Media Psychology*, *11*, 167–185.

Hamburger, Y., & Ben-Artzi, E. (2000). The relationship between extraversion and neuroticism and the different uses of the Internet. *Computers in Human Behavior, 16*, 441–449.

High, A., & Caplan, S. (2009). Social anxiety and computer-mediated communication during initial interactions: Implications for the hyperpersonal perspective. *Computers in Human Behavior*, *25*, 475–482.

Howell, D. C. (2007), *Statistical methods for psychology* (6th ed.). Belmont, CA: Cengage Wadsworth.

Kelly, A. E., & Rodriguez, R. R. (2006). Publicly committing oneself to an identity. *Basic and Applied Social Psychology, 28*, 185–191.

Lampe, C., & Johnston, E. (2005). Follow the (slash) dot: Effects of feedback on new members in an online community. In *Proceedings of the 2005 International ACM Conference on Supporting Group Work* (pp. 11–20). New York: ACM Press.

Lee, E.-J. (2009). I like you, but I won't listen to you: Effects of rationality on affective and behavioral responses to computers that flatter. *International Journal of Human-Computer Studies, 67*, 628–638.

McKenna, K. Y. A., & Bargh, J. A. (2000). Plan 9 from cyberspace: The implications of the Internet for personality and social psychology. *Personality and Social Psychology Review, 4*, 57–75.

Mead, G. H. (1934). *Mind, self and society*. Chicago: University of Chicago Press.

Miura, A., & Yamashita, K. (2007). Psychological and social influences on blog writing: An online survey of blog authors in Japan. *Journal of Computer-Mediated Communication, 12*, 1452–1471.

Nass, C., & Moon, Y. (2000). Machines and mindlessness: Social responses to computers. *Journal of Social Issues, 56*, 81–103.

Nass, C. I., Moon, Y., Morkes, J., Kim, E., & Fogg, B. J. (1997). Computers are social actors: A review of current research. In B. Friedman (Ed.), *Human values and the design of computer technology* (pp. 137–162). Stanford, CA: Center for the Study of Language and Information.

Pennebaker, J. W., Chung, C. K., Ireland, M., Gonzales, A., & Booth, R. J. (2007). The development and psychometric properties of LIWC2007. Austin, TX: LIWC.net. Retrieved February 1, 2010, from http://www.liwc.net/LIWC2007 LanguageManual.pdf

Pennebaker, J. W., Francis, M. E., & Booth, R. J. (2007). *Linguistic inquiry and word count (LIWC): LIWC2007*. Austin, TX: liwc.net

Pennebaker, J. W., & King, L. (1999). Linguistic styles: Language use as an individual difference. *Journal of Personality and Social Psychology*, *77*, 1296–1312.

Ramirez, Jr., A., & Wang, Z. (2008). When on-line meets off-line: An expectancy violation theory perspective on modality switching. *Journal of Communication*, *58*, 20–39.

Ramirez, Jr., A., & Zhang, S. (2007). When online meets offline: The effect of modality switching on relational communication. *Communication Monographs*, *74*, 287–310.

Reeves, B., & Nass, C. I. (1996). *The media equation: How people treat computers, television, and new media like real people and places*. New York: Cambridge University Press.

Rosenthal, R., & Rosnow, R. L. (1985). *Contrast analysis: Focused comparisons in the analysis of variance*. New York: Cambridge University Press.

Schlenker, B. R., Dlugolecki, D. W., & Doherty, K. (1994). The impact of self-presentations on self-appraisals and behavior: The power of public commitment. *Personality and Social Psychology Bulletin, 20*, 20–33.

Snyder, M., & Haugen, J. A. (1994). Why does behavioral confirmation occur? A functional perspective on the role of the perceiver. *Journal of Experimental Social Psychology, 30*, 218–246.

Snyder, M., & Haugen, J. A. (1995). Why does behavioral confirmation occur? A functional perspective on the role of the target. *Personality and Social Psychology Bulletin, 21*, 965–974.

Snyder, M., Tanke, E. D., & Berscheid, E. (1977). Social perception and interpersonal behavior: On the self fulfilling nature of social stereotypes. *Journal of Personality and Social Psychology, 35*, 656–666.

Snyder, M. L., & Swann, W. B. (1978). Behavioral confirmation in social interaction: From social perception to social reality. *Journal of Experimental Social Psychology, 14*, 148–162.

Thomson, R., Murachver, T., & Green, J. (2001). Where is the gender in gendered language? *Psychological Science, 12*, 171–175.

Tice, D. (1992). Self-concept shift and self-presentation: The looking glass self is also a magnifying glass. *Journal of Personality and Social Psychology, 63*, 435–451.

Tong, S. T., Van Der Heide, B., Langwell, L., & Walther, J. B. (2008). Too much of a good thing? The relationship between number of friends and interpersonal impressions on Facebook. *Journal of Computer-Mediated Communication, 13*, 531–549.

Turkle, S. (1995). *Life on the screen: Identity in the age of the Internet*. New York: Simon & Schuster.

Valkenburg, P. M., & Peter, J. (2009). Social consequences of the Internet for adolescents: A decade of research. *Current Directions on Psychological Science, 18*, 1–5.

Valkenburg, P. M., Peter, J., & Schouten, A. M. (2006). Friend networking sites and their relationship to adolescents' well-being and social self-esteem. *CyberPsychology & Behavior, 9*, 584–590.

Valkenburg, P. M., Schouten, A. P., & Peter, J. (2005). Adolescents' identity experiments on the internet. *New Media & Society, 7*, 383–402.

Walther, J. B. (1994). Anticipated ongoing interaction versus channel effects on relational communication in computer-mediated interaction. *Human Communication Research, 20*, 473–501.

Walther, J. B. (1996). Computer-mediated communication: Impersonal, interpersonal, and hyperpersonal interaction. *Communication Research, 23*, 3–44.

Walther, J. B. (1997). Group and interpersonal effects in international computer-mediated collaboration. *Human Communication Research, 23*, 342–369.

Walther, J. B. (2006). Nonverbal dynamics in computer-mediated communication, or : (and the net : ('s with you, :) and you :) alone. In V. Manusov & M. L. Patterson (Eds.), *Handbook of nonverbal communication* (pp. 461–479). Thousand Oaks, CA: Sage.

Walther, J. B. (2007). Selective self-presentation in computer-mediated communication: Hyperpersonal dimensions of technology, language, and cognition. *Computers in Human Behavior, 23*, 2538–2557.

Walther, J. B., & Parks, M. R. (2002). Cues filtered out, cues filtered in: Computer-mediated communication and relationships. In M. L. Knapp & J. A. Daly (Eds.), *Handbook of interpersonal communication* (3rd ed., pp. 529–563). Thousand Oaks, CA: Sage.

Walther, J. B., Slovacek, C., & Tidwell, L. C. (2001). Is a picture worth a thousand words? Photographic images in long term and short term virtual teams. *Communication Research, 28*, 105–134.

Walther, J. B., Van Der Heide, B., Hamel, L., & Shulman, H. (2009). Self-generated versus other-generated statements and impressions in computer-mediated communication: A test of warranting theory using Facebook. *Communication Research, 36*, 229–253.

Walther, J. B., Van Der Heide, B., Kim, S., Westerman, D., & Tong, S. T. (2008). The role of friends' behavior on evaluations of individuals' Facebook profiles: Are we known by the company we keep? *Human Communication Research, 34*, 28–49.

Walther, J. B., Van Der Heide, B., Tong, S. T., Carr, C. T., & Atkin, C. K. (2010). The effects of interpersonal goals on inadvertent intrapersonal influence in computer-mediated communication. *Human Communication Research, 36*, 323–347.

Yao, M. Z., & Flanagin, A. J. (2006). A self-awareness approach to computer-mediated communication. *Computers in Human Behavior, 22*, 518–544.

Zimmerman, D. P. (1987). Effects of computer conferencing on the language use of emotionally disturbed adolescents. *Behavior Research Methods, Instruments, & Computers, 19*, 224–230.

APPENDIX A
Feedback to Participants in the Extraverted and Introverted Conditions, Delivered via a Blog

= =
Cathy Lipa (clipa21): Those are really nice responses. I'm really sure I got this one right - whew! Okay, here goes. I think you are a really dynamic person. You would be really active when you are with people. The way you communicate shows me how emotionally demonstrative you are, like people don't have to guess how you feel about things. People know you as being pretty lively.
= =
Cathy Lipa (clipa21): Those are really nice responses. I'm really sure I got this one right - whew! Okay here goes. I think you are a really withdrawn person. You would be really passive when you are with people. The way you communicate shows me how emotionally reserved you are, like people have to guess how you feel about things. People know you as being pretty timid.

APPENDIX B
Feedback to Participants in the Extraverted and Introverted Conditions, Delivered by "LIPA" Computer Analysis Program

= =
LIPA 2.1 Linguistic Inquiry Personality Assessment © University Board of Regents 2009
Dictionaries accessed: 7
Iterations: 4
Confidence: 96%
The following results are based on analysis of linguistic style markers, content indexes, and DSM IV[TM] correspondence analysis.
The subject is a dynamic individual who tends to be active in relation to other people. S/he is emotionally and attitudinally demonstrative, and frequently lively in his/her communication with others.
= =
LIPA 2.1 Linguistic Inquiry Personality Assessment © University Board of Regents 2009
Dictionaries accessed: 7
Iterations: 4
Confidence: 96%
The following results are based on analysis of linguistic style markers, content indexes, and DSMIII[TM] correspondence analysis.
The subject is a withdrawn individual who tends to be passive in relation to other people. S/he is emotionally and attitudinally reserved and frequently timid in his/her communication with others.