THE EFFECT OF AVATARS ON PERCEIVED CREDIBILITY OF COMMENTS POSTED TO ONLINE NEWS STORIES

A Thesis

presented to

the Faculty of the Graduate School

at the University of Missouri-Columbia

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

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by

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JULY 2009

The undersigned, appointed by the dean of the Graduate School, have examined the thesis titled

THE EFFECT OF AVATARS ON PERCEIVED CREDIBILITY
OF COMMENTS POSTED TO ONLINE NEWS STORIES

presented by Nathan Birt,

a candidate for the degree of master of arts,

and hereby certify that, in their opinion, it is worthy of acceptance.

Professor Kevin Wise
Professor Bimal Balakrishnan
Professor Paul Bolls
Professor Shelly Rodgers

I wish to extend my heartfelt thanks to the faculty of the Missouri School of Journalism, in particular the staff of the Columbia Missourian and the staff of the print and convergence sequences. Your dedication is inspiring, your instruction invaluable. I also wish to thank my wonderful and supportive family, in particular my brother, Adam Birt, for designing the dog avatar used in this study. I would especially like to thank my wife, Julie, for her calm resolve, faith and dedication through this process.

ACKNOWLEDGEMENTS

I would first and foremost like to thank Dr. Kevin Wise for the kindness he showed in his willingness to chair my thesis committee; for his outstanding coaching and instruction through the course of my graduate education; for his remarkable organization; and for being ever gracious, friendly and funny.

I would also like to thank Dr. Bimal Balakrishnan for his outstanding suggestions during the course of this project and his insights into virtual reality; Dr. Paul Bolls, for his attention to methodological precision and for encouraging me to pursue this project from the beginning; and Dr. Shelly Rodgers for pushing me to answer important questions and for much-appreciated excitement about this project.

I also wish to extend thanks to others who have provided helpful feedback during the course of this project, including Dr. Glenn Leshner and Dr. Clyde Bentley and Dr. Lee Wilkins.

TABLE OF CONTENTS

LIST OF FIGURES

Figure Page

LIST OF TABLES

Table Page

THE EFFECT OF AVATARS ON PERCEIVED CREDIBILITY
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ABSTRACT

An experiment tested two two-part hypotheses predicting the effect of specific avatar features — avatar humanness and eye contact — on perceived credibility of related comments about online news stories. Participants viewed news stories and related comments, and responded to questions regarding the likelihood of their recommending the comments; and perceived credibility and social presence of the comments.

Repeated-measures analysis of variance (ANOVA) was used to test the effects of the manipulations. A significant interaction was identified between avatar humanness and eye contact, such that comments paired with indirect-eye contact human avatars were rated as more credible than comments paired with direct-eye contact human avatars.

Hypothesis 1a predicted that comments paired with human-like avatars would be recommended more often than comments paired with animal-like avatars. Hypothesis 1b predicted that comments paired with human-like avatars would be rated as more credible than comments paired with animal-like avatars. Neither hypothesis was supported.

Hypothesis 2a predicted that comments paired with direct-eye contact avatars would be recommended more often than comments paired with indirect-eye contact avatars. Hypothesis 2b predicted that comments paired with direct-eye contact avatars would also be rated as more credible than comments paired with indirect-eye contact avatars. Neither hypothesis was supported.

The manipulations had no effect on perceived comment social presence.

Avatars, story comments and perceived credibility

Recent survey data have indicated that interaction in computer-mediated settings is becoming increasingly important. The same is true in journalism. A report (Johnson, 2008) about the largest newspapers in the U.S. by Web site design company The Bivings Group noted, "Seventy five percent of newspapers now accept article comments in some form, compared to 33 percent in 2007". That transformation represents a surge in social networking more broadly that has happened in recent years. Yet while a recent Pew study indicated that evidence "suggests that many households are hubs of personal communication networks" (Kennedy, Smith, Wells & Wellman, 2008, p. 30), it also noted that 64 percent of survey respondents said the Internet has not improved their ability to meet new people (Kennedy et al., p. 33).

One feature that has been suggested for enhancing the quality of online conversation, and one being used on many news Web sites, is the avatar. Some research indicates that allowing people to use avatars — visual representations of Internet users — could be beneficial. For example, one study indicated that some people perceive avatar communication in certain settings as positively as they do audio or video communication (Bente, Sabine & Eschenburg, 2008, p. 22). While Internet communication has been criticized for an absence of visual cues normally used by humans to interpret and respond to messages, avatars could theoretically bridge that gap by providing a set of visual cues not previously present online.

In a journalism context, avatars posted next to comments on news Web sites might enhance social presence and convey a positive, more credible image to other

users, thereby creating greater potential for democratic dialogue and increasing the frequency with which users return to a Web site. In turn, more Web site traffic might increase a site's potential for attracting advertising revenue.

Two features of avatars, humanness and eye contact, were manipulated in this study for the purpose of tracking participants' perceived credibility evaluations. It was predicted that messages paired with avatars possessing more humanness would be perceived as more credible than those that did not. It was also predicted that avatars that maintained eye contact with participants would be perceived as more credible than avatars that did not make eye contact with participants.

Thus, the stated research question for this paper was: How do avatars affect Internet users' perception of credibility in story comment sections of traditional online news Web sites? What follows is an overview of relevant literature regarding avatars, perceived credibility and social presence as they relate to the factors of humanness and eye contact.

Avatar humanness

For the purpose of this study, avatar humanness was defined as the degree to which an **a**vatar — a virtual character that enables Internet users to participate in community activities online — resembles a human. Conceptually, humanness was defined in terms of a circular face that included two white eyes with smaller black pupils and a mouth. Additionally, one human avatar used in this study appeared to have hair on the top of its head, while another appeared to be sporting a red headband. A UNESCO report noted that the sheer volume of avatar characters and attributes in online games makes it possible for young Koreans to "express and realize their hopes, desires and

curiosities," some of which they might not otherwise share publicly (Gale, 2005, p. 212). They are essentially a representation of a real, physical person in a digital space. The term is taken from the Hindu religion, in which an avatar was one of the many representations of a god on Earth (Vesna, 1997, defining the "avatar"). In the online world, avatars can come in many forms. They can be two- or three-dimensional, stationary or animated. In the world of news Web sites, users often have the option to fill a small, two-dimensional block of pixels with an unanimated personal picture or image that will appear along with comments they attach to news stories.

Research indicates that people choose features for their avatars that directly reflect aspects of their personalities. For example, researchers used a think-aloud protocol to gauge what avatar features were most important to design (Vasalou, Joinson, Bänziger, Goldie & Pitt, 2008). They found that students tried to find characteristics that matched themselves, such as eye and mouth shape, and hair color (Vasalou et al., 2008, section 4.1.1, Personalising a face). In fact, environmental cues also led the participants to adjust their avatars. For example, when research was conducted on a rainy day, one participant equipped his customized avatar with rain gear (Vasalou et al., 2008, Section 4.1.4, Real Life Events). The researchers concluded that avatars were used to depict participants' actual or idealized selves; that they were used to create playful self-representations of the participants; and finally, that they were used as an "expressive signal" to convey a message (Vasalou et al., 2008, Conclusion section, pps. 810-811). Yee (2004, p. 12) has indicated that some avatar users may see their virtual selves as "representations of themselves in a social environment" where the object is to interact with other people,

including significant others.

The ability to choose one's avatar thus becomes an important consideration based upon the message a user seeks to convey. Depending upon the features available, a computer user may have the option of customizing an avatar or of having a chosen photograph sized down to fit the specifications assigned by a Web site, such as that of a news organization. Such an option greatly increases the number of possible avatars from which the user of such a Web site can choose.

Eye contact

For the purposes of this study, eye contact was defined as the degree to which the avatar appeared to be making eye contact with the participant. This was defined by whether the black pupils in the white eyes appeared to be centered in the middle of the white eye. Indirect eye contact avatars had pupils that shifted to the right-hand side of the whites. In addition, the entire eye was shifted to the right-hand side of the face.

The manipulation of a behavioral feature such as eye contact was important because with traditional media, when participants are presented with minimal source identifiers, they have been shown to look for other clues that allow them to gauge the truth of a message — for example, whether the message seems believable, is presented well and backed with data (Johnson & Kaye, 1998). Johnson and Kaye (1998, p. 327) noted at the time of their analysis, "Studies suggest that few of these standards are met in online discussions." Johnson & Kaye surveyed participants who use the Internet to obtain political information. They found that participants rated online newspapers and online candidate literature as more credible than such information delivered traditionally. But

they also found many participants rated online media as only somewhat credible. The researchers do not appear to have used avatars in their survey at all. Thus, in the present literature review, it is theorized that visual cues provided by avatars may serve as additional cues to readers for gauging perceived message credibility.

The evaluation of animated characters in subjective terms such as perceived credibility is striking because there is ample research to suggest that such evaluations also happen among humans interacting face to face. In other words, some data suggest that people are predisposed to use nonverbal cues to make judgments about others. For example, in a study of adolescents ranging in age from 9 to 15, researchers found that girls and older adolescents perceived drawings of non-basic faces — those with a mixture of target emotions, such as sadness and anger — as having more negative emotion than did boys and younger adolescents (Van Beek & Dubas, 2008, p. 48). Further, it appeared to be "more 'mature' to assume that other negative feelings may accompany the target emotion, albeit with much lower intensities" (Van Beek & Dubas, 2008, p. 48).

Use of nonverbal cues has also been documented in adults. A recent study on married couples' communication evaluation skills indicated that both verbal and nonverbal signals carry emotional weight and affect the degree to which one partner perceives the other as being capable of conveying a message (Van Buren, 2002). Van Buren concluded that her study suggests, "Nonverbal signals are best studied in terms of their verbal context" (Van Buren, 2002, p. 33).

The idea that a *verbal* component of communication must be considered in the context of an accompanying nonverbal component appears to highlight a gap in research

that has been done up to this point. It has been documented that avatars, like humans, can elicit specific perceptions based on nonverbal cues such as appearance.

For example, one study presented participants with animated avatars that gradually transformed from being neutral to being either happy or angry (Ku, Jang, Kim, Kim, Park, Lee, Kim, Kim & Kim, 2005). Participants indicated they were able to identify the target emotion of those avatars in over 80 percent of cases (Ku et al., 2005, p. 498). Moreover, participants said it was easier to identify a negative emotion such as anger than it was to identify a positive emotion such as happiness (Ku et al., 2005, p. 501). At the same time, participants said that while they could recognize emotions, those emotions did not affect them (Ku et al., 2005, p. 501). Such limitations

> "could be due to the channel being insufficient to transfer emotion because the avatars are generated on a computer artificially. In order to compensate for these limitations, emotional expressions should be provided in a multimodal manner, such as with sound and gestures." (Ku et al., 2005, p. 501)

The present study represents an extension of this one in that it will present participants with a multimodal platform in which they both see a computer-drawn avatar and read a comment presented as being that of another human being.

Another study also animated avatars and compared emotion perceptions to those of non-animated avatars (Weyers, Mühlberger, Hefele & Pauli, 2006). While animated avatars yielded higher emotion recognition overall, both animated and nonanimated avatars in the happiness category increased participants' facial mimicry of the avatars, as measured using electromyography (Weyers et al., 2006, p. 453). Importantly, Weyers et al. note, such brain activity in response to emotional content has been previously identified as happening largely on a subconscious level (Weyers et al., 2006, p. 450).

This is important for the present study because it indicates that specific avatar properties can unknowingly influence participants' perceptions. It may be possible to magnify participants' reactions to humanness and eye contact in avatars by playing upon a predisposition to pass judgment on avatar interactions on an unconscious level.

It has also been documented that verbal components of human interaction can affect how people are perceived. But unlike the case of human interaction, in which Van Buren (Van Buren, 2002, p. 33) suggested both verbal and nonverbal components play a role in perceptions of individuals, little if any research has documented whether such an interaction also takes place in computer-mediated settings. The present study would advance existing research indicating that avatars affect perceptions of subjective criteria by testing their effects on a verbal component: comments posted to news stories online.

Story comments sections of news Web sites

In order to understand how avatars could affect Internet users' perceptions of credibility, it is important to demonstrate that research has documented several aspects of online communication that separate it from face-to-face communication. Research has indicated that people approach messages in different ways based upon the medium in which those messages are presented. For example, Bertacco (2007, p. 317) argued that the anticipation of receiving an e-mail or print letter alters the psychological expectations one has about that communication. Bertacco found that student participants who were told that they would receive an e-mail from an individual (a confederate) and then reviewed that individual's biographical information had significantly lower recall of key details about that person than those who were told they could expect to receive a letter by

mail (Bertacco, 2007, pps. 299-300). The implication is that the speed with which a message is delivered can affect the quantity of information individuals retain.

Computer-mediated communication also has been identified as having the potential for facilitating hyperpersonal interaction. To elaborate, "growing numbers of reports are appearing that reflect more personal CMC interaction, sometimes *just* as personal as face-to-face (FtF) interaction, or even describing interaction that surpasses FtF in some interpersonal aspects" (Walther, 1996, p. 4). The body of research about computer-mediated communication thus indicates that features of that communication could contribute to the formation of positive online relationships — potentially the very relationships identified as lacking by the Pew Center (Kennedy et al., 2008) — because these relationships have the potential for being more gratifying in some respects than those established in face-to-face settings. If traditional news Web sites are fostering hyperpersonal interaction by using avatars in story comments sections, they could potentially be fostering positive dialogue, a decrease in instances of negative behaviors and a rise in the frequency with which users return to post comments. If, however, avatars are not producing these kinds of results, news producers may wish to reconsider whether users should be allowed to continue using them at all.

While evidence exists that close relationships can be created and maintained over a technological medium, there has been some concern among researchers that lower-than-desired numbers of people may be regularly taking advantage of the Internet's interactive potential. News organizations, for example, may simply be unwilling to pursue these kinds of story comments because they are not perceived as being newsworthy. Data from

a 2007 survey of editors and the public suggested that while both groups thought "asking for user comments on many stories" would be beneficial to good online journalism, their opinions differed regarding more active involvement by journalists online ("Local readers and the newsroom," 2008, p. iv). While 50% of the public viewed "journalists joining the conversation online and giving personal views" as something that would be beneficial to some degree, only 27% of editors thought the same thing. Likewise, just 36% of the public thought such interaction would be harmful, while 58% of the editors thought it would be harmful.

It is probably fair to say that many news managers and Internet news users are seeking to avoid harm. But that is only half of the equation. The other half is: How can Internet users present a more credible face to the online public, thereby improving the quality of online interaction? The next section examines relevant research on credibility perceptions within the framework of Internet news.

Credibility perceptions

Despite potential hesitance by news organizations to engage in online conversation, previously referenced research indicates that interaction online is nonetheless popular among young people and Internet users. If news organizations *do* choose to facilitate such online communication using avatars, it would be advisable to determine exactly how those avatars factor into Internet users' perceptions of messages that accompany them. Specifically, news organizations would need to know more about perceived credibility.

Positive perceptions of Internet forum users may lead to the formation of

relationships more meaningful than face-to-face ones. Negative encounters involving such practices as flaming, in which one user is overtly confrontational with another, may result in a commenter leaving a forum altogether (Lee, 2005, p. 392). Thus, the way in which a commenter presents himself or herself is critical to forming a positive environment for online communication. In a news setting, positive perceptions of a user posting comments might enhance credibility perceptions, encouraging more users to return to a forum more often. News Web sites seeking to build networks of online users would likely desire this kind of positive interaction. If news Web sites could empower their readers not only to be perceived as more credible and positive, but also empower them to have more social presence (i.e. replicate visual and other cues that occur in face-to-face conversation), news Web sites might build larger communities.

One group of researchers mentioned previously (Bente et al., 2008) found that communication conducted via avatars created as high a social presence for users as similar conversations by audio and video. All three media were found to yield better interaction satisfaction, feelings of co-presence and an affective component of trust, according to the researchers. It appeared that users got quick first impressions from avatars and gave such visual cues less attention with time. The researchers noted that this study didn't allow users the opportunity to forge deep relationships over a long period of time. "Virtual worlds and avatars," they wrote, "could thus be a means to contextualize social interaction and foster the salience of nonverbal information instead of just providing high-fidelity transmission channels for visual cues" (Bente et al., p. 310)

The present study was aimed at determining whether story comments sections

might be one such method of fostering a highly contextualized interaction setting. Caspi & Blau (2008) found that Internet learning environments that foster a heightened sense of social presence correlated positively with online activity. For example, there was "a positive correlation between social identification and level of posting to the group, as well as a positive correlation between social identification and level of login to the courses' discussion groups" (Caspi & Blau, 2008, p. 340). The more that student participants felt they were a part of the group, the more they appeared to post and log into the learning community. The researchers suggested that visual cues might not be as important online as in a face-to-face encounter because other cues such as text-based humor took their place in forging relationships. But again, this research did not address the present question of whether visual cues may enhance well-developed textual relationships further, resulting in similar time commitment as defined by logins and number of posts made to a story comments section.

The media equation model established by Reeves and Nass was used to determine what nonverbal factors of avatars might affect how the messages that accompany them are viewed. Reeves & Nass (1996) examined human interactions with computers and television and found that participants largely treated these media as though they were actual people. That is important because it means that media messages can be designed to elicit certain responses based on principles of interpersonal interaction. For example, a polite computer (e.g. one that says, "Thank you for using this program") might be perceived as more likeable than a computer is not polite, and so on.

Operationally, this study paired avatars exhibiting two different nonverbal cues —

avatar humanness and eye contact — with comments posted to online stories to determine whether the interaction between nonverbal and verbal cues documented in real-life settings could be replicated in a computer-mediated setting. Each of the cues has two levels.

Avatar humanness

The first of the hypotheses tested whether the category into which some avatars may fall — human or animal — affects how accompanying comments are perceived. Presumably, avatars that engender more positive attitudes and a greater degree of engagement in the user will also be those that are perceived as being more credible.

Research indicates that human-like avatars have the potential to command interest and attention in users. For example, in a study aimed at developing a methodology for building avatars to be used by the mental health community, the researchers (Rizzo, Neumann, Encisco, Fidaleo & Noh, 2001, p. 473) observed:

> If the dynamic characteristics of facial and gestural actions can be rendered with some degree of fidelity to prototypic expressions seen in common types of implicit signaling, then avatars could serve to enhance communication, usability, and user-acceptance.

Nowak and Rauh (2005), in a later study, separated avatars into three classes — humans, animals and objects — and presented them to participants, who then provided self-report data on characteristics including perceived credibility. Results indicated that participants viewed human-like avatars as being the most credible, with credibility decreasing when animals were used as avatars, and falling even further when avatars represented objects, such as a hammer (Nowak & Rauh, 2005, Features of the avatar image that influence perception).

It would be unfair to say that all researchers have come to similar conclusions, though it may be that differing results in how avatar humanness is perceived can be explained without much trouble. Contrary to the 2005 study (Nowak & Rauh, 2005), Nowak & Biocca (2003) found that non-anthropomorphic avatars were apparently perceived by participants as being more engaging than non-human ones. Nowak & Biocca (2003, p. 484) defined anthropomorphic images as those that are "more "human-looking"". But it is important to note that in this study, both human and non-anthropomorphic avatars were presented as floating in a virtual space. The researchers hypothesized that perhaps human-like avatars disconcerted participants because they appeared as a floating head, very much unlike humans in real life (Nowak & Biocca, 2003, p. 491). This is an important consideration for the present study because it demonstrates the potential influence a virtual environment can have on users' perceptions of avatars. Because the present study did not involve large virtual landscapes but rather a story comments structure familiar to Internet users, any potential for a floating-head confound was expected to be minimized. Thus, because research seems to favor human-like avatars as yielding the most positive self-report data, it was hypothesized that human-like avatars — and, thus, the comments associated with them — would be perceived as being more credible.

There is evidence that the pairing of avatars and text is becoming increasingly popular as a method for boosting the effectiveness of a text-based message. For example, more than 10 million South Koreans use avatar e-mail to communicate with one another, and many of those individuals are business professionals (Lee, Kozar & Larsen, 2005, p.

92). The use of an avatar is not only perceived as being fun, but also as an extension of one's emotions in addition to the text of an e-mail. One businessperson who participated in the study responded that

> "We avatar email users share the same belief that it is fun, fancy, and highly understandable. Even exchanging avatar email for resolving difficult tasks is perceived as cool. I, as a senior [-level employee], think that it is natural when I get avatar email from subordinates. There is no insult and no respect issue any more. I prioritize responding to the avatar email as quickly as I can." (Lee et al., 2005, p. 95)

Other research has indicated that it is difficult for people to evaluate trustworthiness of a partner using an avatar in an online chat room, another setting that can pair both images and text (Galanxhi & Nah, 2007). However, that study did not specifically address the question of whether specific avatar manipulations might make that evaluation easier. Another study evaluated whether participants' perceptions of trust were increased in an online shopping experience through use of a 3D avatar (Qiu & Benbasat, 2005). Again, results indicated that the avatar, which communicated an audio-based message, did not increase perceptions of trust. However, the researchers noted a key limitation: "In this study, although the 3D avatar could generate basic body language, the lack of facial expressions greatly degraded the fidelity and warmness one might perceive in face-to-face communication." (Qiu & Benbasat, 2005, p. 89)

The present study evaluated two manipulations to begin an investigation into whether specific nonverbal cues can help or hurt user perceptions of messages in both visual and textual contexts.

> **H1a:** *Story comments paired with human-like avatars will be perceived as more credible than story comments paired with animal-like avatars.*
>
> **H1b:** *Story comments paired with human-like avatars will be recommended more frequently than story comments paired with animal-like avatars.*

If these hypotheses were supported, it could make the ability to customize an avatar important. If an avatar's humanness, or lack thereof, affects how a user is perceived, a user might manipulate that quality so others view his or her message in a more positive light, which might lead to more frequent, and potentially more civil, conversations on news Web sites.

Eye contact

The second manipulation involved altering a specific avatar facial characteristic to determine whether that can affect participants' perceptions of comment credibility. The justification for this manipulation spans several fields of study, including psychology and medicine. There is evidence that the human brain processes avatar emotions in a way that resembles how it processes human emotions. Moser and colleagues (Moser, Derntl, Robinson, Fink, Gur & Grammer, 2007) tracked participants' amygdalas, a part of the brain thought to play an important role in emotion processing. They found that while participants' brains could readily distinguish between a human face and an avatar depicting such a face, the overall response to five basic emotions such as fear and happiness was very similar. Although that study did not evaluate responses to facial indicators of lying, other research has tried to pin down the nonverbal cues that accompany such behavior.

In real-world settings involving human-to-human interaction, researchers have developed methods for gauging perceptions of nonverbal communication (Gorawara-Bhat, Cook & Sachs, 2007). Because of earlier research indicating that some elderly medical patients may find the process of interaction more important than the content of a

message, Gorawara-Bhat and colleagues sought to build a tool that would "assess the physical content of exam rooms in doctor-older patient visits" (Gorawara-Bhat et al., 2007, p. 223). They found that rooms without a desk for the doctor facilitated greater eye contact and more touch with the patient, both positive characteristics (Gorawara-Bhat et al., 2007, p. 226).

Eye contact, described in the Gorawara-Bhat study, can be manipulated in an avatar and has been connected theoretically with the concept of perceived credibility. Those who do not make eye contact — in other words, those whose gaze is indirect — are said to display a nonverbal cue that could be indicative of lying.

Ohmoto, Ueda & Ohno (2007) programmed technology to use gaze direction as a factor in determining whether someone is lying. Participants interacted with a computer program, which then evaluated a series of data to determine whether the participant had told a lie. The researchers suggested in their conclusion that "it is necessary for discriminating lies to pay attention to multimodal nonverbal information in situations similar to actual communication" (Ohmoto et al., 2007, p. 198). The present study represented an outgrowth of that study in a media context. If gaze aversion is a common feature of the act of lying in humans, it may be that participants will respond similarly to the act of gaze aversion in avatars. Presumably, avatars and the comments associated with them would be perceived as more credible when there is eye contact and less credible when there is indirect eye contact.

Admittedly, not all research has supported the idea that gaze aversion is a good indicator of lying. Levine and colleagues for example, found support for an opposite

effect — namely, that people who know whether or not someone is lying can extrapolate those feelings onto how the lying party's actions are perceived (Levine, Asada & Park, 2006). If John thinks Jane is lying, John may perceive Jane as averting her gaze for a prolonged time when, in fact, she really isn't. But while it may be true that gaze aversion is not a good indicator of truth-telling, that was not the issue for this study. The issue, rather, was whether a nonverbal indicator that people use to make evaluations about whether someone is lying — at least sometimes — also happens when participants try to evaluate story comments on perceived credibility.

Using the positive nonverbal cue of eye contact, a second hypothesis was proposed:

> **H2a:** *Story comments paired with avatars that appear to make eye contact with participants will be perceived as more credible than story comments paired with avatars that appear to not make eye contact with participants.*
>
> **H2b:** *Story comments paired with avatars that appear to make eye contact with participants will be recommended more frequently than story comments paired with avatars that appear to not make eye contact with participants.*

These hypotheses were tested in an experiment in which participants viewed a series of four articles and the comments that accompanied them on laptop computers. Each article displayed with three related avatar-comment pairings, one of which contained the manipulation under review (high avatar humanness/low avatar humanness and direct eye contact/indirect eye contact). Participants were then directed to perform four tasks. First, participants were asked to click a box indicating the degree to which they would be likely to recommend the comment to another reader. Second, participants indicated their perceived credibility for all comments displayed on six bipolar questions identified by McCroskey & Young (1981). Third, participants were asked to answer a

series of questions in a questionnaire on the degree of social presence they experienced while reading each comment. Fourth, participants were asked to rate the degree to which each avatar appeared to be human, and the degree to which each avatar appeared to make direct eye contact.

Method

Participants

A convenience sample of 40 college students from a large Midwestern university was used for this study. This sample size was derived from a power analysis with the following parameters: α=.05, power = .95, effect size (partial η^2)=.2, correlation among repeated measures: .5. This analysis yielded a suggested sample size of 16 for within-subjects factors. About half of the students were offered extra credit. The other students were offered $10. Participants did not have the option of choosing one or the other.

Design

A 2 (avatar humanness) x 2 (eye contact) x 4 (order) mixed design experiment was used to examine how avatar features affect perceived credibility of posts to news stories. Avatar humanness and eye contact were both manipulated within-subjects, while condition was manipulated between-subjects. A total of eight avatars were used across four conditions, such that participants saw all four independent variable combinations — human-direct eye contact, animal-direct eye contact, human-indirect eye contact and animal-indirect eye contact —but only half of the avatars created for the study. Avatars were sized to take up most of the white box in which they appeared, and an effort was made to keep the shape and size of both the eyes and the head consistent across all avatars so the manipulations would be easier to see on a small scale. The same comments were used in all four conditions, but the pairing of an avatar with a particular comment

was counterbalanced across the four conditions.

Independent Variables

The practice of allowing only two-dimensional avatars appeared to be common for online news Web sites, and that acted as a boundary condition in the present study. Only two-dimensional avatars were manipulated. Some researchers have suggested that while the Internet holds great potential for effective education and learning (Ayiter, 2008), that learning must happen in a carefully controlled environment. Ayiter (2008) suggested that online art education, for example, can be moved out of a stale two-dimensional world into one that is three-dimensional and provides more learning opportunities. But at this time, the news world appears to have embraced a two-dimensional model. It is possible that a three-dimensional model for this study would have presented an unfamiliarity that could have acted as a confound. Thus, two-dimensional avatars were chosen for study, in keeping with accepted norms for online news. Additionally, only unanimated avatars were manipulated.

Avatar Humanness

The first independent variable was avatar humanness. The first level of this variable was human and was defined by whether the avatar presented to participants resembles a human face. The definition of humanness was formed by observing of the physical characteristics of the avatar stimuli used in research by Nowak & Rauh (2005) and others. As stated earlier, human avatars were operationalized as those having circular heads with white eyes in which black pupils were embedded. These avatars also featured a flat line representing a mouth. Male human avatars were created in an effort to avoid

adding a third independent variable, gender, into the study. It was predicted that because the features of the avatars were fairly limited — all that participants saw was a face with a handful of attributes — and more resembled a cartoon character than an actual human, it was predicted that the effect of gender on perceived credibility would be minimal. The second level of this variable was animal and was defined by whether the avatar face was that of an animal. Animal avatars were operationalized with one featuring a big nose with whiskers and ears (dog) and another featuring black-and-white skin and a yellow beak (penguin).

Eye Contact

The second independent variable was eye contact. The first level of this variable was direct gaze and is defined by whether the eyes and pupils of the avatar in question were centered in the middle of its eyes, thus appearing to make eye contact with the participant. The second level of this variable was indirect gaze and was defined by avatars whose pupils appear skewed toward the edges of its eyes in a parallel direction (for example, avatar's pupils were both skewed up, down, left or right) and whose eyes appeared skewed to one side of its face. It intuitively made sense to include this as a variable with respect to credibility because of the discussed literature indicating that eye contact can be a factor in the degree of perceived credibility. Example avatars representing all combinations of humanness and eye contact are provided in Figure 1.

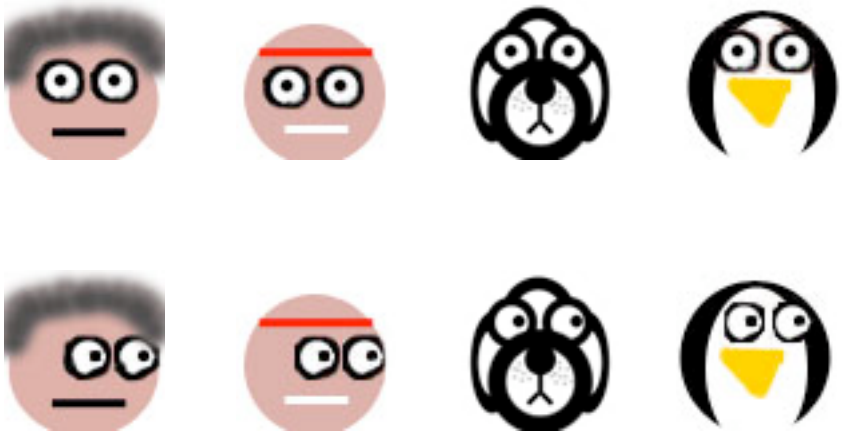


Figure 1. Representations of the avatars used in this study for documenting perceived credibility of comments under two conditions, avatar humanness and eye contact.

Stimulus Materials

MediaLab software (Jarvis, 2004) controlled stimulus and questionnaire presentation. The four stories used in this study were selected from a pool of 8 stories that were pretested by 8 undergraduate advertising students who rated the difficulty of reading each story on a 5-point scale. The four stories selected received the lowest difficulty scores (Range: 1-1.75, ns). The three comments that appeared beneath each story were kept in the same order for all stories and all conditions. Control avatars, shown in Appendix C, remained the same across all stories. The eight avatar levels under manipulation were distributed across all four conditions so that the same comments were paired with multiple avatars across the four conditions, as shown in Table 1.

Table 1

Distribution of avatars with comments across four study conditions

Condition Number	Lincoln story	Spitzer story	Costumes story	Artist story
1	HD1 | Pos. 1	HID2 | Pos. 2	AD1 | Pos. 3	AID2 | Pos. 1
2	AID2 | Pos. 1	HD1 | Pos. 2	HID2 | Pos. 3	AD1 | Pos. 2
3	AD2 | Pos. 1	AID1 | Pos. 2	HD2 | Pos. 3	HID1 | Pos. 3
4	HID1 | Pos. 1	AD2 | Pos. 2	AID1 | Pos. 3	HD2 | Pos. 1

Note. In this table, "H" represents a human avatar, "A" represents an animal avatar, "D" represents direct eye contact, "ID" represents indirect eye contact and "Pos." represents the order in which the comment appeared following the story, out of three possible positions.

Dependent Variable

Perceived credibility

The dependent variable under review in this study was perceived credibility. McCroskey & Young (1981, p. 33) stated that perceived credibility is composed of two dimensions, competence and character. Accordingly, they developed a scale of 12 bipolar questions that could be used by "researchers who wish to have more concise measures of the two dimensions" and also reported that the scale should be expected to exhibit "reliability in the neighborhood of .80" (McCroskey & Young, 1981, p. 34).

A condensed version of McCroskey & Young's 12-item credibility scale was used to measure participants' credibility perceptions. The source for the present study was the commenter behind the comment-avatar pairing. The condensed version used here

contained six items representing the competence factor developed by McCroskey & Young. Each item contained seven points (Flanagin & Metzger, 2000), with either endpoint representing extremes of opinion (e.g. strongly agree and strongly disagree). The competence factor was used because the focus of the present study was to evaluate perceived credibility of comment content rather than perceived credibility of commenters' character. Scores were reverse-coded as needed so that higher scores on every question indicated "greater perceptions of media credibility" (Flanagin & Metzger, 2000, p. 522). This instrument is included in Appendix A.

Second, a behavioral indication measure was used to further evaluate readers' perceptions of each comment's credibility. This single item asked how likely participants would be to recommend a particular comment to other readers. The 7-point item was anchored by the statements "Very likely to recommend" and "Not at all likely to recommend." This was determined to be a valid indicator of perceived credibility because the recommend feature is one widely used in Internet media settings allowing users to interact with the content and other readers. Therefore, it is something very familiar to many people who use the Internet. Additionally, the idea that a product can be evaluated for others using a system of ordered rankings has been widely popularized by such Web sites as Amazon.com and Internet tools such as Apple's iTunes Store. An example of this item appears in Appendix E.

Third, a questionnaire aimed at gathering participants' feelings of social presence was included. An eight-item social presence scale used by Hamman (2006) and modified for this study was used. This was added as an exploratory measure, and no related

hypotheses were developed. This instrument is included in Appendix B.

After all other questions had been answered, participants were presented with a manipulation check meant to gauge whether they recognized the difference between human and animal avatars, and the difference between direct eye contact and indirect eye contact avatars.

Experimental Procedure

Participants were recruited from undergraduate and graduate university courses. The study was presented to them along with a second graduate research study. The subject matter of the other study — regarding participants' need for closure in online news — was deemed sufficiently unrelated to the present topic to be a cause for concern. Participants indicated their interest in participating in the study by filling out sign-up sheets provided following brief oral classroom presentations detailing the study. In other cases, professors agreed to send e-mails via student listservs to inform prospective participants of the research opportunity.

Upon arriving at the study site, participants were greeted and presented with two consent forms detailing the two components of the studies. Students signed and dated these forms. At this point, students had been randomly assigned to a laptop and were instructed to begin taking the first study that appeared on their screen. The order in which these studies were presented was alternated to reduce the chance that scores for either study would be affected by responses to the first study.

Participants were presented with a series of four stories. The stories were about 500 words in length each and involved topics such as the newly designed $5 bill and an

artist whose paintings depict nature. After reading each story, participants evaluated the credibility of the comments for other news consumers by clicking one of seven buttons to indicate the degree to which they would be willing to recommend each comment to another reader. Comments were not pretested but were written in an effort to avoid content that might be considered political or otherwise controversial. Participants then completed the 6-item perceived credibility scale and also answered a questionnaire with questions aimed at gathering participants' perception of the social presence of each comment. Each of the four stories was presented with three avatar-comment pairings in an effort to keep participants from catching onto the manipulations. Participants were asked to evaluate all comments on all of the questionnaires presented. Thus, each participant reviewed a total of 12 comments. Responses to control avatar-comment pairings were not used for data analysis. A sample version of what participants saw while reading each article is provided in Appendix D.

Finally, participants were presented with a screen displaying all eight manipulated avatars, which included those they had not seen for their condition. No control avatars were included in the manipulation check. For these questions, participants were asked to evaluate the humanness and degree of eye contact each represents using a semantic differential scale. (For example, human = 1, animal = 7; Not at all direct eye contact = 1, direct eye contact = 7). These questions were intended to act as a manipulation check to determine whether participants noticed the difference between human and animal avatars, and the difference between direct eye contact and indirect eye contact avatars. Scores were then reverse coded such that higher scores indicated greater perceived humanness

and greater perceived direct eye contact. Participants were then briefed, thanked for their time and dismissed. The experiment lasted approximately 40 minutes.

Results

Reliability Analysis/Data Reduction

The reliability of the perceived credibility and social presence instruments was determined by computing Cronbach's alpha. The criterion for acceptable reliability was $\alpha > .70$ (Garson, Measures of internal consistency, Cronbach's alpha). Both instruments had Cronbach alphas exceeding .70, as shown in Table 2. Data was then reduced by creating indices that were computed as the mean score across the items in each questionnaire. This process yielded a credibility index and a social presence index, which were used in further analyses.

Table 2

Cronbach alphas for Credibility and Social Presence Instruments

	Credibility Humanness		Social presence Humanness	
Eye Contact	Human	Animal	Human	Animal
Direct	.92	.95	.92	.91
Indirect	.95	.96	.95	.91

Manipulation Check

The manipulation check was evaluated to determine the degree to which the 45 participants recognized the avatar manipulations under consideration. A paired-samples T-test revealed that for the avatar humanness variable, participants reported perceiving human avatars (M = 6.56, SD = .67) as being more human than animal avatars (M = 1.24,

SD = .54), t(44) = 38.96, p = .000. This indicates that participants could distinguish the difference between human and animal avatars, such that avatars intended to resemble a human were generally perceived as being human-like, and avatars intended to resemble an animal were generally perceived as being animal-like.

For the eye contact variable, participants reported perceiving direct-eye contact avatars (M = 6.46, SD = .859) as making more direct eye contact than indirect-eye contact avatars (M = 1.21, SD = .376), t(44) = 37.77, p = .000. This indicates that participants could distinguish the difference between direct-eye contact and indirect eye-contact avatars, such that avatars intended to make direct eye contact were generally perceived as making direct eye contact, and avatars intended to make indirect eye contact were generally perceived as making indirect eye contact.

Hypotheses

All hypotheses were tested with a 2 (humanness) x 2 (eye contact) repeated measures analysis of variance (ANOVA). Hypothesis 1a predicted that story comments paired with human-like avatars would be perceived as more credible than story comments paired with animal-like avatars. The main effect of avatar humanness on perceived comment credibility was not significant ($F(1,44) = .017$, $p > .05$). Hypothesis 1a was not supported.

Hypothesis 1b predicted that story comments paired with human-like avatars would be more highly recommended more frequently than story comments paired with animal-like avatars. The main effect of avatar humanness on participants' comment recommendations was not significant ($F(1,44) = .155$, $p > .05$). Hypothesis 1b was not supported.

Hypothesis 2a predicted that story comments paired with avatars that appear to make eye contact with participants would be perceived as more credible than story comments paired with avatars that appear to not make eye contact with participants. The main effect of eye contact on participants' perceived comment credibility was significant ($F(1,44) = 6.56$, $p < .05$), but not in the direction predicted. Participants who viewed one of the direct-eye contact avatars had a mean perceived credibility score of 3.57 (SE = .16). Participants who viewed one of the indirect-eye contact avatars had a mean perceived credibility score of 4.12 (SE = .15). Hypothesis 2a was not supported.

Next, an analysis was conducted to determine whether there was a significant interaction between avatar humanness and eye contact on perceived credibility. In fact,

there was a significant interaction ($F(1,44) = 4.39$, $p < .05$), as shown in Figure 2. This interaction shows that the effect of eye contact was pronounced for human avatars but not animal avatars. Human avatars that appeared to make indirect eye contact yielded higher credibility ratings than human avatars that appeared to make direct eye contact.

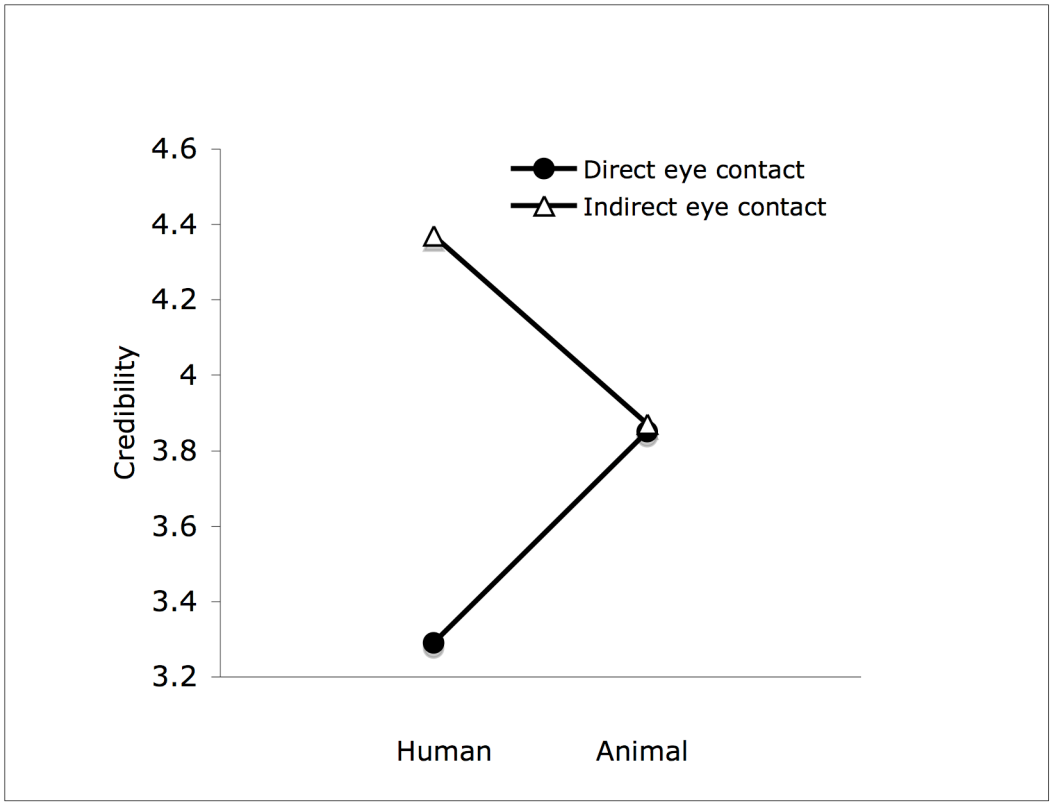


Figure 2. Interaction between avatar humanness and eye contact. Higher ratings indicate greater perceived comment credibility.

Hypothesis 2b predicted that story comments paired with avatars that appear to make eye contact with participants would be more highly recommended more frequently than story comments paired with avatars that appear to not make eye contact with participants. The main effect of eye contact on participants' comment recommendations was not significant ($F(1,44) = .756$, $p > .05$). Hypothesis 2b was not supported.

Another test was conducted to determine whether there was an interaction between perceived credibility and the likelihood of a participant recommending comments to another reader. The interaction between perceived credibility and likelihood of recommending a comment was not significant ($F(1,44) = 3.25$, $p > .05$), as shown in Figure 3.

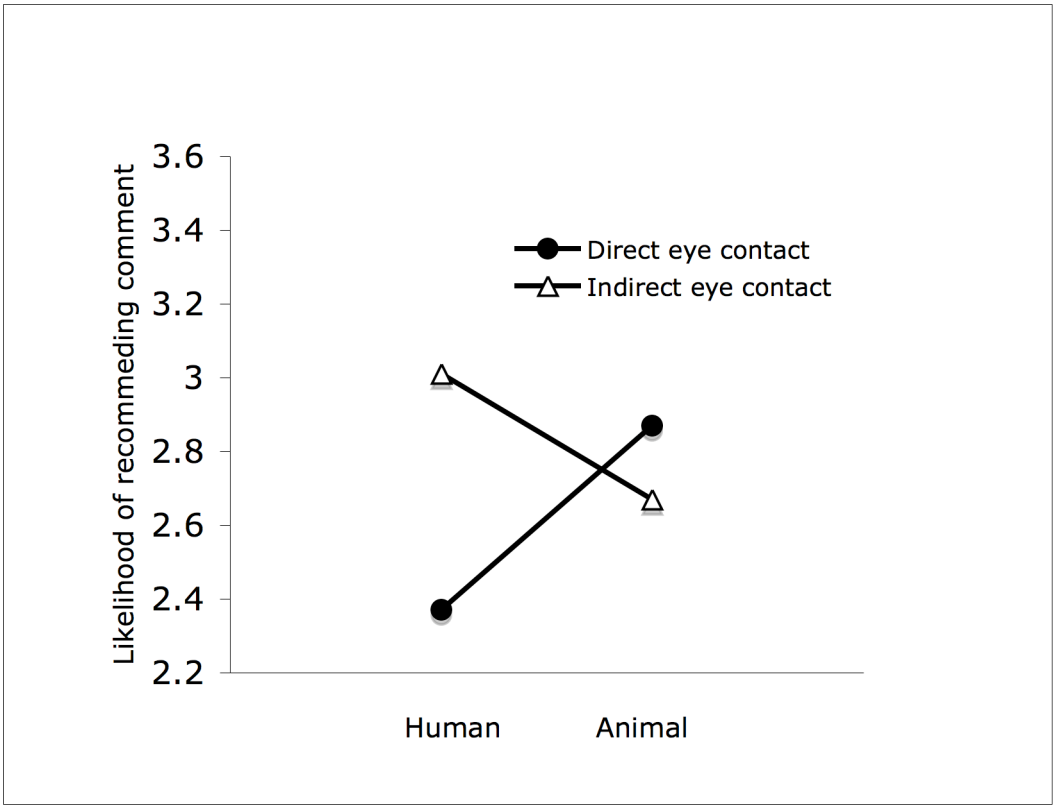


Figure 3. Interaction between avatar humanness and eye contact recommendations. Higher ratings indicate a greater likelihood of recommending the comment.

Table 3

Means for avatar humanness-eye contact interaction

	Human		Animal	
	Direct	Indirect	Direct	Indirect
Credibility	3.29^{A}	4.37^{B}	$3.85^{A,B}$	$3.87^{A,B}$
Recommendability	2.38^{A}	3.00^{A}	2.87^{A}	2.69^{A}
Social presence	2.55^{A}	2.70^{A}	2.73^{A}	2.93^{A}

Note. Means with non-matching superscripts across rows were significantly different from one another according to pairwise comparisons using the Bonferroni correction. All variables are based on 7-point scales. For Credibility, 1 = not at all credible, 7 = very credible. For Recommendability, 1 = not at all likely to recommend, 7 = very likely to recommend. For Social Presence, 1 = low social presence, 7 = high social presence.

This means that comments associated with human avatars making indirect eye contact were reported to be more credible than comments associated with human avatars making direct eye contact. The difference between perceived credibility of comments associated with direct- and indirect-eye contact animal avatars was not significant.

However, this interaction must be qualified. Upon closer examination of the data, it became clear one particular comment consistently yielded higher credibility ratings across all four conditions.

A repeated measures analysis of variance (ANOVA) was conducted to determine whether removing this outlier comment would change the pattern of results. The outlier was removed, new means for each condition were computed with the outlier removed, outlier values were replaced with the condition means and then the same ANOVA as before was rerun. The old and new means are shown in Table 4 below.

Table 4

Interaction means before and after removal of suspect comment

	Means before comment removal		Means after comment removal	
	Human	Animal	Human	Animal
Direct	3.29	3.85	2.76	3.33
Indirect	4.37	3.87	4.04	3.35

Note. Mean ratings before and after removal of high-rating comment in each of four conditions. Ratings were calculated using a repeated measures analysis of variance.

It is important to note in Table 4 that while the means of all four avatar levels shrank, as expected, during the repeated measures analysis of variance, the interaction identified at the beginning remained: Even though the higher-rated comment was removed from a second analysis of the data, the pattern of a higher mean rating in the human-indirect eye contact avatar condition remained. This provides support for the notion that the significant interaction between avatar humanness and eye contact cannot be explained solely by a comment outlier, but rather may be stemming from one or more other factors related not to the content of the comment but to the content of the avatar. This makes sense given that the outlier comment was equally distributed across all four conditions in this design.

Additionally, a test was conducted to determine the perceived degree of social presence represented by comments at each avatar level.

The effect of avatar humanness on participants' perceived social presence was not significant ($F(1,44) = 3.158$, $p > .05$). The effect of eye contact on participants' perceived

social presence also was not significant ($F(1,44) = 1.26$, $p > .05$).

Next, an analysis was conducted to determine whether there was a significant interaction between the social presence of comments associated with the avatar humanness and eye contact variables. There was no significant interaction ($F(1,44) = .02$, $p > .05$).

Discussion

The purpose of this thesis was to investigate whether specific aspects of avatars — namely, avatar humanness and eye contact — could affect participants' perceptions of the credibility of accompanying comments on an online news Web site. If, in fact, avatars do increase credibility perceptions, it might be possible to build more democratic discussions in which people would make more respectful comments and remain on these Web sites for longer periods of time. Specifically, if commenters use avatars that yield higher credibility perceptions, it may be that they and other commenters will engage in discussions over longer periods of time because the commenters perceive one another as more credible overall and more likely to contribute to meaningful dialogue. If, on the other hand, avatars do not increase credibility perceptions, or perhaps hurt them, news managers might consider removing them from story comments sections altogether. Avatars that contribute to lower credibility perceptions might invite negative comments, requiring news managers to spend more time monitoring commenters and less time producing news content.

To test whether these two avatar features would affect credibility perceptions, participants were asked to read four news stories and the comments following each of them. They then answered a series of questions about the comments they had read. First, participants were asked to click a box representing the likelihood of their recommending each comment to another online reader. Second, participants answered six questions about each avatar-comment pairing that were meant to gauge perceived credibility of the comment. Third, participants answered a series of eight questions meant to gauge

perceived social presence of the comment. Finally, participants responded to a manipulation check to determine whether they could differentiate between human and animal avatars, and between direct- and indirect-eye contact avatars.

A manipulation check revealed that participants readily perceived the manipulations in question. They reported understanding the difference between human and animal avatars, and the difference between direct and indirect eye contact, in the directions predicted.

Because some research has indicated that people rank human avatars higher than animal avatars on such factors as credibility (Nowak & Rauh, 2005), it was predicted that this pattern would be replicated. But this hypothesis, H1a, was not supported. There was no significant difference between credibility perceptions of comments paired with human avatars and comments paired with animal avatars. Hypothesis 1b also was not supported. Comment recommendations for human avatars were not significantly higher than comment recommendations for animal avatars.

Results for Hypothesis 2a were unexpected. That hypothesis predicted that comments paired with direct-eye contact avatars would be perceived as more credible than comments paired with indirect-eye contact avatars. In fact, perceived comment credibility rose significantly when the manipulated avatar *did not* appear to make direct eye contact with the participant. But because this finding was in the opposite direction of that predicted, Hypothesis 2a was not supported. Additionally, there was no significant main effect on participants' reported likelihood of recommending comments in the eye contact manipulation. Thus, Hypothesis 2b was not supported.

However, Hypothesis 2a must be qualified. There was a significant interaction between avatar humanness and eye contact, such that comments paired with human avatars making indirect eye contact were reported to be more credible than comments paired with human avatars making direct eye contact. Additionally, there was no significant difference between direct- and indirect-eye contact animal avatars. Finally, there were no significant main effects of social presence on comment credibility perceptions.

These results raise several questions about research done up to this point on non-verbal cues as they relate to avatars. Per the first hypothesis, it is important to ask whether online norms related to credibility perceptions have changed. While Nowak & Rauh (2005) found that human avatars were perceived as being the most credible, followed by avatars depicting animals and then by those depicting objects, the present study found no significant main effect for avatar humanness on perceived credibility. While Nowak and Rauh specifically asked about avatar credibility, and the present study asked about comment credibility, the interaction found in the present study suggests that avatar features may unknowingly influence participants' comment credibility ratings.

It is clear that online norms are continuing to evolve. It is possible that avatars are among the communicative tools that have been subject to this change. While some research has indicated that human avatars are more credible than animal or object avatars, not all studies have supported that notion. For example, Nowak & Biocca (2003) found that non-anthropomorphic avatars were perceived by participants as being more engaging than non-human ones. One explanation these researchers provided for this finding was

that the human-like avatars might have disconcerted participants. Indeed, the Nowak & Biocca (2003) study featured human avatars that appeared as floating heads.

In the present study, human-like avatars were presented also as a head, but in the confines of a two-dimensional space rather than in a larger three-dimensional arena. Because of the nature of this design, it was suggested that any floating-head confound would be minimized because the human avatars would appear in a setting familiar to many college students — a story comments section of a news Web site.

The present results suggest that an avatar's humanness may matter little to online newsreaders. It is possible that readers no longer draw a distinction between human and animal avatars and instead embrace the notion that this particular aspect of avatars is not a reflection of credibility but a matter of personal choice. Perhaps, as in the case of South Korea's avatar e-mails (Lee, Kozar & Larsen, 2005, p. 92), human and animal avatars have come to reflect personal diversity versus questionable character.

It has been stated that there is research (Vasalou, Joinson, Bänziger, Goldie & Pitt, 2008) to support the notion that people may make diverse choices about how to present an avatar based on such things as personal appearance. It has also been noted that avatars are found on numerous news Web sites' comments sections, which themselves have flourished (Johnson, 2008). It is also important to point out that the Johnson (2008) study was conducted in years following the Nowak & Rauh (2005) study. It may be that the use of avatars has ballooned along with the use of comments sections, and that as a result, new norms have developed.

The prediction that indirect eye contact would be perceived as suspicious and

therefore lower credibility ratings was not supported. In fact, participants rated comments paired with indirect-eye contact avatars as *more* credible.

Again, that finding must be qualified. There was an interaction between avatar humanness and eye contact, such that human avatars making indirect eye contact were perceived as more credible than human avatars making direct eye contact. The question here is whether the lack of a significant main effect of eye contact on perceived credibility stems from a similar real-life phenomenon. The present research was based on the media equation model developed by Reeves and Nass (1996), who repeatedly documented instances of humans interacting with technology in much the same way that they interact with other humans. For this study, it was proposed that the technology with which participants interacted was the story comments section of several news stories. The use of a story comments section to test this premise was justified with research (Ohmoto, Ueda & Ohno, 2007) suggesting that a multimodal context can be helpful in making behavioral judgments.

This experiment presented a multimodal platform — it included both commenter text and a commenter image — but the eye contact hypotheses were not supported. Several explanations may help interpret this unexpected finding. First, other research (Levine, Asada & Park, 2006) has been critical of attempts to draw a connection between eye contact and lying. It is possible that a lack of eye contact is no longer associated with lying but rather is associated with a behavior or attribute that is perceived as more credible than direct eye contact. Some physiological evidence (Moser, Derntl, Robinson, Fink, Gur and Grammer, 2007) suggests that people's brains respond in similar ways to

avatars as they do to humans. Moser and colleagues' study suggests that there may be other parallels between human responses to real-life images and computer-mediated ones. But again, there is a solid theoretical base arguing that eye contact can be a behavioral indicator of whether someone is lying. It intuitively makes sense that indirect eye contact could be perceived as less than credible.

Second, it is possible that the demographics of the sample affected reported credibility perceptions, in that young people comprised the sample. The participants in one of the aforementioned studies (Gorawara-Bhat et al., 2007) were much older than those used in this sample. It is possible that differing interpretations of eye contact may stem from relative differences in the interpretation of eye contact across generations.

Third, it is possible that the direction of the indirect eye contact affected participants' reported credibility perceptions. All of the eyes and pupils for the indirect-eye contact avatars were shifted to the right to keep the avatars consistent under all manipulations. However, shifting eyes and pupils to the right could also have given the appearance that the avatars were looking directly at their accompanying comments, which were placed to the right of the avatars. It is possible that eye contact directed at the comments led participants to focus more on those comments and rate their credibility higher, but more research is needed to determine whether skewed gaze in other directions (e.g. away from the comment) would yield different results.

It seems possible that avatars whose eyes are directed away from the comment would yield lower credibility ratings than those whose eyes are directed onto the comment. This notion stems from the idea that commenters may be perceived as trying to

present a unified front. Research referenced earlier indicates that people may design avatars to reflect a unified persona that draws on aspects of their personality. It could be that while participants in this study perceived comments with indirect-eye contact avatars as unified — the avatar appeared to be focused on the comment — an avatar with the opposite gaze direction might produce a mixed message. For example, participants might be led to ask, If this commenter wants to be perceived as credible, why does his or her avatar appear to be avoiding the content of the comment?

It is also possible that a larger sample would yield a significant interaction between avatar humanness and eye contact recommendations on perceived credibility. Additionally, this study could have been underpowered. It is possible that the effect size may have been overestimated in the power analysis. More people may have been needed to demonstrate an effect.

No significant main effect of avatar humanness or eye contact on social presence was found. It may be that this form of communication did not score significantly on presence because participants recognize its limits as a communication medium. Responses in a story comments section, for example, are posted over time, and communication is less than instantaneous (as opposed to communication in a chat room or over an instant-messaging service). Additionally, the avatars were drawn to adhere to the conditions outlined, and not to adhere to any standard of realism. Thus, it may be that more realistic-looking avatars — or perhaps actual pictures of humans and animals — would produce significant perceived credibility and social presence scores.

The theoretical significance of this study is that it represents perhaps the first

attempt to present avatars in a multimodal news platform, pairing avatars with text, in an effort to get feedback on credibility and social presence items. The findings suggest a possible shift in Internet newsreaders' perceptions of avatars.

Lee (2004) and others have suggested that behavioral norms can develop online. People associate themselves with online communities for many different reasons, including to spend time engaging in the exchange of ideas, as on news Web sites, or to meet people and make friends. As these processes unfold, behaviors come to be identified as positive (establishing social networks, for example) or negative (hurling insults at other commenters).

The media equation model developed by Reeves and Nass (1996) identifies behaviors that arise when humans engage technology and asks whether humans also engage their peers in similar ways. Thus, the present study raises the question of whether the interaction between avatar humanness and eye contact is somehow tied in to real-world behavior.

It seems possible that participants' reactions to the human indirect-eye contact avatar in the present study are a reflection of resistance to direct confrontation online. In the news industry, there has been a growing trend toward obtaining reader feedback. That is no clearer than in the 2008 report by The Bivings Group that was mentioned at the beginning. Efforts to generate reader feedback using comments, citizen journalism and social networking Web sites such as Twitter and Facebook are ongoing. Yet amid these realities, the Pew study identified earlier found that people reported not having made many new friends online. In at least some cases, then, it appears that efforts to facilitate

meaningful relationships in online spaces have failed. Perhaps the human avatars that made direct eye contact were classed in this category of online noise that has become increasingly louder. The logic might go something like this: Online human-like personalities who appear to be going too far in their search for attention lack credibility. Those who communicate while avoiding an overt gaze are more plausible because they can present their ideas and allow me to evaluate them in the absence of direct confrontation.

These ideas presented in this research are also important from a practical standpoint. First, news managers should consider working with Web staff and reporters to carefully select their avatars, perhaps choosing human avatars that do not make appear to make eye contact with readers. Again, an implication of this study and others before it (Weyers et al., 2006, p. 450) is that readers can make these decisions subconsciously, even in a computer-mediated setting. It is important to begin with a good first impression.

Second, it may be advisable for news organizations to explore new ways of creating a news presence online. Newsrooms might also consider working with readers to boost their credibility, too, by providing tips for selecting avatars. And they might choose to invest money in research aimed at using avatars effectively online, instead of following newsroom trends without fully understanding the consequences of their use.

For example, if further research reveals that avatars can be a deterrent to reader feedback, it might be advisable to limit avatar choices among newsroom staff. Additionally, if further research were to show that personal pictures are advisable over a cartoon avatar, it might generate conversation about ways to engage readers and develop

sources. Reporters, for example, might have more success recruiting sources via Twitter and Facebook, two other forums in which pictures are paired with text information to present a message.

Third, newsrooms that are becoming increasingly converged stand to benefit from this study. The idea behind convergence is that multiple media forms ought to be brought together in the same place, to help readers understand a story in its context. If avatars are to be brought into the fold of a converged newsroom, they ought to be well-vetted before being given the stamp of approval. Do avatars help present a credible message? Or do they lead online readers to question news content?

Today, it appears that many news Web sites allow users to select and upload a personal avatar without regard for content, excepting that which is obscene or violates a terms of service policy. To many journalists, story comments sections may be seen as a place where readers ought to be able to interact about important issues. But if no regard is taken for the content that is put into these sections, including avatars, discussions may dissolve. The interaction identified in this study should raise a red flag that newsrooms need to invest more resources in understanding how readers understand news online, and how they interact with other readers.

Several limitations to this study inhibit the degree to which its results may be generalized. First, broader sample size would lend greater credence to the findings presented here because it would widen the demographic scope of participants. For example, 34 participants were female while 11 were male. It may be that results would vary with the incorporation of more male students. Another gender consideration is that

the human avatars may have appeared to be more male than female — one of them, for example, appeared to be wearing an athletic headband resembling that worn by some male basketball players — while the animal avatars may have appeared more feminine. The human avatars were initially designed to be male in an effort to minimize the potential for a gender confound. It may be that the interaction might have been more pronounced if at least one of the avatars had been more female.

Future studies should consider asking participants the degree to which avatars are male or female. A repeated measures analysis of variance (ANOVA) could then be conducted to determine whether avatar gender has a significant effect on perceived credibility, and whether there is an interaction between perceived credibility and participant gender.

It is also important to note that these were student participants, many of whom were enrolled in journalism courses and have a deeper connection with or investment in online news than perhaps many other groups of students. Journalism courses are now stressing the importance of developing online skills and building conversations with readers. It may be that implicit assumptions about the relative value of story comments sections could have affected these findings in a way that would not be replicated were other kinds of students to be chosen.

A second important limitation is that the comments used in this study were not pretested. In reviewing results, it became apparent that one comment in particular, paired with a pretested story about new $5 bills, yielded higher credibility scores than almost every other comment in the study. This contributed to the significant interaction found

between avatar humanness and eye contact.

However, efforts were made to minimize the likelihood that comments would influence participants' credibility responses. While comment order was not changed, the avatar with which those comments were paired did change across each condition. Additionally, a repeated-measures analysis of variance (ANOVA) conducted without four of the five suspect comments still yielded particularly high credibility ratings. There is evidence that credibility responses did not depend exclusively on the content of the comments.

A third limitation of this study is that it does not consider possible differences in perception based on whether the avatar is a drawn representation of a human or animal versus a picture of an actual human or animal. Only characters drawn using Adobe Photoshop were used in this experiment. Future research might explore whether credibility perceptions tied to avatar humanness and eye contact differ based upon whether the avatar in question is real or imaginary.

A fourth limitation of this study is that the avatars used were confined to a small box of space. While this is common in online news settings, it does not mean that it is the most effective at enhancing perceived credibility. It is possible that size and shape might affect perceptions of avatar credibility. For example, if avatars had been presented larger or without an accompanying box, scores might have differed.

Several things may have gone wrong during the course of this research. There were a few occasions on which the same condition was accidentally presented back-to-back. Additionally, it should be noted that this study was presented to participants along

with a second graduate research study. The subject matter of the other study — regarding participants' need for closure in online news — was deemed sufficiently unrelated to the present topic to be a cause for concern. It may be that order effect could have played a role, albeit small, in some of these findings. However, the order in which these studies were presented was alternated for the majority of participants, meaning the risk of order effects should have been reduced. Additionally, studies were designed to be concise in an effort to maintain response consistency and to minimize participant fatigue. Many participants finished both studies in about 40 minutes.

Third, the content of the stories themselves should be considered. It is possible that the subject matter influenced participants' responses to the credibility of related comments. It is also possible that credibility scores were influenced by the fact that some of the stories, such as those about the new $5 bill and the scandal surrounding Eliot Spitzer, were somewhat outdated at the time of the study. Perhaps responses to the comments would have differed if the stories had involved more recent news. However, all stories used in this study had been pretested and found to be at an acceptable reading level. And two of the stories — those relating to Spitzer and the new $5 bill — involved events likely within the memory of many students who participated in the study. Additionally, an effort was made to place emphasis not on the stories themselves but on the content of the comments beneath them. Questions asked specifically about the content of the comment. This also should have minimized the effect of story content.

Fourth, the wording of some of the questions may have been interpreted as confusing. For example, one of the social presence questions stated, "I felt like the commenter was thinking about readers like me when he or she wrote the article." The

problem, of course, is that on many news Web sites, there is a very distinct difference between commenters and article writers. If a reporter wishes to engage readers in a story comments section, an attempt at transparency is normally made in which the reporter inserts a tagline or other label identifying the fact that he or she was the author of the article. However, the effect of question wording should have been minimized, as indicated by Cronbach's alphas of greater than 0.7 for the social presence index. This supports the notion that participants rated the eight items in that index in a reliable way that was not significantly reduced by a poorly worded question.

Fifth, it is possible that the recommend feature was not familiar to some participants. It was suggested at the start of this research that intuitively, it might make sense that participants would be familiar with the practice of recommending items online. But it is unclear whether the participants in this sample actively participate in recommending story comments online. Thus, more research is needed to determine whether this is a common practice among students, primarily undergraduate ones.

A future version of this study might be adjusted in several key ways. First, all comments to be used in the study should be pretested. Such a pretest might provide a better idea of which items could skew results. Those comments could then be discarded in favor of more judgment-neutral ones. Additionally, comments containing possible confounds, such as those claiming some sort of expertise, might be discarded. A few comments used in the present study included began with such statements as, "As a printer with more than 20 years of experience … ." It may be that comments making such claims were perceived as more credible, and therefore influenced credibility ratings. Therefore, carefully controlling for such claims might further reduce invalid results.

It is also possible that some kind of memory test might help determine whether

participants formed a mental link between avatars and comments. It is possible that less vanilla comments and more controversial ones might have an affect on participants' perceived credibility ratings. Again, an effort should be made to determine the nuances that are present in the types of comments that exist and how they could possibly affect responses. Avatars might also be pretested as needed to make sure factors such as perceived gender are not affecting responses. It is possible that comment or avatar content could be an underlying factor behind perceived credibility ratings.

Second, the study could be presented by itself in order to further minimize participant fatigue and reduce further any issues with order effect. Third, a new batch of stories should be compiled to reflect more current topics, and those should be pretested those in order to reduce the likelihood of a content bias in credibility responses.

Indeed, the rapidly changing nature of online news has led to the creation of new places for conversation and interaction, including story comments sections. Because news managers are increasingly looking for ways to build community and establish conversation on the Internet, the next logical step for this research track would be an investigation into whether the interaction findings in this study — namely, that human avatars making indirect eye contact led to higher perceived comment credibility — hold true for actual pictures of people on news Web sites. Many news managers allow their Web staff, reporters and editorial writers to include a picture with their work. As newsrooms look to increase the dialogue they have with readers and post comments alongside those of readers, it would behoove news managers to examine how best to make a good first impression with an online community.

This study lays the groundwork for an exploration into the use of avatars in online news. As more newsrooms become multimodal, offering such features as audio, video and Flash graphics, it is also important that they consider the possible effects of content over which they now have limited control — namely, the avatars people select to appear with their comments. News managers could become industry leaders by exploring and adapting ways in which avatars are used alongside text-based and other forms of news content, and by engaging the public in discussions about how this content is used. If participants in this study unknowingly rated avatars making indirect eye contact as more credible than those making direct eye contact, it is possible that there now exists one more tool for presenting a better first impression in an online news setting. With more research, it may be possible to pin down exactly which elements of online multimodal platforms positively affect participants' perceptions of news content. At the same time, it may be possible to encourage people to have more meaningful and civil news discussions online.

Appendix A: Six-item source credibility questionnaire presented to participants

1	2	3	4	5	6	7
Intelligent						Unintelligent
1	2	3	4	5	6	7
Untrained						Trained
1	2	3	4	5	6	7
Expert						Inexpert
1	2	3	4	5	6	7
Uninformed						Informed
1	2	3	4	5	6	7
Competent						Incompetent
1	2	3	4	5	6	7
Stupid						Bright

Appendix B: Social presence questionnaire presented to participants

I paid more attention to the commenter than the story.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I felt like the commenter was thinking about readers like me when he or she wrote the article.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

At times, I felt like the commenter was in the room with me.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I felt like the commenter was talking directly to me.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

When I read the comment I imagined the commenter writing it.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I was aware of the commenter while reading the article.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I felt like I got to know the commenter.

1 2 3 4 5 6 7

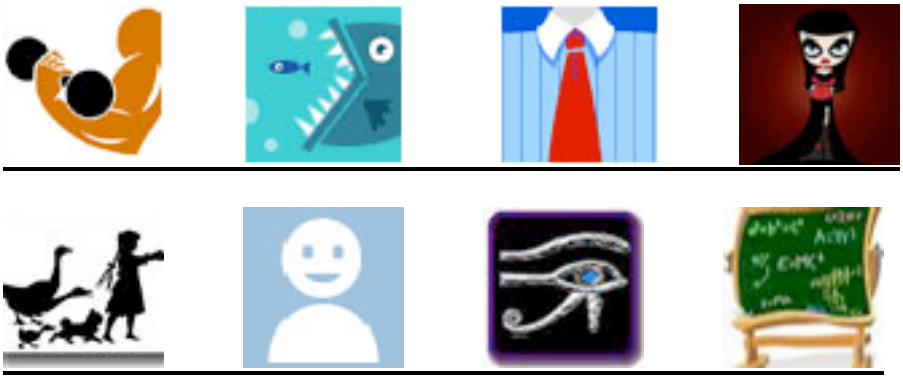
Strongly agree Strongly disagree

I felt present with the commenter.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

Appendix C: Control avatars presented to participants



Appendix D: Example of story with avatar-comment pairings

Abraham Lincoln is getting a makeover.

New $5 bills bearing the face of the nation's 16th president - but with some pigment added - are making their way to banks and retail locations.

The bill went into circulation Thursday, when the Federal Reserve, the supplier of the nation's currency, started distributing the bills to banks, which send them to businesses and eventually into the hands of people. The newly introduced bill was spent for the first time on Thursday at the gift shop of President Lincoln's Cottage in D.C., a location that the late president used as a vacation home in the summer months.

The bill is the latest in a series of redesigned notes aimed at preventing the production of counterfeited bills in an effort to keep up with technology that makes copying money easier.

Lincoln, the nation's 16th president, is still on the front, and the Lincoln Memorial remains on the back of the bill.

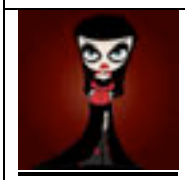
To observers without knowledge of the changes, only the addition of mauve tones at the center and gray near the external parts of the bill are obvious. Undersized numerals are printed on the front and the back. The Great Seal of the United States appears to the right of the president's picture. Semicircles of elements with five triangular points are adjacent to the president's representation and the seal.

The note also displays a "5" in the lower part of the back of the bill. It has two watermarks and multiple changes brought about by new technology, making it harder for counterfeiters to produce.

The old $5 bills will continue to be accepted and recirculated until they deteriorate beyond the point of use.

The alteration of the $5 bill is similar to changes to $10, $20 and $50 bills that went into effect in March.

Next up for a new appearance: the $100 bill.

	I can't imagine how much work must have gone into planning these new bills. As a 20-year veteran of the printing industry, I'm confident that it probably took several years.
	I can't wait to start using these new bills. Has anyone used the new $10, $20 or $50 bills the article mentions?
	I actually just heard about this on the radio this morning. I wonder what President Lincoln would think of these changes!

Appendix E: Example of interface allowing user to rate comments using Likert scale and recommend feature

Comment 1

	I can't imagine how much work must have gone into planning these new bills. As a 20-year veteran of the printing industry, I'm confident that it probably took several years.

Please click the box that best represents the likelihood of you recommending this comment to another reader.

1	2	3	4	5	6	7
Not at all likely to recommend						Very likely to recommend

Please click the box that best describes how you feel about this comment.

1 Intelligent	2	3	4	5	6	7 Unintelligent
1 Untrained	2	3	4	5	6	7 Trained
1 Expert	2	3	4	5	6	7 Inexpert
1 Uninformed	2	3	4	5	6	7 Informed
1 Competent	2	3	4	5	6	7 Incompetent
1 Stupid	2	3	4	5	6	7 Bright

On the next page, you will see a comment that appeared with the story you just read and a question about the commenter. The commenter is the person who wrote

the comment. Please click the box that best describes how you feel about the commenter, and do the same for each of the questions to follow.

I paid more attention to the commenter than the story.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I felt like the commenter was thinking about readers like me when he or she wrote the article.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

At times, I felt like the commenter was in the room with me.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I felt like the commenter was talking directly to me.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

When I read the comment I imagined the commenter writing it.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I was aware of the commenter while reading the article.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I felt like I got to know the commenter.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I felt present with the commenter.

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

Comment 2

	I can't wait to start using these new bills. Has anyone used the new $10, $20 or $50 bills the article mentions?

Please click the box that best represents the likelihood of you recommending this comment to another reader.

1	2	3	4	5	6	7
Not at all likely to recommend						Very likely to recommend

Please click the box that best describes how you feel about this comment.

1	2	3	4	5	6	7
Intelligent						Unintelligent
1	2	3	4	5	6	7
Untrained						Trained
1	2	3	4	5	6	7
Expert						Inexpert
1	2	3	4	5	6	7
Uninformed						Informed
1	2	3	4	5	6	7
Competent						Incompetent
1	2	3	4	5	6	7

Stupid Bright

On the next page, you will see a comment that appeared with the story you just read and a question about the commenter. The commenter is the person who wrote the comment. Please click the box that best describes how you feel about the commenter, and do the same for each of the questions to follow.

I paid more attention to the commenter than the story.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I felt like the commenter was thinking about readers like me when he or she wrote the article.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

At times, I felt like the commenter was in the room with me.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I felt like the commenter was talking directly to me.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

When I read the comment I imagined the commenter writing it.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I was aware of the commenter while reading the article.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

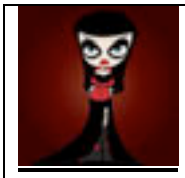
I felt like I got to know the commenter.

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

I felt present with the commenter.

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

Comment 3

	I actually just heard about this on the radio this morning. I wonder what President Lincoln would think of these changes!

Please click the box that best represents the likelihood of you recommending this comment to another reader.

1	2	3	4	5	6	7
Not at all likely to recommend						Very likely to recommend

Please click the box that best describes how you feel about this comment.

1	2	3	4	5	6	7
Intelligent						Unintelligent
1	2	3	4	5	6	7
Untrained						Trained
1	2	3	4	5	6	7
Expert						Inexpert
1	2	3	4	5	6	7
Uninformed						Informed

1 2 3 4 5 6 7
Competent Incompetent

1 2 3 4 5 6 7
Stupid Bright

On the next page, you will see a comment that appeared with the story you just read and a question about the commenter. The commenter is the person who wrote the comment. Please click the box that best describes how you feel about the commenter, and do the same for each of the questions to follow.

I paid more attention to the commenter than the story.
1 2 3 4 5 6 7
Strongly agree Strongly disagree

I felt like the commenter was thinking about readers like me when he or she wrote the article.
1 2 3 4 5 6 7
Strongly agree Strongly disagree

At times, I felt like the commenter was in the room with me.
1 2 3 4 5 6 7
Strongly agree Strongly disagree

I felt like the commenter was talking directly to me.
1 2 3 4 5 6 7
Strongly agree Strongly disagree

When I read the comment I imagined the commenter writing it.
1 2 3 4 5 6 7
Strongly agree Strongly disagree

I was aware of the commenter while reading the article.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I felt like I got to know the commenter.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

I felt present with the commenter.

1 2 3 4 5 6 7

Strongly agree Strongly disagree

Appendix F: Manipulation check for two avatar conditions

	Human						Animal
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7

1 2 3 4 5 6 7

Direct eye contact **Indirect eye contact**

1 2 3 4 5 6 7

1 2 3 4 5 6 7

1 2 3 4 5 6 7

1 2 3 4 5 6 7

1 2 3 4 5 6 7

1 2 3 4 5 6 7

1 2 3 4 5 6 7

1 2 3 4 5 6 7

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