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# Criticism or Praise? The Impact of Verbal versus Text-Only Computer Feedback on Social Presence, Intrinsic Motivation, and Recall

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## ABSTRACT

The Computers Are Social Actors (CASA) paradigm asserts that human computer users interact socially with computers, and has provided extensive evidence that this is the case. In this experiment ( $n = 134$ ), participants received either praise or criticism from a computer. Independent variables were the direction feedback (praise or criticism), and voice channel (verbal or text-only). Dependent variables measured via a computer-based questionnaire were recall, perceived ability, intrinsic motivation, and perceptions of the computer as a social entity. Results demonstrate that participants had similar reactions to computers as predicted by interpersonal communication research with participants who received text-only criticism reporting higher levels of intrinsic motivation, perceived ability, and recall. Additionally, the computer was seen as more intelligent. Implications for theory and application are discussed.

## INTRODUCTION

**P**RAISE is a powerful social strategy. Teachers use it to maintain control in the classroom, to motivate students and encourage learning, parents use it to encourage positive behaviors in their children, and supervisors use it to motivate employees. People often find themselves working harder to maintain good standing or to continue receiving praise. But, what if the praise came from a computer?

When people work on a computer, they sometimes form a relationship with that particular machine, going as far as giving a name to their computer. (On both Macintosh 'OS' and the Windows operating system the user sees an icon of a computer that is originally labeled "Hard Drive"

or "My Computer" and the user can change this label by highlighting the label and typing a new name.<sup>1</sup>) People often complain about their computer "giving them a hard time" or "being uncooperative." These references to computers in daily life are just a few indications of the fact that people can and do see computers as more than machines; they often unknowingly attribute personalities to them. There have been attempts to create/program computers to respond to us (i.e., "Big Blue," the chess program that has actually won when playing human champions).

Nass et al. have provided substantial evidence that adults react socially to computers and other technologies,<sup>2</sup> responses that represent an "illusion of nonmediation" called presence.<sup>3</sup> Examples of

their findings include evidence that computers are seen as teammates,<sup>4</sup> and consistent with similarity-attraction theory,<sup>5</sup> computer users are more attracted to computers that exhibit similar personalities to their own.<sup>6</sup> These findings have led Nass and his associates to suggest that human-computer interaction should be studied not only as mediated communication but also as a new type of interaction.

Interpersonal communication research suggests that praise increases a person's intrinsic motivation,<sup>7</sup> and in turn increases the amount of attention and time the person devotes to the task, and thereby the amount of learning that occurs. The effect of this social interaction in the context of human-computer interaction maybe that praise motivates people to continue using the computer program and improve learning outcomes.

In an experiment, the extent to which people experience a type of presence in which they respond to and interact with technology as they do with people in nonmediated interpersonal communication is explored. Specifically, the study attempts to answer the following questions: Does receiving praise encourage people to interact socially with computers? Will people respond to praise from a computer and a human similarly? If they do, does such treatment affect intrinsic motivation and learning? What effect does hearing feedback (versus reading on the screen) influence people's responses?

The following sections outline the relevant literature in the areas of presence and Computers Are Social Actors (CASA); praise, including the role of intrinsic motivation, and perceived ability. Then the method and results of the study are detailed and implications of the results and future avenues of research are presented.

## PRESENCE

The term "telepresence" was first used by Marvin Minsky<sup>8</sup> in 1980 to refer to teleoperation technology that provides the user with a "remote presence" in a different location via a feedback system that allows him or her to "see or feel what is happening" there. The term was adapted and shortened when the journal *Presence* (from the MIT Press) was founded in 1992 to provide a forum for "current research and advanced ideas on teleoperators and virtual environments." Six conceptualizations of presence were identified by Lombard and Ditton<sup>3</sup> in a diverse set of literature, including presence as social richness (the "warmth" or "intimacy" possible via a medium),

realism (perceptual and/or social, transportation (the sensations of "you are here," "it is here," and "we are together"), immersion (in a mediated environment, social actor within medium (parasocial interaction), and medium as social actor. Lombard and Ditton<sup>3</sup> incorporated them into a single conceptual definition of presence: "the *perceptual* illusion of nonmediation." The term "perceptual" indicates that this phenomenon involves continuous (real time) responses of the human sensory, cognitive, and affective processing systems to objects and entities in a person's environment. An "illusion of nonmediation" occurs when a person fails at some level and at some degree to accurately perceive or acknowledge the existence of a medium in his or her communication environment and responds as he or she would if the medium were not there.

The dimensions of presence are often categorized into physical and social types of presence.<sup>9</sup> A physical sense of presence occurs when the user has the sense of physically being in or near a mediated environment (for example, being immersed in a "virtual reality" environment, or the setting of an IMAX movie or television program). The social dimension of presence reflects a sense of being near or with a social entity of some kind (feeling connected to another person, computer-generated avatar or character, or a technology that appears to be "alive"). This paper focuses on the social category of presence and specifically the dimension of presence in which people perceive media technologies as social actors. The most studied example of this type of social presence is represented by Computers Are Social Actors (CASA) research.

## COMPUTERS ARE SOCIAL ACTORS

The CASA paradigm maintains adults interact with computers in a social manner by applying interpersonal interaction rules to the exchange and that these responses are inherently social and not parasocial. This area of research has demonstrated that the computer itself (and not the programmer) is treated socially; further that this type of interaction is common and not the result of cognitive or other deficiency. Evidence provided by CASA studies demonstrate that people's reactions to computers follow interpersonal rules. For example, people attribute gender to a computer and respond accordingly,<sup>10</sup> computers with different voices are perceived as different social actors, and people are polite to computers which display man-

ners.<sup>12</sup> All of these results mirror human-human interaction findings from interpersonal communication research.

Reeves and Nass<sup>2</sup> provide a model for conducting CASA research, which they describe in their book, *The Media Equation*. To demonstrate social responses to technology, the researcher chooses a finding in social science research, and replaces the word "person" or "environment" with the substitute medium, and then attempts to replicate the social science finding using the technological medium rather than a person or environment. In this case, the computer is substituted for an individual who praises or criticizes a person for their performance on a task.

### *Computers and voice*

A factor contributing to social interaction is the presence of human-sounding speech or voices. Since human speech is distinct and we perceive the ability to speak as a sign of intelligence, it follows that computers' voices should encourage human interaction with a computer to be social. Computers can now both speak and understand human languages. Recent technology that allows the computer user to speak commands instead of typing them is also readily available (e.g., Dragon Naturally Speaking, from Scansoft, has a 60,000-word active vocabulary and 120,000-word backup vocabulary and can translate up to 160 words per minute). The ability for the computer to speak and understand human language increases the number of ways that computers are like humans.

To investigate if human computer voices are treated as social, Nass and Steuer<sup>11</sup> explored whether or not subjects would respond to a computer that praised or criticized itself as they would to a person who praised or criticized herself/himself. The interpersonal finding that is tested in this study is that people regard self-praise (and criticism) as less accurate than praise (or criticism) received from another person.<sup>13</sup> Nass and Steuer<sup>11</sup> employed three separate computers for tutoring (learning the task), testing, and evaluation sessions. The experiment was a 2 (praise/criticism)  $\times$  2 (same box/different box)  $\times$  2 (same voice/different voice) between subjects design. In the evaluation session, the computer reviewed each question verbally with the subject and all subjects were told that they answered the same questions correctly or incorrectly (they were given either positive or negative feedback regardless of their answers). Then the subjects were

asked to complete a paper-and-pencil 10-point Likert scale set of questionnaire items to assess the tutoring sessions. The results demonstrate that different voices were perceived as different social actors. This conclusion was reached because of the subjects' perception that the evaluation of the tutoring session was more accurate and fair when described by a different voice than by the same voice that conducted the tutoring. Nass and Steuer assert that the subjects applied the interpersonal rule for assessing human behavior (self versus other praise/criticism) in evaluating the performance and "personality" of the computer.

Nass et al.<sup>14</sup> conducted a follow up experiment to assess whether it was the voice or the computer ("box") that the subjects perceived as distinct social actors. In this study, the subjects who participated were tested, tutored and evaluated on one of three computers. The experiment design is the same as the above study except for the addition of a third voice in the evaluation session. (The evaluation was in one of eight conditions: the same voice/box conditions from the previous study plus Voice 1/Computer 1, Voice 3/Computer 1, Voice 1/Computer 3, or Voice 3/Computer 3.) The reason for the addition of the third voice is to take "the question one step further by pinpointing the locus of self/other attribution." The results are similar to the Nass and Steuer<sup>11</sup> study: subjects responded to different voices as different social actors, regardless of the location of the voice (on the same or different computer). The consistency of these results demonstrates that voice is a cue of a social actor and that computers that have voices elicit strong social responses from their human users.

## PRAISE

Research has shown that praise is an effective interpersonal communication strategy in changing behavior. Praise is defined within education literature as spoken or written statements that "commend the worth of or express approval or admiration" for others.<sup>15</sup> Brophy<sup>15</sup> sees praise as a more intense teacher response than feedback or "affirmation of correct response" (e.g., "you are correct"). He states that "praise statements express positive affect (surprise, delight, excitement) and/or place the student's behavior in context by giving information about its value or its implications about the student's status." Mills and Grusec<sup>16</sup> identified two types of praise: Dispositional praise is the application of a positive trait label (e.g., "good girl") and nondispositional

praise is the evaluation of a specific behavior (e.g., "Susie, you have neat handwriting"). Both types of praise are commonly used to promote and manage good behavior.

## REACTIONS TO PRAISE

While we often think of praise as being used more commonly with children, there are similar reasons and occasions for praising adults, especially in college classrooms and in the workplace. Research that examines adults and praise focuses on the adults' reactions and perception of the reason the praise was given.

### *Praise and perception of ability*

Meyer<sup>17</sup> examined individuals' perceived ability and the social interaction or context in which praise was given. Meyer asserts that adults use comments made by others to interpret what the other person thinks of the praised person's ability. Examples of these types of comments are praise and blame (or criticism) from a teacher/professor. Meyer et al.<sup>18</sup> had teachers read stories that described two students who completed either arithmetic problems which were characterized as very easy or very hard. The subjects were assigned to one of four conditions: easy problem/correct response, easy problem/incorrect response, hard problem/correct response, hard problem/incorrect response. The two students in the story received different feedback, although their answers were the same: neutral ("Yes, 32 is the correct answer"), praise ("You have done very well; I'm pleased"), or blame ("What have you done! 35 is wrong"). After reading the story the teachers were asked to rate the students' ability. Students who were praised in the easy condition were judged by the teachers as having lower ability, while students who were blamed in the difficult condition were given credit by the teachers for having higher ability. These results indicate that praise or blame influences the perceived ability estimates based on the amount of effort seen as necessary or sufficient for success at a task. The judgments made by the teachers demonstrate that adults do use praise (or criticism) to make judgments, whether intentionally or not, about people's ability.

In a study using a similar method, Meyer et al.<sup>18</sup> tested the perceptions of adults (20–50 years old) and teenagers (16–18 years old). In this study, the adults indicated that the teacher in the story

praised students who were perceived to be at a lower level for successful completion of an easy task and criticized students who the teacher perceived to be at a higher ability level for unsuccessful completion of a more difficult task. The teenagers' responses were similar to the adults'—teachers praising a student for completing an easy task correctly leads to the perception of lower ability. Additionally, the authors suggest that these "reactions may also influence the self-perception of ability." This supports an earlier claim by Meyer et al., who found that when a student was criticized for not successfully completing an easy task, the student's expectation and perception of his/her own ability increased, suggesting this study provides evidence that well-intentioned responses may have negative or inverse reactions. Therefore, that praise and blame may play a role in helping individuals evaluate their own ability and in shaping self-concept.

### *Praise and perceptions of the evaluator*

Another study that examined how praise and criticism are evaluated was conducted by Amabile.<sup>19</sup> In this study, Amabile<sup>19</sup> used actual negative and positive book reviews written by one author from the *New York Times* book review section. The reviews were edited to be the same length. The reviews were given to 100 male and female undergraduates to read, and they were instructed that the reviews were of the same book by different reviewers (in fact they were reviews of different books by the same reviewer); participants were asked to form an impression of the reviewers. Amabile<sup>19</sup> found that a negative reviewer was seen as being "more intelligent and competent, with higher literary expertise than the positive reviewer. He was, however, also seen as significantly less fair, likable, open-minded, and kind." The results show that praise and criticism are not only received differently but that the person who delivers either the praise or criticism is also evaluated differently.

Adults respond to praise (and criticism) in predictable ways and based on such comments they assess what the other person thinks and is like.

In sum, adults can have very strong reactions to praise. It has been demonstrated that adults perceive praise (or criticism) to be an indication of what the praise giver thinks about the praised person's abilities and that recipients of praise (or criticism) may develop strong impressions of the person who gives the praise (or criticism).

Previous research on praise suggests it is effective in interpersonal contexts because it increases intrinsic motivation. Intrinsic motivation refers to participation for the enjoyment of an activity or out of curiosity.<sup>20</sup> Intrinsic-motivated behaviors are behaviors for which the only reward is the activity itself.<sup>21</sup> In a meta-analysis, Cameron and Pierce<sup>7</sup> concluded that using verbal praise (versus reward or no praise) increases intrinsic motivation. The reason given for the increase is praise's "informational value" and that "verbal praise is seen as giving the individual more confidence in their ability to complete the task." The increase remains even when the praise is removed.<sup>22</sup> The primary consequence of increased intrinsic motivation is increased learning.<sup>20,23-27</sup> Together these studies provide a clear link between praise and increased intrinsic motivation, and improved learning.

## HYPOTHESES

The following specific hypotheses were tested:

- H1: Participants who receive criticism from a computer during performance of a task perceived as easy *will perceive their ability to complete the task as higher* than participants who receive dispositional praise from the computer.
- H2: Participants who receive criticism . . . *will be more intrinsically motivated* than participants who receive dispositional praise from the computer.
- H3: Participants who receive criticism . . . *will have lower recall scores* than participants who receive dispositional praise from the computer.
- H4: Participants who receive criticism . . . *will evaluate the computer as more intelligent* than participants who receive praise from the computer.
- H5: Participants who receive dispositional praise . . . *will evaluate the computer as nicer* than participants who receive criticism from the computer.
- H6: Participants who receive verbal feedback from the computer will report higher levels of the relationships predicted in H1-H5.

## MATERIALS AND METHODS

A between-participants 2 (praise/criticism) × 2 (voice/text-only) experiment was designed to ex-

amine adults' social reactions to a computer and test their recall, perceived ability, and intrinsic motivation. First, participants read 30 trivia facts on a computer. Next, they interacted with the computer, receiving either praise or criticism as they answered a series of multiple-choice questions about the trivia facts. Participants then completed a distraction task, and filled out a computer-based questionnaire that measured the dependent variables. (This experiment was reviewed and given human participants approval by the Institutional Review Board.)

### *Participants*

One hundred and thirty-four people (94 female and 38 male) participated. The average age was 27.0 (range 18-64). Seventy-one percent of the participants were Caucasian, 19% were African American, 3.0% were Asian, and 7.1% were of other ethnic backgrounds. The participants were all enrolled in a communication research course at a large Midwestern university, and received extra-credit for their participation.

### *Stimuli*

The participants were presented with 30 trivia facts that were found on a website of strange but true facts. The participants used a computer mouse to click on a directional arrow graphic to continue from one page to the next.

### *Apparatus*

The story and the multiple-choice questions were contained within the same computer program. The program was created using the Toolbook Assistant 7.0 software package (Click-to-Learn Corp., 2000), a multimedia authoring program designed to assist educators in creating on-line courses, CD-ROMs, and stand-alone programs.

### *Independent variables*

*Feedback.* The primary independent variable was feedback, either praise or criticism. Each participant used a computer that gave either a "praise" or "criticism" response as the participant completed prompted recognition memory tasks (multiple-choice questions). In the praise condition, the language used by the computer complimented the participant's actions (i.e., "Wow! You are doing a

fine job!"). If the participant chose one of the three incorrect responses, a text message on the computer asked the participants to "Please try again." The participant was given this "try again" prompt until he/she answered the question correctly. In the criticism condition, the comments provided a negative statement about the participant's performance (i.e., "No, what is wrong with you"). When participants in the criticism condition answered the question correctly, the language used provided neutral statements to inform the participant of his/her progress (i.e., "OK").

*Voice.* Participants were assigned to one of two "voice" conditions. In the text-only condition, they either saw the computer feedback messages on the screen only without hearing any noise or voice from the computer. In the voice condition, the participants were able to both read the feedback statements and to hear it simultaneously. The participants in the voice condition wore headphones so each individual participant could only hear their own feedback statements.

*Other independent variables.* Participants completed items inquiring about their age, ethnicity and gender using traditional measures.

#### *Dependent variables*

The dependent variables were perceived ability, intrinsic motivation, and recall. With the exception of the learning items, the dependent variables were measured using paper-and-pencil 9-point Likert scale questionnaire items.

*Perceived ability.* The participants' perceived ability was measured using Likert scales.<sup>6</sup> The participants rated 10 questions using the response scale 1 = "Totally disagree" to 9 = "Totally agree." The dependent variable was an index built from 4 items that measured the participants' perceived ability. The participants were asked the extent to which they agreed or disagreed with statements such as, "The questions were very easy," and "I felt in total control while answering the questions." The index was reliable (Cronbach's alpha = 0.70).

*Intrinsic motivation.* Intrinsic Motivation was measured using an adapted version of the Activity-Feeling Scale (AFC).<sup>28</sup> The scale evaluates a person's self-determination, competence, relatedness, and tension with a set of 12 nine-point Likert scale items. The response scale was 1 = "Totally disagree" to 9 = "Totally agree." The participants were

asked the extent to which they agreed or disagreed with statements such as, "When the computer told me I was right it made me feel smart," "When the computer told me I was right it made me feel I achieved something," and "When the computer told me I was right it made me feel I wanted to do this." The index was reliable (Cronbach's alpha = 0.90).

*Recall.* To measure recall the participants were asked to write out as many of the trivia facts as they could remember. Each set of facts was coded for correct recall of the trivia facts with one-point given for each correctly recalled item. The maximum recall score was 30 points.

#### *Social presence*

*Perceived intelligence.* The participants' perception of the computer's intelligence was measured using Likert scales.<sup>6</sup> The participants rated 10 questions using the response scale 1 = "Totally disagree" to 9 = "Totally agree." The participants were asked the extent to which they agreed or disagreed with statements such as, "The computer was intelligent," and "The computer was logical." The index was reliable (Cronbach's alpha = 0.86).

*Perceived niceness.* The participants' perception of how nice the computer was measured using Likert scales.<sup>6</sup> The participants rated 13 questions using the response scale 1 = "Totally disagree" to 9 = "Totally agree." The participants were asked the extent to which they agreed or disagreed with statements such as, "The computer was warm," and "The computer was kind." The index was reliable (Cronbach's alpha = 0.91).

#### *Procedure*

Participants were assigned randomly to one of four the feedback conditions (praise/voice, praise/text-only, criticism/voice, and criticism/text-only). There were four sessions with each group participating simultaneously. The participants were told that they were helping the experimenter evaluate a new computer program. The participants read the 30 trivia facts on the computer and then answered the 30 recognition questions in which the feedback manipulation was embedded. After the exposure to the manipulation, the participants switched computers to avoid the possibility that they would alter their responses.<sup>14</sup> Next, the participants completed a computer-based questionnaire containing a distraction task (questions about television news). Following the distraction task, the participants were

instructed to write out what they remembered from the story in order to test recall. Then they completed questions that measured perceived ability, intrinsic motivation, social presence, and demographic items. The experiment took approximately 30–40 min to complete.

## RESULTS

A series of two-way univariate analyses of variance with the independent variables feedback (praise or criticism) and aural (voice or not voice) were used to test the hypotheses.

Hypothesis 1, predicting criticism from a computer will increase participants' perception of their ability to compete the task, was not supported ( $F(1, 133) = 2.31, p = 0.13, \eta^2 = 0.02$ ). The prediction that participants who heard a voice would report higher perceived ability was significant ( $F(1, 133) = 4.81, p = 0.03, \eta^2 = 0.04$ ). However, the means were in the opposite direction than predicted with participants who received text-only condition ( $M = 4.48; SD = 0.83$ ) reporting greater increases in their perceived ability than those in the verbal comments ( $M = 4.20; SD = 0.79$ ). The interaction was not significant.

Hypothesis 2, positing that participants who received criticism from a computer would report greater amounts of intrinsic motivation than those who received dispositional praise, was not supported ( $F(1, 133) = 0.40, p = 0.52, \eta^2 = 0.003$ ). The prediction that verbal versus text-only comments would increase intrinsic motivation was significant, but the means were in the opposite direction with participants who received text-only ( $M = 2.73, SD = 1.10$ ) reporting higher levels of intrinsic motivation than those who received verbal comments ( $M = 2.41, SD = 1.11$ ). Additionally, the interaction between feedback and voice condition was significant with ( $F(1, 133) = 3.75, p = 0.05, \eta^2 = 0.03$ ). The means demonstrate that the participants in the criticism/text-only condition ( $M = 2.86; SD = 1.03$ ) reported slightly higher intrinsic motivation than those in the praise/verbal condition ( $M = 2.66; SD = 1.22$ ), praise/text-only ( $M = 2.60; SD = 1.18$ ), and criticism/verbal condition ( $M = 2.16; SD = 0.86$ ).

Hypothesis 3, suggesting that participants who received criticism from a computer would have higher recall scores than children who received dispositional praise, was not supported ( $F(1, 133) = 0.51, p = 0.47, \eta^2 = 0.004$ ). However, the means were in the predicted direction with participants in the criticism condition had higher recall scores ( $M = 10.10; SD = 5.19$ ) than those in the praise condition ( $M = 9.32;$

$SD = 4.94$ ). The prediction that hearing a voice would increase recall was significant ( $F(1, 133) = 0.95, p = 0.002, \eta^2 = 0.07$ ), with participants who received text-only comments ( $M = 10.83; SD = 5.19$ ) recalling more trivia facts than those who received verbal comments from the computer ( $M = 7.96; SD = 4.35$ ). The interaction was not significant.

Hypothesis 4, positing participants who received criticism would evaluate the computer as smarter than participants who received praise, was not supported ( $F(1, 133) = 0.51, p = 0.48, \eta^2 = 0.004$ ). Also, the prediction regarding the voice condition was not supported ( $F(1, 133) = 1.98, p = 0.16, \eta^2 = 0.015$ ) with participants in the criticism condition ( $M = 2.81; SD = 1.20$ ) reporting the computer was more intelligent than those who received praise ( $M = 2.56; SD = 1.32$ ). However, the interaction between feedback and aural condition was significant ( $F(1, 133) = 4.98, p = 0.03, \eta^2 = 0.04$ ). The means demonstrate that the participants in the criticism/text-only condition ( $M = 2.98; SD = 1.25$ ) reported slightly higher intrinsic motivation than those in the praise/verbal condition ( $M = 2.83; SD = 1.23$ ), praise/verbal condition ( $M = 2.64; SD = 1.15$ ), and praise/text-only ( $M = 2.18; SD = 1.39$ ).

Hypothesis 5, positing that participants who receive dispositional praise will evaluate the computer as nicer than participants who receive criticism from the computer, was supported ( $F(1, 133) = 5.77, p = 0.01, \eta^2 = 0.04$ ), with participants who received praise ( $M = 2.99; SD = 1.36$ ) reporting the computer was nicer than the participants who received criticism ( $M = 2.61; SD = 1.24$ ). The prediction that participants who received verbal praise would report perceiving the computer as nicer ( $F(1, 133) = 3.55, p = 0.06, \eta^2 = 0.04$ ) than those who received text-only comments approached significance. However, the means demonstrate that in the text-only condition ( $M = 2.94; SD = 1.27$ ), more participants felt the computer was nicer than those who received verbal comments ( $M = 2.63; SD = 1.36$ ). Additionally, the interaction between feedback and aural condition was significant ( $F(1, 133) = 7.89, p = 0.007, \eta^2 = 0.05$ ). The means demonstrate that the participants in the praise/verbal condition ( $M = 3.10; SD = 1.33$ ) reported slightly the computer was slightly nicer than those in the criticism/text-only condition ( $M = 2.98; SD = 1.16$ ), praise/verbal condition ( $M = 2.90; SD = 1.38$ ), and praise/text-only ( $M = 1.94; SD = 1.11$ ).

## DISCUSSION

The results of this study demonstrate that people do respond to computers as social actors. Individuals



responded to the computers socially and responded to feedback from the computer in ways predicted by interpersonal communication and education literatures. The results demonstrate that when participants received criticism as text-only comments they were more likely to have an improved perception of their own ability, higher intrinsic motivation, and felt the computer was more intelligent than participants who received verbal praise. The exception was the evaluation of the computer as being nice, where participants who heard praise comments rated the computer as nicer.

The results provide further evidence that people will respond to simplistic social cues,<sup>11</sup> as evidenced here by the response to the text-only comments. A possible explanation for the reversal of the voice versus text-only results may be that the voice condition seemed stilted and awkward to the participants versus the immediate text-only feedback (there was a very brief delay before the participants heard the verbal comments). Previous research suggests media users will accept the limitations of a medium and are willing to overlook the poor quality; however, when presented with a high-quality image and inferior audio the media user will find the experience uncomfortable.<sup>29</sup>

It must be noted that perhaps the participants were responding to the novelty of the criticism—much like the reason people go to restaurants where the waiters insult them. Or perhaps it is as the interpersonal research suggests, that they felt the computer thought more of their ability because the task was a relatively easy one. However, it is important to note that criticism only produced these positive outcomes in the text-only condition: the verbal criticism may have been too harsh for the participants.

As suggested by previous research, when intrinsic motivation and perceived ability increase, learning (recall) will also increase. The results here provide evidence the same relationship holds true for feedback from computers. Some practical applications of these findings include varying the type of feedback provided in adult targeted educational software so that user feels there is a high expectation of their ability. Given the results of this study the current use of praise may actually be self-defeating as users may feel the computer thinks they are “stupid” and therefore needs continuous praise for an easy task.

#### *Future research*

This area of research needs to be further developed by expanding the type of content and the

types of feedback provided. One possibility is to examine the computer users' reactions to similar feedback manipulations after exposure to on-line lecture. The difficulty of the subject matter being presented could also be manipulated. The voice feedback should be studied with a faster computer, allowing the feedback to be immediate (in the current study there was a short pause).

Utilizing these changes will permit the experimenter to study a larger group of subjects, allowing comparisons of age and gender. These comparison studies will have two main goals: to see if the same increased learning results can be replicated and to explore differences between participants' social responses to computers. Additionally, future studies should include the use of other interpersonal communication findings, including possibly other in-class teacher behaviors (e.g., communication styles and their relationship with learning).

## CONCLUSION

This study provides further empirical support for social presence response to computers. The use of text-only criticism by a computer produced positive increases in intrinsic motivation, perception of one's own ability, and recall. Taken together these results demonstrate that computer users are responding to the computer as a social entity and not as if it were only a machine.

In as far as this study was exploratory, the recall outcomes suggest that the continual use of praise in computer software may be self-defeating for people who use programs for educational purposes.

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