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ABSTRACT

Conducted in the attribution-research paradigm of social psychology, a study examined whether human-computer interaction is fundamentally social (as in human-human interaction) or parasocial (as in human-television interaction). All 30 subjects (drawn from an undergraduate class on communication) were exposed to an identical interaction with computers. In one condition, subjects were told they were dealing with computers; in another, they were told they were interacting with programmers. Each subject was tutored by two different computers on two topics and evaluated by the computers. The first set of evaluations praised the subject four out of five times, the second set of evaluations criticized the subjects four out of five times. Psychological differences were found between conditions, suggesting human-computer interaction to be social rather than parasocial. Users tended to respond to computers as though the computers were other humans, and dealing with computers is more like interpersonal communication rather than like mass communication. Further research should expand on this study by adding another condition wherein subjects are led to believe that they are interacting with a live tutor/evaluator in another room. Depending on whether this condition is closer to the computer condition or the programmer condition, theories about the socialness of human-computer interaction can be generated. (Contains 25 references and one table of data.) (RS)

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Is Human-Computer Interaction Social or Parasocial?

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RUNNING HEAD: HCI - Social or Parasocial?

Is Human-Computer Interaction Social or Parasocial?

A B S T R A C T

Is human-computer interaction fundamentally social (as in human-human interaction) or parasocial (as in human-television interaction)? This experiment, conducted in the attribution-research paradigm of social psychology, exposed all subjects to an identical interaction with computers. In one condition, subjects were told they were dealing with computers; in another, they were told they were interacting with programmers. Psychosocial differences were found between conditions, suggesting human-computer interaction to be social rather than parasocial.

Is Human-Computer Interaction Social or Parasocial?

Two recent developments - increasing digital convergence of multi-media and the arrival of the so-called information superhighway - have dramatically pushed the computer to the center stage of communication technology. The open, decentralized Internet computer network (as opposed to the closed, top-down cable television system) has been touted as the model for the nation's new information infrastructure (e.g., Bank, 1994).

Given this model, the end-user manifestation of most of the projected innovations in communications technology is likely to be in the form of computers (e.g., Williams, 1994). All known forms of media are likely to be channeled to users through computers. This raises an obvious question to media scholars: Can past research on television, print and other media technologies be generalized to computers, too? Put another way: Will users react similarly to televisions and computers?

Literature on the psycho-social aspects of human-computer interaction offer two opposing views. On the one hand is the social model which holds that human-computer interaction is fundamentally social, that users tend to treat computers as though they (the computers) were other human beings, that dealing with computers is more like interpersonal communication than mass communication. On the other hand is the parasocial model which holds that human-computer interaction is akin to human-television interaction, that users tend to covertly interact with imagined others through computer terminals much like they do with the mass mediated characters they see on television screens.

Social Model

Computers are considered social actors because of their increasing interactivity, use of language and human-sounding speech, and entry into hitherto human roles. Investigations into the psychology of human-computer interaction reveal that individuals treat computers socially even when they are fully aware that they are interacting with machines (Nass & Steuer, 1993).

Users tend to apply the social rules of human-human interaction while dealing with computers. For example, people apply interpersonal politeness norms to computers: Users asked by a computer about its own performance feel compelled to be more positive than users asked about the same computer by a different computer or an independent source like a paper-and-pencil questionnaire (Nass, Wade, Malick & Reiss, 1994).

Other social-psychological findings about interpersonal communication are also replicated with computers. For instance, a computer that praises other computers and criticizes itself is considered friendlier than a computer that praises its own performance and criticizes the performance of other computers (Nass, Steuer, Henriksen & Dryer, 1994). Even gender stereotypes are applied to computers with male and female voices. A female-voiced computer is considered more authoritative than a male-voiced computer in topics like love and relationships. Praise from a male-voiced computer is considered more convincing than the same praise coming from a female-voiced computer (Green, 1993).

Such unconscious, automatic social responses are claimed by some researchers to be directed at computers without any mediation (e.g., Nass, Steuer, Tauber & Reeder, 1993). This means that people respond to computers in much the same way they do to other human beings. This is a pure unmediated model, and all social attributions are made to the machine

directly. These social responses are natural and not a function of novelty, infancy or mental deficiency. Furthermore, these responses are incurable, commonplace and easy to generate amongst experienced computer users (Nass, Steuer & Tauber, 1994).

Parasocial Model

Many tend to disagree with the social model - not just because it seems ludicrous to think that people treat machines socially, but because they see computers as just a medium through which the user has a two-way communication with the programmer (Rafaeli, 1990). This may be called the television model wherein people are understood to be reacting psychologically to the characters on the screen (or the creator of those characters) instead of the screen or the TV set itself. The experience may also be paralleled with reading a book wherein the reader is not reacting to the pages of the book, but to the author or the characters created by the author. In sum, this alternative view proposes that individuals, when using computers, visualize a human being inside the computer or at the other end of the computer, and so their application of social rules is hardly out of place (e.g., Rubin & Rubin, 1985). After all, communication scholars have long noticed media users carrying on a parasocial relationship with television news anchors (Rubin, Perse & Powell, 1985), soap opera characters (Rubin, 1985; Rubin & Perse, 1987), and so on. At least one scholar has suggested that the imagined relationship taken on by a Dungeons and Dragons player with the Dragons or the Wizard resembles the relationship some people had with Walter Cronkite (Rafaeli, 1986).

By definition, parasocial interaction (PSI) is an illusory subjective activity carried out by users who delude themselves into thinking that their relationship with the

mediated representation of another human being is in fact a flesh-to-flesh interaction (Horton & Wohl, 1956). Advocates of PSI would argue that people apply social rules while interacting with the computer, not because they think that the machine is a human being but because they imagine they are dealing with another human being through the machine (e.g., Houlberg, 1984; Levy, 1979).

Thinkers in cognitive psychology and computer science also believe that people covertly interact with a human entity that has intentions (Heidegger, 1977; Laurel, 1990; Weizenbaum, 1976). Technology simply serves as a proxy for the creator of the material (Cosmides, 1989; Dennett, 1991). Thus, when participants in the classic Heider and Simmel (1944) experiment describe geometric objects moving around the screen as if the objects had intentions and motivations, they are actually referring to what the creator of the image wanted them to experience; that is, the human creator, and not the screen, is the source of the message (Dennett, 1988; Searle, 1981; Weizenbaum, 1976).

Certain philosophers believe that people make metaphorical attributions of intentionality to machines because they see these machines as extensions of their own intentionality (Dennett, 1988). For Searle (1981), social-psychological responses are carried out with an "understanding" being in mind, not simply aimed at "unthinking" information processing chips. This whole line of reasoning suggests that users make social attributions to the human programmer while dealing with a computer, and their social responses are not directed at the box or voice itself, but to the source of the message or program.

Research Questions and Hypotheses

Our central research question is: Who or what are people psychologically responding to when they interact with

computers? Are they making social attributions to the computer qua machine or to the programmer of the computer interaction? Is the interaction with the machine a real - ortho-social - interaction with the box or voice or some combination of the two as claimed by some experimenters (Nass & Steuer, 1993)? Or, is it a parasocial interaction with a perceived human being as suggested by other scholars (e.g., Rafaeli, 1990)? This is in many ways an ontological question: What are computers? To the extent we define computers by the way people process them psychologically, it becomes important to understand the target of their social attributions (Sundar, 1993). Are computers real human or para-human? Are computers people or televisions?

If the social responses to computers noticed in past research are directed at the programmer, as the PSI advocates suggest, then we should see no difference in responses to the following two scenarios: One, when users are told that they are dealing with computers. And, two, when they are told that they are dealing with programmers.

If there is a difference in the responses elicited by these two scenarios, then we would conclude that human-computer interaction is social (as in human-human interaction), and not parasocial (as in human-television interaction). Given that the former (the social model) has lately garnered considerable experimental evidence (e.g., Nass & Steuer, 1993; Nass, Steuer & Tauber, 1994) and the latter (the parasocial model) has not been empirically demonstrated, the present study hypothesizes that users will consider computers to be much more social when they think they are dealing with computers as opposed to when they think they are dealing with programmers through the computers. Stated formally,

Hypothesis 1: Human-computer interaction is social and not parasocial.

Hypothesis 2: The socialness of human-computer interaction will be higher when parasocial cues are absent rather than present.

Method

The two scenarios outlined above were created in the form of two experimental between-subjects conditions. In one condition, subjects were told that they were dealing with two different computers. In another condition, they were told that they were dealing with two different programmers. Each subject was tutored by two different computers on two topics, was tested by the same mute terminal, and evaluated by the two tutoring computers that taught them the two topics respectively. The first set of evaluations praised the subject four out of five times. The second set of evaluations criticized the subject four out of five times. Praise-Criticism was the within-subjects factor and Computer-Programmer was the between-subjects factor in this 2x2 mixed experimental design.

Procedure

The subject, upon entering the lab, sat in front of the mute terminal for a practice and instruction session. Then, he/she proceeded to the computer whose screen said "Computer # 1" or "Programmer # 1" depending upon the condition. There, the subject was tutored on American Social Customs, which involved voice output of 12 facts in a pseudo-interactive format that was intended to make the subject believe that the tutoring was complementing his/her knowledge on the topic. Then, the subject went back to the mute terminal for a supposedly independent test on the topic. During this testing session, the subject answered five multiple-choice questions on American Social Customs by clicking on one of the five response options for each question. After this, the subject went back to "Computer # 1" (or "Programmer # 1") for a set

of five evaluations relating to the five questions asked in the test, also through voice output. (All subjects were told that they got four out of five right and praised for their good work). After this, the subject filled out a paper-and-pencil questionnaire comprising 74 items. This completed the first session. In the second session starting immediately thereafter, the subject went to yet another computer - the third in this experiment - whose screen said "Computer # 2" or "Programmer # 2" depending upon the condition. There, he/she was tutored on the subject of American Teenagers. Then, he/she went back to the same mute terminal for a test on this topic. After this, he/she returned to "Computer # 2" (or "Programmer # 2") for the evaluation session of this second test. (All subjects were told that they got four out of five wrong and criticized for their inadequate work). After this, the subject filled out a paper-and-pencil questionnaire comprising the same 74 items, but relating to the second session.

Subjects

Thirty subjects drawn from an undergraduate class on communication, technology and society were randomly assigned to the two conditions (15 each). After signing the informed consent form, they were given the cover story. They were told that the purpose of the experiment was to evaluate the pedagogical styles of the two tutoring computers (or programmers), who, while being structurally similar, were said to have different teaching and evaluating strategies, i.e., in the way they chose facts and in the way they evaluated their own and the subject's performance in the interaction. They were also told that other subjects would be asked to evaluate other sets of two computers (or programmers). Subjects were debriefed at the end of the experimental session and awarded class credit for their participation in the experiment.

Stimuli

In the computer condition, subjects were told that they will be interacting with two different computers through two terminals labeled "Computer # 1" and "Computer # 2." In the programmer condition, subjects were told that they will be interacting with two different programmers through two terminals labeled "Programmer # 1" and "Programmer # 2." In accordance with the manipulation, the instruction and practice sessions referred exclusively to computers or terminals in the computer condition and to programmers or terminals in the programmer condition. That is, all references to computer were replaced by programmer in the latter condition. The content of the tutoring, testing, and evaluation sessions in both the computer and the programmer conditions was identical with one difference: During the evaluation sessions, the computer referred to itself as "This Computer" while the programmer referred to himself as "I."

Measures

Each paper-and-pencil questionnaire comprised 74 items, out of which some were task-oriented (e.g., how helpful was the computer/programmer?), some were social (e.g., how friendly was the computer/programmer?), and some were style-oriented (e.g., how similar was the teaching style of the computer/programmer to your own teaching style?). All items were measured on a ten-point scale with the anchors being "Not at all" and "A lot." Each subject filled out two such questionnaires, one each for the Praise and Criticism sessions. Therefore, we had 148 dependent measures for each subject.

Analysis

One-tailed t-tests were used to compare the means of the computer and the programmer conditions for all the measures. In keeping with Hypothesis 2, it was expected that computers would be rated higher than programmers on positive socialness

variables and lower than programmers on negative socialness variables. Sign tests were used to determine the overall direction of the means across all the 148 items.

Conceptually similar items were grouped to arrive at five indices. Items with positive valence were added while those with negative valence subtracted. Five indices were thus obtained: Friendliness (Cheerful, Gentle, Likeable, Warm, Friendly, Sympathetic, Affectionate, Childlike), Effective (Articulate, Creative, Clever, Insightful, Intelligent, Helpful, Responsive, Competent, Analytical), Computeresque (Efficient, Rational, Objective, Biased), Playful (Entertaining, Enthusiastic, Playful), and Style Similarity (Similarity of Style of Teaching, Similarity of Style of Evaluation). These indices were subjected to analyses of variance with Computer and Programmer conditions constituting the between-subjects factor and Praise and Criticism forming the within-subjects factor.

Results

Both the Computer-Programmer and the Praise-Criticism manipulations were checked for validity. In an exit interview just before debriefing, subjects were given a multiple-choice question which asked, "In the experiment you just finished, who tutored you and evaluated your performance?" The response options were (a) two computers, (b) two programmers, and (c) two tutors. All the subjects in the computer condition chose option (a) and 10 out of the 15 subjects in the programmer condition chose option (b) while the other five chose option (a). Responses of these five subjects were compared with the other ten in the programmer condition, and no significant differences were found. Hence it was decided to retain them for the rest of the analysis.

The Praise-Criticism manipulation was evaluated in the form of a question hidden in the battery of 74 questions on the paper and pencil questionnaire. Essentially, it asked

subjects to rate how favorably the computer/programmer evaluated their performance on a 10-point scale ranging from low to high favorability. The means for the praise and the criticism sessions were 5.4 and 2.2 respectively [$F(83, 1) = 51.1; p < .000$], thereby validating the within-subjects manipulation.

One-tailed t-tests revealed that computers were rated significantly higher than programmers on positively valenced items and significantly lower than programmers on negatively valenced ones. As many as fifty of the 148 dependent measures collated from the two questionnaires were significant at the 0.10 level in their differences between the two conditions (31 at .05 level), thus lending support to Hypothesis 1. Computers were judged to be significantly more articulate, cheerful, entertaining, enthusiastic, responsive, helpful, likeable, playful, friendly, and objective than programmers overall. Subjects felt significantly more comfortable with the computer during the tutoring session, and thought that the teaching style of the two computers were significantly more similar to their own teaching style than that of the programmers. In the same session, they found the computers to be clearer, faster, and significantly less mechanistic than programmers. Subjects also found the evaluating style of the computers to be significantly more similar to their own style than that of the programmers' evaluating styles. They also felt that the programmers were significantly more boring and mechanistic than computers during the evaluation sessions.

Some variables showed differences between the computer and the programmer conditions during one of the two sessions: In the first session, subjects found the computer significantly more confident, analytical, gentle, insightful and significantly less sarcastic than programmer overall. In the tutoring segment of the first session, they found the programmer to be significantly more abrupt and less thorough

than computer. In the evaluation segment of the first session, they found the programmer more uninteresting and less involving than computer.

In the second session - with the criticism manipulation - subjects found the programmer to be significantly more aggressive than computer. They also found computer to be cleverer and more credible than programmer. In the evaluation segment of the second session, where they were criticized for their poor performance on the test, subjects found the computer to be faster and more balanced than the programmer.

All of the fifty significant variables were in the direction favoring computer over programmer. That is, the subjects liked the computers better than programmers as predicted by Hypothesis 2. A sign test yielded 101 of the 112 variables that were below 0.4 significance level (0.5 is the maximum possible) to be in the hypothesized direction ($p < 10^{-19}$).

The analyses of variance performed on the indices revealed a similar pattern of results. Table 1 shows the means of the two conditions for both the praise and criticism sessions¹.

Computers were considered significantly more friendly, effective, playful and similar in teaching and evaluating

Insert Table 1 about here

styles than programmers. However, they were considered more computeresque only when they praised the subjects' performance.

As mentioned earlier, the only two things that differed between the Computer and the Programmer conditions in this experiment were: (a) the fact that the subjects were told that they were dealing with two computers or two programmers;

and (b) the use of the self-referential "I" by the programmers as opposed to the "This Computer" by the computers during the evaluation sessions.

The huge differences found between the two conditions could be attributed to either of these two variations. In order to further clarify the reality of computer as a separate self - a self distinct from its creator or source, the programmer - we introduced a third condition, which mimicked the Computer condition but for the use of the "I" instead of the "This Computer" while referring to itself during the evaluation sessions. Everything else was identical, and as described earlier.

The means for the "Computer with I" condition were closer to the Computer condition than to the Programmer condition², hinting that the use of "I" was not the source of the differences observed between the initial Computer and Programmer conditions.

Conclusion

Both hypotheses were supported by the data yielding the following conclusion: Psycho-social responses to computers are significantly different - and more pleasant - than responses to programmers. The psychological responses to computers noticed in past studies are NOT due to parasocial interactions with an imagined human entity like the programmer. Rather, they are due to the inherent socialness of human-computer interactions. Interacting with computers scores significantly higher on socialness than interacting with programmers.

Implications

The implications of this piece of research are wide-ranging. Besides showing that human-computer interaction is not parasocial, this study evaluates dealing with a computer to be much more pleasant than dealing with a programmer, possibly because of the high expectations cued by the latter.

Second, it provides evidence contrary to conventional wisdom in human-computer interface design which holds that the more human you make your computer, the more pleasurable the interaction with the user. If anything, humanizing computers will heighten expectations to the point that users will resent it (for not adequately matching up to human-human interaction) and rather prefer dealing with a machine with no human pretensions.

The central message of this study is that people are not dealing with imagined other people when they interact with computers. The social responses they show to computers are of a different ilk than what they show when they think they are dealing with human entities beyond the computer.

This study supports the social model in favor of the parasocial model by prompting the following conclusions:

- (i) human-computer interaction is fundamentally social rather than parasocial.
- (ii) users tend to respond to computers as though they (the computers) were other human beings and not mediated representations of other human beings.
- (iii) dealing with computers is more like interpersonal communication than like mass communication.

Limitations

This study does not perform a pure comparison between conditions because the Programmer Condition is confounded by the use of the self-referential "I" which arguably may have an effect independent of the psycho-social responses aimed at the Programmer. Literature on the use of I in computer interface abounds (e.g., Weizenbaum, 1976), especially on the Internet. A lot of it presupposes strong psychological effects of I. The present study could not isolate the "I" factor in the Programmer for reasons of ecological validity and believability of the manipulation (it would be ludicrous if the programmer addressed himself as "This Computer...").

The next best solution was found in the form of the "Computer with I" condition, but it does not account for the potential interaction between the Programmer condition itself and the use of "I" by the programmer in that condition.

A second limitation of the study has to do with external validity considerations. Since all subjects hailed from a technology course, the results could be biased in favor of the computer because the subjects may be more oriented to favor technologies over humans in general.

Future Research

The external validity threat can be eliminated by replicating the study with different subject pools, preferably those with no systematic predispositions toward technologies or humans.

Clearly, further research is needed to explicate the core of people's psychological responses to computers. In addition to the unmediated and television/book models suggested earlier, there is at least one other model that has generated a lot of theoretical interest: the telephone model, wherein users are said to be interacting with a living person at the other end of the computer. This is different from the television model which simply proposes a human being behind the computer, not someone in real time. This also attempts to explain people's responses while transacting through electronic mail and other network communication technologies. The telephone model is a manifestation of that famous litmus test for AI systems, the Turing test, whose psychological importance has not been ascertained as yet. Further research should expand on the present study by adding another condition wherein subjects are led to believe that they are interacting with a live tutor/evaluator in another room. Depending upon whether this condition is closer to the computer condition or the programmer condition, theories

about the socialness of human-computer interaction can be generated.

Endnotes

¹ The within-subjects manipulation of Praise and Criticism did not yield any significant differences. No differences were hypothesized. The manipulation was included in the study to rule out content effects, i.e., we wanted to show that psycho-social effects of human-computer interaction can be generalized without regard for the content of the interaction.

² First, the Computer with I condition was compared with the Programmer condition. Twenty of the 148 variables were significantly different at the .05 one-tailed t level, and 16 out of the 18 valenced and significant items were in the direction suggesting that the "Computer with I" was better than the programmer. A sign test revealed that 90 out of the 114 valenced items below an one-tailed significance level of 0.4 were in the same direction, thus suggesting that the "I" condition stacks up between the Computer and the Programmer conditions, but perhaps much closer to the former than the latter.

Comparisons between the Computer and the "Computer with I" conditions revealed that ten out of the thirteen significant variables were in the direction favoring the former over the latter. Further, in a sign test, 75 out of the 109 valenced items below a one-tailed significance level of 0.4 were in favor of the Computer condition. That is, 34 items were in the direction favoring the "Computer with I" condition.

Next, mean comparisons on the five indices were made between all three conditions at the same time. Out of ten comparisons (five each for the Praise and Criticism sessions), eight were in the direction suggested above, i.e., Computer scored highest, followed by Computer With I and

Programmer. In the other two, the Computer With I scored highest, followed by Computer and then Programmer.

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Table 1

Mean ratings of computer/programmer as a function of the valence of evaluation

	Praise			Criticism		
	C	P	E	C	P	E
Friendliness	36.1	26.4	5.1**	19.6	14.0	6.0**
Effective	53.5	42.5	4.2**	40.5	32.3	3.1*
Computeresque	16.2	10.5	7.0**	9.4	5.8	1.4
Playful	14.9	9.4	6.9**	9.6	6.0	5.2**
Style Similarity	9.8	7.0	5.3**	7.3	4.7	4.8**

C = Computer Condition (Social)

P = Programmer Condition (Parasocial)

* p < .10 **p < .05