My Agent as Myself or Another: Effects on Credibility and Listening to Advice

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Abstract. People consider other people who resemble them to be more persuasive. Users may consider embodied conversational agents, or ECAs, to be more persuasive if the agents resemble them. In an experimental study, we found that users rated the persuasiveness of agents that resemble them higher than other agents. However, *actual* advice-taking diverged from this pattern; when users created the agents, users changed their choices less when interacting with the agents that resembled them. We conducted a follow-up study and found that resemblance and self-esteem affect interactions with agents that resemble users. We discuss the use of self-report and behavioral data in evaluations of agent interfaces and how agents that resemble users might foster particular social interactions with a system. We suggest that agents that resemble users may be more persuasive in advising users about their actions and decisions.

1 Introduction

Users consider other people who resemble them to be more persuasive [8,9]. They evaluate those people as more attractive [28] and they are more likely to help those people [16]. Can this phenomenon be used to make ECAs or embodied conversational agents more persuasive?

Advances in computing technology have made it possible to use computers to change attitudes, beliefs, and behaviors [15]. Computers can provide feedback to users about their actions and decisions; how much they exercise [2,7], whether they take their medications [14], and how frequently they communicate electronically [5]. Inevitably, users will receive negative information about them, that their behavior was inappropriate. For example, an exercise-monitoring system might say, "In the past week, you missed your goal of running three miles. You only ran a mile." When carelessly communicated, negative feedback can have unanticipated social outcomes: people may become resentful, blame the problem on others, and lose their motivation to change [19].

How can we make people aware of negative information about themselves without negative impact? Researchers have explored some approaches to delivering negative feedback in laboratory settings, but they are not practical in the real world. For example, people consider others that resemble themselves to be more persuasive [8,9] and trustworthy [10]. However, it is not always practical to find someone who resembles

the user. Self-reports from a study that used videotaped recordings to provide feedback [23] showed that users received negative evaluations better when coming from recordings of themselves than from recordings of someone else; users took more responsibility for the evaluations and perceived the feedback to be more valid and objective. However, recording every possible evaluation statement in different voices and expressions is tedious and not scalable. Recordings from one application may also not be transferable to another one.

An alternative approach is to use ECAs or embodied conversational agents [20] to provide negative feedback. Agents are familiar to computer users, such as those in Microsoft Office (*e.g.*, Clippy), and support important social interactions between users and the tools they use. Instant messengers (IM) and video games provide utilities for users to easily create images and animations to represent themselves. Additionally, once an agent is created, it can present any type of feedback without user involvement, removing the overhead of videotaping users and providing scalability. A study of 3D agents represented with users' faces showed that users treated them more positively than agents represented with someone else's face [3]; we expect that this would lead to better reception of negative information from an agent. In addition to 3D agents resembling users, agents can be easily made with users' photographs or with software that enable users to create their own likenesses. By doing so, can we improve computer interactions by taking advantage of the social phenomenon that people trust others that resemble themselves. Would computer agents that resemble users be more persuasive?

We conducted two studies to explore the use of agents that resemble users for giving feedback to people about themselves. In the first study, we investigated whether users will find agents that resemble them more credible. We also examined whether users will find agents that they created more credible, since theories of ownership show that people rate owned objects much more favorably than similar objects they do not own [4,6]. In the second study, we explored whether participants accepted evaluations from their own faces because they were familiar. In both studies, we kept the feedback consistent and focused our investigation on the effect of agent appearance. In particular, we examined behavioral data to explore whether participants actually took the agent's advice as predicted by their self-reports.

We found that participants in the first study rated agents that resemble them highly for credibility, regardless of who created those agents. However, behavioral data diverged from the self-reports. Participants were more likely to follow the suggestions of agents that resemble them when the experimenter created the faces, rather than when participants created them. We speculated that people did not follow unfamiliar agents they did not create because those agents were chosen randomly, so in our second study, we had users select agents to use. We found that self-esteem may play a role in whether a user follows a face that resembles them or a face that is simply familiar. These findings will support designers in constructing interfaces that can maintain social relationships with users and appropriately convey positive and negative feedback to them.

2 Study 1

The first study explored the influence of agents that resemble the user and the influence of agents created by the user or by someone else. In our study, participants completed an online survival task, in which they were presented with a series of paired items (*e.g.*, water and matches) and asked which item to prioritize. Agents gave participants advice about their choices, either telling participants that their choices were appropriate or that the agent thought they should choose the other option. We measured perceptions of the agent's credibility and whether participants changed their choice after the agent gave advice. We hypothesized:

H1: Participants will rate a computer agent that resembles themselves as more credible and trustworthy than a computer agent that resembles someone else.

H2: Participants will be more likely to change their choices following advice from an agent that resembles themselves.

H3: Participants will rate a computer agent that they created themselves as more credible and trustworthy than a computer agent that was created by someone else.

2.1 Method

Study 1 used a 2 × 2 mixed factorial design. Participants were randomly assigned to one of two creation conditions: they created the agents (Self-Created) or someone else created the agents (Other-Created). In both conditions, participants interacted with an agent that resembled them (Similar) and another agent that differed (Dissimilar). The order of these conditions was counterbalanced. 12 undergraduate and graduate students (6 males and 6 females) completed the experiment. Each participant received $15 to attend two study sessions.

2.2 Procedure

The experiment consisted of two sessions separated by two or three days. In the first session, each participant created the visual representation or faces for two agents. In the second session, each participant interacted with agents in two online survival tasks. We divided the study into sessions so that participants' experience in creating faces would not carry over into the main experiment. It also gave us time to create faces for participants in the Other-Created condition.

Face-Creation Session. All participants created two agent faces: (1) a face that resembled them and (2) a face of the same gender that "would be suitable for providing feedback and evaluation to users". Faces were created in a counterbalanced order.

Participants used a face-creation application we created (Figure 1), based on the Ultimate Flash Face program created by Max Ishchenko (http://flashface.ctapt.de/). The application started with a blank face template onto which users added custom features such as hair, eyes, eyebrows, ears, nose, mouth, facial hair, and eyeglasses. Participants used a mirror while creating the face that resembled them.

After creating the faces (Figure 2b,c), participants completed a questionnaire about how much the face resembled them. Photographs of participants were taken, which an experimenter used to create the faces for the Other-Created condition (Figure 2d).

Survival Task Session. For the survival task session, we adapted the subarctic [13] and desert [21] survival scenarios used in face-to-face management training systems and in group decision research. In survival scenarios, team members try to survive in a harsh environment after an accident by deciding what items are important to their survival. For this experiment, we modified the survival scenarios to involve only a single individual interacting with an agent.

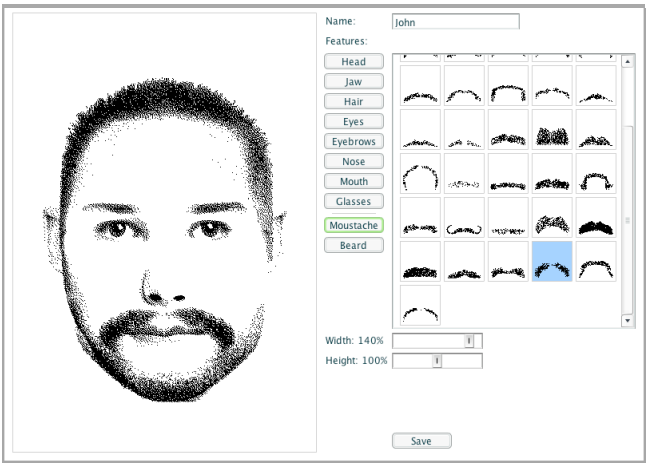
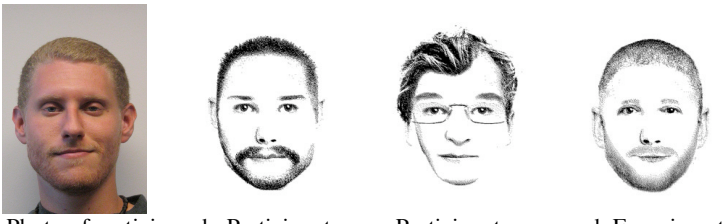


Fig. 1. Face-creation software. The user has chosen a moustache and applied it to the face.



a: Photo of participant

b: Participant created own face.

c: Participant created agent for feedback.

d: Experimenter created participant's face.

Fig. 2. Photograph of a participant and 3 faces of an agent.

The survival application began with a description of the scenario such as "You are lost in the desert…" Next, participants saw 20 pairs of items (e.g., a jackknife and a large plastic raincoat). For each pair, they selected the item that would be more important to their survival. After making a choice, participants received feedback from an agent and the opportunity to keep or retract their choice. (Figure 3). The agent agreed with the choices 13 times and suggested a change 7 times, *e.g.*, "I think your chosen item lowers your chances of survival."

To participants, it appeared that the feedback they received was contingent on the correctness of their choices. However, all participants received the same feedback in the same order regardless of their choices (though the order of the feedback in the two survival scenarios were different.) At the end of the session, participants completed a paper-based questionnaire.

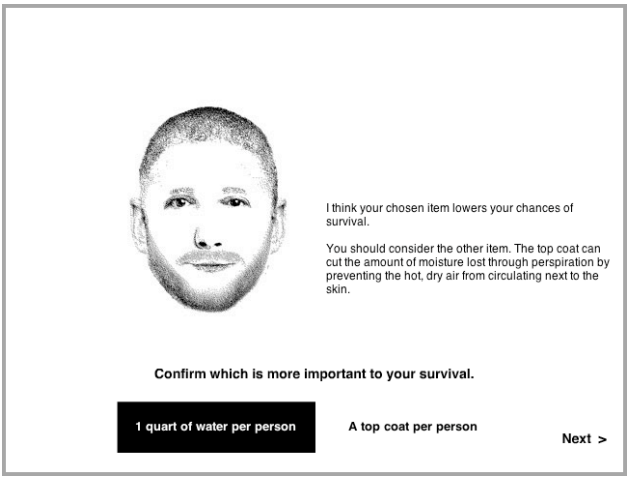


Fig. 3. Screenshot of the survival scenario software. The user has selected an item and the agent is providing advice.

2.3 Measures

In the first session, participants rated the agent for similarity: (1) the face resembles me; (2) the face does not remind me of myself; and (3) the face has many features similar to mine. Responses were provided on a 5-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). Participants also rated how much they liked the agent faces from "I hate the face" (1) to "I love the face" (5). In the second session, participants rated their perception of the agents' credibility on 5 scales: how much they trusted the agent, how good the agent's suggestions were, how much the agent influenced their choices, how helpful the agent seemed, and how much they depended on the agent in ranking their items. The responses were rated on 5-point scales ranging from "Not at all" to "Very much."

To measure the agents' actual influence on the participants, we counted the number of times participants changed their choices (retractions) after the agents provided negative feedback. There was only one retraction after receiving positive feedback.

2.4 Results

We checked whether participants and the experimenter created faces that resembled the participants. Then, we tested the effect of the independent variables on the credibility ratings of the agents and on the number of retractions. We used standard least squares ANOVA with one between-subjects variable (Self-Created vs. Other-Created) and one within-subjects variable (Similar vs. Dissimilar). There were no significant order effects or interactions.

Credibility of the Agents. We hypothesized that participants would find agents that resembled them to be more credible than agents with someone else's face. Thus, we tested the effects of the independent variables on the participants' ratings of each agent's trustworthiness, quality of their suggestions, helpfulness, and dependability. We also asked the participants how influential the agents had been.

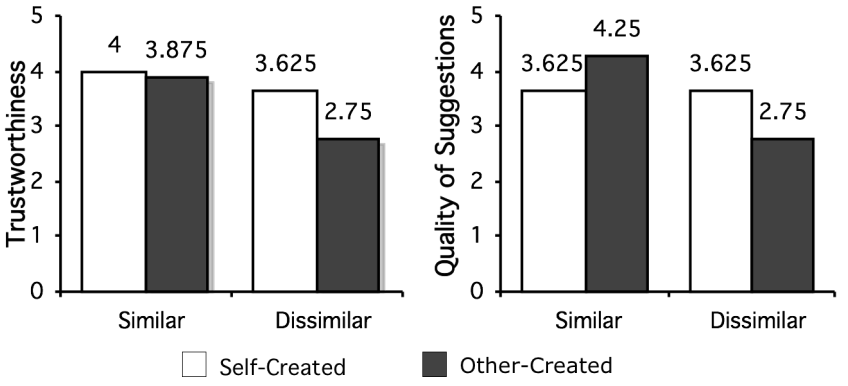


Fig. 4. Rated trustworthiness of the agent and quality of the agent's suggestions.

Similar agents were rated more highly; they were rated as more trustworthy ($F [1, 10] = 14$, $p < .01$), as giving higher quality suggestions ($F [1, 10] = 4.6$, $p = .05$), as more helpful ($F [1, 10] = 4.4$, $p = .06$), as more dependable (but n.s.), and as more influential ($F [1, 10] = 9.3$, $p = .01$). Additionally, the ratings predicted actual behavior; those who rated the agent as more influential also were more likely to follow the agent's advice ($r = .73$, $p < .001$). Figures 4a and 4b show these effects for the trustworthiness and suggestion quality scales.

In sum, the credibility ratings strongly support Hypothesis 1, *i.e.*, people would find agents that resemble themselves more credible than agents that resemble someone else's face. Nass *et al.* showed the same effect using video recordings of the user, but we show that the same applies to agents.

Agent Influence. An analysis of variance computed on the number of retractions indicated that the interaction between the two independent factors was significant ($F[1,10] = 6.30$, $p = .03$). Similar agents were more influential when experimenters

created the faces, but Dissimilar agents were more influential when participants created the faces (Figure 5).

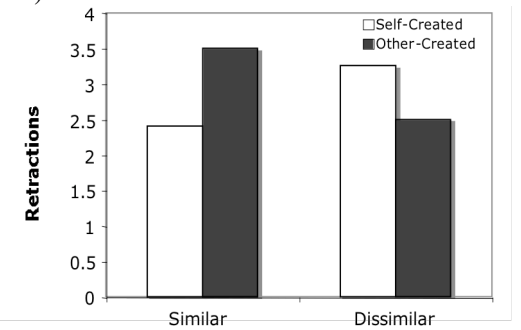


Fig. 5. Retractions when agents gave advice to participants to change their choice.

We explored why participants did not follow the advice of Similar agents that they made. One hint derives from the correlations between the participants' credibility ratings and their retractions. In the Other-Created condition there was a very high correlation between the credibility ratings and retractions, ranging from about .65 to .80. Other-Created participants rated the Similar agents higher than the Dissimilar agents, and the more they did so, the more retractions they made. Yet in the Self-Created condition, certain ratings, notably trustworthiness and quality of suggestions, were negatively correlated with retractions. Thus, Self-Created participants who more highly rated the Similar agents did not necessarily follow the advice, and there was even a trend not to.

We asked subjects how much they liked the faces they made in the first session. Analysis of this data suggests that participants did not like the faces they made, even though they rated them as credible. Perhaps they thought the faces were unattractive and had concerns about their artistic ability for creating faces. We speculate that those who made their own face and then interacted with it as an agent may have suffered from the phenomenon called objective self-awareness [11,12], when one is reminded of the gap between one's actual and ideal self. Participants might have rated the face as trustworthy and credible, but when faced with the agent using their face and giving them advice, become uncomfortable taking its advice. We expand on this possibility below.

2.5 Discussion

We explored the effects of advice from agents that resemble the user and found a disjuncture between ratings and actual behavior. Our results show that people find their own face more credible than someone else's face, and resulted in more retractions when the experimenter created an agent that resembles the participant. However, when participants created their own face, they rated it highly but tended not to follow its advice. We showed that although participants rated the face they made that resembled them as highly trustworthy and credible, they did not like the face very much.

We speculate that participants were dissatisfied with their creation, and when interacting with it as an agent, they might have been made uncomfortable in the way the agent made evident the discrepancy between their actual and ideal self.

The results bring home some important points about the use of agents to give advice. First, self-reported credibility is not identical to actual influence when the agent gives advice. We replicated the results of self-reports of subjects in *Nass et al.*'s study. *However, we saw that it is possible to rate an agent highly but not follow its advice.* Second, seeing one's own face as an agent may have mixed social outcomes. On the one hand, it may be comforting to view an agent that resembles oneself that looks similar and therefore may be viewed as attractive [28], and may even be viewed as persuasive [9]. On the other hand, an agent that resembles oneself may be like looking into a mirror. This activity can remind us of who we really are, and how far we need to go to be like our idealized selves. In fact, most research in objective self-awareness induced the automatic comparison of oneself against a standard by using mirrors [12]. We believe our study highlights some of these tradeoffs and points to the need for deeper research into agents that resemble ourselves, particularly if these agents are going to provide evaluative feedback and advice.

2.6 Issues

This first study had a small sample size of only 12 participants. Nevertheless, the internal validity of the experiment is supported by its statistical significance and substantial effect sizes. The results were comparatively strong, suggesting that agents were powerfully influential on participants' ratings and behavior.

With advanced computer vision, users may not need to create agents [17,22]. However, our first study demonstrated that the act of creation creates a relationship between users and agents that may be lost when agents are automatically generated.

Another limitation is that the agent faces that were compared with the participants' own faces were of unknown quality along many dimensions. For example, we do not know if Dissimilar agents in the Self-Created condition were comparable to Dissimilar agents in the Other-Created condition. One solution is to compare an agent resembling the participant with a celebrity face in all conditions. For the second study, we limited the variability of the Dissimilar agents by having users select from a collection of faces.

3 Study 2

It is not clear from the first study whether people liked their own face because it resembled them or simply because it was familiar. In the Self-Created condition, the participants created the Dissimilar agents and followed them more than the Similar agents. In the Other-Created condition, the experimenter randomly selected the Dissimilar agents and participants followed them less. Random selection made the Dissimilar agents unfamiliar to the participants. This begs the question, would users follow familiar Dissimilar agents more than Similar agents, even if they did not create

them? In Study 2, participants selected the face of the Dissimilar agents. We expected that the user would listen more to the Dissimilar agent since they had a chance to select and become more familiar with it. We hypothesized:

H1: Participants will change their selections in the survival task following advice from a Dissimilar agent that they selected more than from a Similar agent.

In study 2, we use photographs for the Similar and Dissimilar faces instead of the face creation software. To create idealized renditions of the photographs, the experimenter transformed the photographs into line drawings. The line drawings of the faces are direct computer tracings of the photographs, so the structural features of the face do not change. While preserving the structural features of the face, the line drawing removes blemishes and imperfections in the photograph. We hypothesized:

H2: Participants will change their selections more following advice from an agent that has been transformed into a line drawing than a photograph.

3.1 Method

The second experiment used a 2 × 2 counterbalanced within-subjects design. The first independent variable was whether the agents' faces were photorealistic (Photo) or a line drawing (Line). The second independent variable was whether the agents resembled the participants (Similar) or someone else (Dissimilar). 24 undergraduate and graduate students (13 males and 11 females) were paid $25 to participate in the study.

3.2 Procedure

For Dissimilar faces, participants selected a face (from a set of 10 gender-matched headshots from the Corbis stock photography site) they believed was "most suitable to give feedback and evaluation to users."

We added two more survival scenarios: Amazon Adventure [30] and Lost at Sea [24] survival scenarios. Participants interacted with four agents, one on each survival task. The figure below shows 4 faces that a participant saw during the experiment.

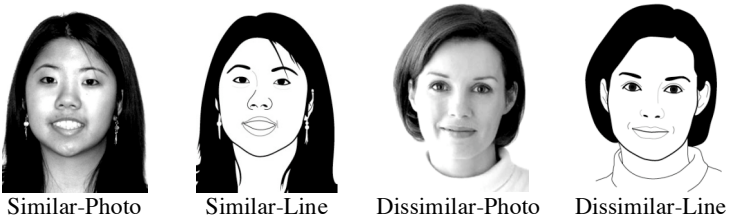


Fig. 6. 4 faces that a participant saw during the experiment.

3.3 Measures

In addition to the questions that we asked in the first study, we asked participants how confident they were with their own choices *vs.* each agent's choices, and how much they trusted themselves *vs.* each of the agents. The responses were rated on 7-point Likert scales ranging from "Strongly disagree" to "Strongly agree."

Participants rated the faces along 9 personality scales. We took these scales from the five dimensions of Brand Personality (Sincerity, Excitement, Competence, Sophistication, and Ruggedness) [1] and from three of the "Big Five" personality dimensions (Extraversion, Agreeableness, and Neuroticism) [25]. We added a ninth scale, Inventiveness, to capture whether participants thought the agents had the resourcefulness necessary to succeed in a survival scenario.

3.4 Results

In general, the hypotheses for Study 2 were not supported. Since we did not find significant effects of the independent variables on number of retractions, we performed an internal analysis to explore our results. While we found no statistically significant differences by gender, age, or task order, popularity of the faces that participants selected revealed an interesting and significant effect.

Fig. 7. Headshots from the Corbis stock photography site from which participants selected the face "most suitable to give feedback and evaluation to users."

Separation by Popularity. We observed that certain faces were selected more often than others. Among the faces, the female face, F6, was selected four times (twice as many as each of the other female faces) and the male face, M5, was selected six times (more than twice as many as each of the other male faces). We separated the participants into two groups based on whether the face they selected was Popular (10 participants) or Unpopular (14 participants).

Influence of Agents by Popularity. Analyses of variance computed on the retractions for each group yielded significant interaction effects (main effects were not

significant). The Popular group had the most retractions in the Similar-Line condition (interaction: $F[1,27]=11.06$, $p < .01$), while the Unpopular group had the most retractions in the Similar-Photo condition (interaction: $F[1,39]=9.59$, $p < .01$).

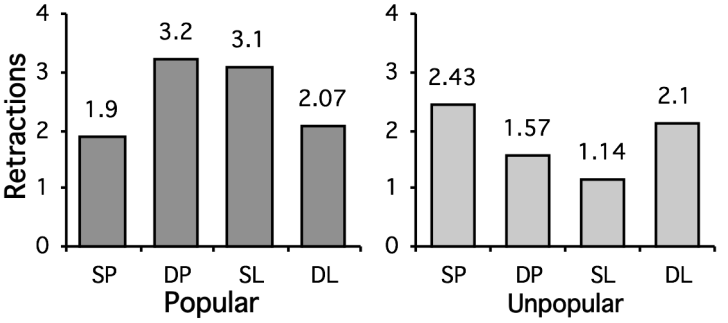


Fig. 8. Retractions of the Popular and Unpopular groups for each of the agents, Similar-Photo (SP), Dissimilar-Photo (DP), Similar-Line (SL), and Dissimilar-Line (DL).

Self-Esteem. We found that participants in the Unpopular group were more confident about their choices ($F[1,94]=9.57$, $p < .01$) and trusted their own choices more ($F[1,94]=22.46$, $p < .001$). We measured the self-esteem of participants using the Rosenberg Self-Esteem Scale [26] (23 of 24 participants responded). The participants in the Unpopular group ($M=23.21$, $SD=4.32$) had higher self-esteem than the Popular group ($M=20.11$, $SD=6.21$), but the difference was not statistically significant ($F[1,21]=2.71$, $p = 0.11$). Additionally, the Unpopular group's ratings of Similar agents were higher along all personality traits than the Popular group's ratings of Similar agents ($F[1,46] = 5.65$, $p < .02$), which indicates how the Unpopular group regarded themselves.

Trust. We combined two items, "agent trust" and "trust self more than agent" (inverse), into one factor. Agent trust factor correlated with the number of retractions (correlation = 0.63) and is reliable (Cronbach's alpha = 0.76). The differences in trust for the Similar-Line and Dissimilar-Photo agents were statistically significant. In all cases, the Popular group trusted the agents more than the Unpopular group.

Resemblance and Attractiveness. The Popular and Unpopular group thought the Similar agents resembled them more than the Dissimilar agents and, among the Similar agents, the Photo agents resembled them more than the Line agents. The Popular group rated the Dissimilar agents as more attractive than the Similar agents ($F[1,27]=5.84$, $p < .05$).

3.5 Discussion

Analysis of the data revealed differences for the credibility of the agents, but none for the behavioral influence of the agents. However, when participants were separated

into two groups depending on the popularity of the faces they selected, we get some interesting results. The Unpopular group regarded their selves very highly: they trusted their own choices more, were more confident about their choices, and had higher self-esteem than the Popular group. They liked their own self more and thus followed the photograph of their face, which best represented their selves. The Unpopular group rated the Similar agents higher in all traits compared to the Popular group. They followed the Similar-Photo agent more than any of the other agents.

In contrast, the Popular group followed and placed more trust on the Similar-Line agents and the Dissimilar-Photo agents more than the other agents. The Similar-Line agents reminded participants less of themselves than the Similar-Photo agents and thus were less likely to remind them of their imperfections. While the Dissimilar agents resembled them the least, the Popular group thought that the Dissimilar-Photo agents were more attractive and thus followed them more than the Dissimilar-Line agents.

The results show that self-esteem has an effect on using agents to give advice. First, self-esteem is an important indicator of how much users need the advice of the agents. We saw that participants with higher self-esteem followed their own choices more often despite contrary advice of the agent. Second, if participants have higher self-esteem and will more likely follow their own decisions, agents can still affect their decisions if the agents resemble the participants. On the other hand, users with lower self-esteem will be more likely to respond to agents that resemble them less and are attractive to them, hence the higher number of retractions in the Similar-Line and Dissimilar-Photo cases.

3.6 Issues

While we learned many things about the use of agents that resemble users and the role of users' self-esteem, there were some issues with our study. First, familiarity and resemblance were confounded for Similar agents; a face that resembles the user is also familiar to the user. Thus, we cannot conclude whether familiarity or resemblance caused participants to follow the Similar-agents.

Both studies did not delve deeply into the reasons participants feel an agent was credible or the reasons participants follow the agent's advice. Nass *et al.* [23], for instance, attribute some of this to participants' feelings of responsibility for the feedback, to the actual validity of the advice, or to negative biases in memory.

We chose not to animate the agents, because animating agents requires that they look, sound, and move like the user and static representations of oneself are familiar to users (e.g. IM clients, My Virtual Model, etc.). While behavioral mimicry [18] and body-type resemblance [31] and showing emotions [27] can improve trust of agents, we focused on face resemblance.

Lastly, both studies compared interactions with different agent faces, but not with interfaces without faces. Research suggests that people respond to talking-face interfaces differently from text-display interfaces [29]. How would a no-face interface compare to interfaces that resemble users?

4 Design Implications

Using the user's face as an interface introduces new potentials for social interaction that are not found in regular graphical user interfaces and agent interfaces. Our findings will support designers in constructing interfaces that can maintain a social relationship with users and appropriately convey positive and negative feedback to them.

We found in the first study that if users created the faces for agents, they are less likely to follow the faces that resembled them. We also found that users' ability to make faces may have a significant effect on how they will receive advice from the agents. Thus, users need appropriate tools and features to help them create faces that they are imagining.

The second study showed that self-esteem of users could play a role on what kind of agents they will take advice from. It may not be fruitful to force users to either use their own faces or to pick from a collection of faces without knowing anything about them. One solution is to make both options available to users; we assume that users will gravitate towards faces that fit how they feel about themselves, as did the participants in our study.

We also found in both studies that if users did not create the agents, the agents have to maintain some resemblance to the users. The exact design considerations on how to manipulate the different features of the agent are not completely understood and will need additional study, but the studies suggests that the designer has a big influence on the success of the agent.

Our studies manipulated the resemblance of agents to users to find out whether users would trust computers that look like them just as they would other people. Our research adds another dimension to the many ways the appearance of agents can be designed for advice-giving systems.

Though we did not take into account the quality of the agents' recommendations, there is little doubt that correct and relevant recommendations are better for users. We ensured that recommendations in our studies were reasonable. However, the quality of the feedback that agents give and the way the feedback is presented to the user should be explored. Would ECAs be appropriate for systems where the correctness of the advice may be uncertain? Perhaps, the user would be better served with an interface that better conveys the uncertainty of the advice, such as graph visualization with error bars. For now, assuming the system can give reasonable recommendations, making agents resemble the user can improve their credibility.

Having the interface resemble users also poses new challenges in terms of social interaction. Do users refer to the agents as themselves? And vice versa? Do the agents use the same voice as the users? The interaction may confuse users if agents are too similar to them. However, users may not identify with agents that are too different.

Lastly, what users think of agents does not necessarily translate to how they will act when interacting with the agents. Our studies show that in designing face interfaces, behavioral information must be taken into account. In this case, behavior towards the agents is as important as what they think of the agents. Users may form opinions of agents at first glance, but through interaction, they subconsciously change their opinion about the agents.

4.1 Future Work

Our future work will extend these studies in three significant ways. First, we will expand the types of agent representations to explore the relationship between credibility and idealization. These representations will include both visual and auditory modalities, and will extend beyond representations of the self to include celebrities.

Second, independent of agent representations, we will explore the emotional impact of feedback given by an agent. For example, the advice given may cause anxiety or lead to ambivalence. We will also extend the kind of feedback an agent gives, varying from being motivational and providing encouragement in times of difficulty to being commanding and giving imperatives to the user.

Third, we will explore potential applications of using agents that resemble the user. We know, anecdotally, from the cocktail party effect and scanning a group photograph for one's own image that we attend readily to representations of our voice and face. This saliency of one's own face indicates that it could be used in reminder systems where important alerts need to be immediately recognized by the user. The familiarity and trust attributed to one's own face, agents can be used as interfaces for therapeutic or information querying systems.

We have presented a practical approach to providing advice using computer agents. This work shows that an application can use the user's face as a representation of the agent. We need to investigate further the conditions under which such agents will be perceived as both credible and influential.

Acknowledgements

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