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Exploring users' social responses to computer counseling interviewers' behavior

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ABSTRACT

We explore the effect of behavioral realism and reciprocal self-disclosure from computer interviewers on the social responses of human users in simulated psychotherapeutic counseling interactions. To investigate this subject, we designed a 3 × 3 factorial between-subjects experiment involving three conditions of behavioral realism: high realism, low realism, and audio-only (displaying no behavior at all) and three conditions of reciprocal self-disclosure: high disclosure, low disclosure, and no disclosure. We measured users' feelings of social presence (Copresence, Social Attraction, and Emotional Credibility), rapport, perception of the quality of users' own responses (Embarrassment and Self-Performance), emotional state (PANAS), perception of an interaction partner (Person Perception), self-reported self-disclosure, speech fluency (Pause Fillers and Incomplete Words), and Verbal Self-Disclosure. We observed some contradictory outcomes in users' subjective reports. However, the results of objective data analysis demonstrated that users disclosed greater Verbal Self-Disclosure (medium level of intimacy) when interacting with computer interviewers that displayed high behavioral realism and high self-disclosure. Users also delivered more fluent speech when interacting with computer interviewers that displayed high behavioral realism.

1. Introduction

Concurrent with the growing intelligence of computer programs, one can observe the expanded application of these smart systems in various new domains, such as collecting personal information for clients in the fields of clinical treatment and marketing. Health-related public websites, in particular, have prevailed as one of the most useful applications for this purpose. These sites function by administering a survey of questions varying in levels of intimacy or invasiveness to clients (Moon, 2000). This process is integral to gathering personal information about patients while providing them with the safeguard of anonymity. Following this trend in Computer-Mediated Communication, or CMC, the use of computer avatars controlled by a human in similar settings grants the same assurance of anonymous communication in intimate conversations (i.e. "stranger on a train" phenomenon) with the added benefit of reflecting one's personality or creating a more tailored experience through the avatar. However, the use of an avatar limits users' time and location wise flexibility as the interaction via the avatar requires being there of another person who should control the avatar.

More recently, virtual human technology has introduced a solution to the limits posed by avatars. These computer-controlled agents are equipped with artificial intelligence and controlled by computers, rather than human beings. Virtual human technology currently allows intelligent virtual agents to interact with users by displaying body movements and other gestures in response to the users' speech and gestures (Rizzo et al., 2011). They also introduce an enticing new dimension to explore in communication, thanks to the secure anonymity they provide compared to videoconferences with real humans. This is particularly salient in counseling interactions where the confidentiality of clients' personal information is instrumental in encouraging them to reveal more intimate information, thereby enhancing counseling effects (Kang & Gratch, 2010). An additional benefit of using virtual agents is the absence of time limitations on the interaction, which frequently serves as a hindrance in interactions with avatars or human counselors in face-to-face situations.

The goal of our study is to investigate the potential use of virtual agents as counseling interviewers in psychotherapeutic situations. In a previous study (Kang & Gratch, 2010), researchers found that people talked about themselves more when interacting with virtual agents that were described as avatars, rather than interacting with real humans in computer-mediated interactions. Based on these findings, we aim to explore the effect of different levels of

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behavioral realism and reciprocal self-disclosure from virtual agents on users' social responses in counseling interview interactions. Our motivations for selecting these factors and related theories supporting our exploration of the subject are described below.

2. Theoretical background, research questions, and hypothesis

2.1. Computers Are Social Actors (CASA) paradigm: Users respond to a computer as if interacting with a human being if the computer displays even the minimal amount of social cues

The predominant hypothesis of users' social responses to computers in human–computer interactions is the CASA paradigm established by Reeves and Nass (1996). According to this paradigm, people respond to computers as if they were interacting with human beings, even with minimal social cues of the computers (i.e. text-based interfaces). This paradigm indicates that people tend to anthropomorphize mediated interfaces.

The background of this paradigm is based on the Ethopoeia notion, which posits c.f. (Nass & Moon, 2000; Nass, Moon, Morkes, Kim, & Fogg, 1997) that people respond socially to a computer that presents human-like traits because humans are social animals. Such traits include interacting with others, using natural speech, or playing social roles (Moon, 2000; Moon & Nass, 1996; Nass, Lombard, Henriksen, & Steuer, 1995; von der Pütten, Krämer, Gratch, & Kang, 2010). Based on the CASA model, we have previously studied human–computer interactions by substituting users' interaction partners with computers. This allowed them to examine the application of social rules, such as perception of the interaction partner, reciprocal self-disclosure, reciprocal aid, politeness, and grouping stereotypes (von der Pütten et al., 2010). In studies of user interactions with anthropomorphic interfaces, including virtual agents, users rated interacting with an animated talking character higher than communicating with a text-only interface (Sproull, Subramani, Kiesler, Walker, & Waters, 1996). Users also tended to respond with socially desirable answers to a question delivered by an anthropomorphic agent, compared to in a text-only interface or an audio-only interface, when prompted to choose between an educational documentary and entertaining program (Krämer, Bente, & Piesk, 2003). Users also adhered to social rules and perceived virtual agents more positively when they were asked to evaluate the politeness of a virtual agent by a verbal questionnaire administered by the virtual agent itself, compared to a paper-and-pencil questionnaire (Hoffmann, Krämer, Lam-chi, & Kopp, 2009). In a previous study, researchers (von der Pütten et al., 2010) found no difference in the level of social effects in interactions with agents compared to avatars when both types of virtual characters displayed human-like features. However, they observed that the presence of the back-channeling behavior in the high behavioral realism condition elicited longer storytelling and greater feeling of mutual awareness from users. The researchers concluded that these social effects were greater when people were exposed to more social cues (high behavioral realism), as opposed to less social cues (low behavioral realism), through their communication partner (interviewer), regardless of whether a virtual agent or avatar was used. The researchers (von der Pütten et al., 2010) proposed the *Revised Ethopoeia* concept based on this conclusion.

Contrary to these findings, Bailenson, Yee, Merget, and Schroeder (2006) found that users reported a greater sense of social presence when interacting with a human represented in a videoconference or an audio-only condition compared to an "emotibox[1] (low form realism and high behavior realism)" condition. Their study also revealed that people provided greater self-disclosure in the audio-only condition than in other conditions. These findings are related to Joinson's work (2001), which illuminated the power of text-based CMC to elicit more self-disclosure than visual CMC. Other researchers (Antheunis & Valkenburg, 2009), however, discovered no effects of visual cues on users' social responses to their interaction partners (e.g. liking of interaction partners) between text-based CMC and visual CMC. Kang and Gratch (2010) explored this subject by investigating the associations between the interactant's personality characteristics (i.e. social anxiety) and their social responses, specifically Verbal Self-Disclosure as well as behavioral rapport and differing levels of anonymity. This was facilitated by the interaction with virtual agents (high anonymity) compared to the video interaction with a real human (no anonymity). In the study, the virtual agents were introduced as virtual avatars to users. The users were given a hypothetical conversational scenario in which each assumed the role of an individual (participant, interviewee) who sought to find out if the other individual could be a suitable partner with whom to share a flat. Kang and Gratch (2010) found that people high in social anxiety felt greater behavioral rapport by exhibiting more speech and sharing more personal information than people low in social anxiety when they interacted with virtual agents. These outcomes imply that people disclose greater personal information when their partner is less visually identifiable. The researchers concluded that self-disclosure and social presence could get higher with lean media regarding behavioral realism such as an audio (or text)-only interface or a virtual human (agent or avatar), compared to a videoconference or a face-to-face interaction. This conclusion is supported by the hyperpersonal communication perspective, which posits that people experience greater Copresence and Social Attraction to their interaction partner when it displays less social cues (Walther, 1996). However, it must be noted that one study (Antheunis & Valkenburg, 2009) could not find any difference in the social effects (e.g. liking of interaction partners) present in a text-only interface versus a videoconference.

Based on the discrepancies among these findings,[2] it is not certain whether virtual agents, in general, would elicit more positive social effects compared to audio-only interfaces that previously elicited greater positive social effects in comparison to a virtual avatar controlled by a real human from a previous study (Bailenson et al., 2006). Therefore, we wanted to investigate whether there would be any difference in the level of social effects between virtual agent interviewers with high behavioral realism and audio-only interviewers. We also aimed to explore whether there would be any difference in the degree of social effects elicited by virtual agent interviewers with low behavioral realism and audio-only interviewers. This was done in case the virtual agent interviewers with high behavioral realism would not be available for various reasons, such as technical or financial limitations. To investigate these research problems, we formulated the following research questions:

RQ1: Do people respond differently to virtual agent interviewers who present high behavioral realism compared to audio-only interviewers?
RQ2: Do people respond differently to virtual agent interviewers who present low behavioral realism compared to audio-only interviewers?

[1] Bailenson et al. (2006) describe the "emotibox" as the rendering of "the dimensions of facial expressions abstractly in terms of color, shape, and orientation on a rectangular polygon."

[2] We explored previous findings for social effects on users' interactions with their partners, regardless of virtual agents or avatars according to the *Revised Ethopoeia* concept proposed by (von der Pütten et al. (2010). The researchers observed no difference in the level of social effects in interactions with agents, compared to avatars, if both types of virtual characters presented human-like features.