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Effects of visual and linguistic anthropomorphic cues on social perception, self-awareness, and information disclosure in a health website

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ABSTRACT

Acknowledging the lack of studies examining both visual and linguistic anthropomorphic cues and the underlying mechanisms of their effects, we investigated how the different modalities of anthropomorphic cues in a health website influenced information disclosure. In a 2 (visual cues: human *vs.* non-human image) × 2 (linguistic cues: conversational *vs.* impersonal language) × 2 (question type: less *vs.* more sensitive questions) between-subjects experiment ($N = 254$), participants registered with a mock-up health website. We assessed a behavioral outcome of not disclosing personal information and psychological outcomes of social perception and self-awareness as potential mediators. Results revealed distinctive effects of the two modalities of the anthropomorphic cues. Anthropomorphic images, on one hand, increased public and private self-awareness, and public self-awareness in turn led to less information disclosure. Anthropomorphic language, on the other hand, heightened social perception and promoted information disclosure, but social perception did not predict the disclosure. These results indicate unique underlying mechanisms of the effects of anthropomorphism: *priming effect* of visual cues, and *communicative effects* of linguistic cues.

1. Introduction

A computer often includes manifestations of human attributes, or anthropomorphic cues, in its interface to induce social response from users (Nass & Moon, 2000). Previous studies on the effects of an anthropomorphic interface mainly focused on visual cues (Gong, 2008; Hoffmann, Krämer, Lam-Chi, & Kopp, 2009), and the effects have been examined in a wide range of contexts, including education software (e.g., Lusk & Atkinson, 2007; Rosenberg-Kima, Baylor, Plant, & Doerr, 2008), e-commerce (e.g., Nan, Anghelcev, Myers, Sar, & Faber, 2006; Wang, Baker, Wagner, & Wakefield, 2007), and a heath information website (Kim & Sundar, 2012).

Despite numerous studies on visual anthropomorphic cues, little attention has been paid to how linguistic cues influence its users. Many studies on visual cues employed humanlike, conversational linguistic outputs for both anthropomorphic and non-anthropomorphic visual conditions (e.g., Lee, 2010; Walker, Sproull, & Subramani, 1994), making results valid only under the boundary condition of the anthropomorphic linguistic cues. More importantly, we do not have a systematic understanding of the effects of anthropomorphic (*vs.* machinelike) language. Are the effects of anthropomorphic language similar to those of anthropomorphic visual cues? Are the effects of linguistic cues independent of visual cues, or valid only when visual cues are also anthropomorphic?

To address these questions, we employed *both* visual and linguistic anthropomorphic cues as independent variables and investigated their effects on the extent to which people disclose their personal information. In particular, we tested these effects in a context of registering with a health website, in which we manipulated visual (i.e., images of a physician [anthropomorphic visual cues] *vs.* a building [non-anthropomorphic visual cues]) and linguistic anthropomorphic cues (i.e., conversational text [anthropomorphic linguistic cues] *vs.* machinelike text [non-anthropomorphic linguistic cues]).

The context of a health website was chosen because personal information disclosure has significant practical implications for such website. The privacy concern for the health information is growing (Haas, Wohlgemuth, Echizen, Sonehara, & Müller, 2011) and the concern often causes difficulties in collecting personal information from users (e.g., Anderson & Agarwal, 2011; Bansal, Zahedi, & Gefen, 2010). Further, a health website allows us to test

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disclosing information of diverse social characteristics, such as health-related information which may be socially awkward (e.g., sexual behavior) or relatively comfortable to reveal (e.g., physical activity).

Another potential extension of previous studies is to specify the psychological mechanisms underlying behavioral effects of anthropomorphic cues. Previous studies under the Computers-Are-Social-Actors (CASA) paradigm examined anthropomorphic effects on social behaviors (e.g., flattery, in Fogg & Nass, 1997; reciprocal self-disclosure, in Moon, 2000) and based their findings on the mindless behavior account (Langer, Blank, & Chanowitz, 1978) as an explanation of the behavioral effects (Lee, 2010; Liang, Lee, & Jang, 2013; Nass & Moon, 2000). In these studies the argument is grounded on two universal premises: (a) anthropomorphic cues (either in a computer interface or in a context) make human–computer interaction similar to human–human interaction, and (b) people mindlessly apply human–human communication rules to such an interaction. Although these premises provide a general framework for understanding the effects of anthropomorphic cues, they do not identify a specific mechanism that might differ across social behaviors.

This study attempts to extend previous work by explicating psychological variables relevant to the behaviors of disclosing personal information. We specified the underlying mechanisms by introducing two psychological constructs—*social perception* and *self-awareness*—as possible psychological conduits. In this study, social perception is defined as attribution of human characteristics (e.g., lifelike), contrasting with machinelike features (e.g., artificial), to anthropomorphic cues in a computer interface. We examined whether social perception is a potential mediator for behavioral effects as it captures the ontological characteristics of an anthropomorphic interface and the phenomenological nature of using an anthropomorphic interface. Self-awareness refers to strengthened attention toward self and making oneself the object of one's own consciousness (Duval & Wicklund, 1972). Self-awareness is affected by the presence of others (Froming, Walker, & Lopyan, 1982) and often results in behavioral consequences such as self-disclosure (Kalin & Schuldt, 1991). Accordingly, we tested whether self-awareness is another potential mediator for effects of anthropomorphic cues on information disclosure.

The rest of the paper is structured as follows. Section 2 reviews literature on social perception and self-awareness as psychological outcomes of visual and linguistic anthropomorphic cues. Section 3 discusses how visual and linguistic anthropomorphic cues influence information disclosure and how social perception and self-awareness mediate the effect. Section 4 describes the study method. Section 5 presents results of data analysis. Practical and theoretical implications are provided in Section 6.

2. Effects of anthropomorphic cues on social perception and self-awareness

2.1. Effects of anthropomorphic cues on social perception

The visual anthropomorphic cues induce effects similar to those of a real person regarding how people evaluate social characteristics (for review, see Dehn & Van Mulken, 2000 and Yee, Bailenson, & Rickertsen, 2007). When examining the effect of anthropomorphic cues on social perception studies revealed inconsistent findings. Using semantic differentials (e.g., machinelike/humanlike), Lee (2010) showed that the presence of a cartoonlike character in a trivia game yielded higher social perception of the computer than did the absence of the character. Yet, using the same items, Kim and Sundar (2012) reported that inclusion of a cartoon-like character on a website *decreased* social perception, concluding that attributing human characteristics to a computer is a mindless process.

These inconsistent results may be attributable to how the researchers framed the characters. Kim and Sundar (2012) treated the website as a human by giving it a personified name and used it throughout the experiment. In such a context, a cartoonlike character may deteriorate social perception, due to inconsistency between a mental image of the personified agent and its unrealistic character (e.g., Gong & Nass, 2007). In contrast, Lee instructed participants that the cartoonish character was a mere computer program, on which participants might have low expectation of being humanlike (Chapman & Johnson, 1999). Thus the visual anthropomorphic cues on the website would heighten social perception. Considering that people have a low expectation for social perception from a website in general, we expect that presenting visual anthropomorphic cues on a website will increase social perception of the website.

Contrary to extensive literature on visual anthropomorphic cues, scarce research has focused on the effects of linguistic cues. Studies under the CASA paradigm (Nass, Steuer, & Tauber, 1994) suggest that people tend to ascribe human attributes such as personality (Lee & Nass, 2005) and gender (Lee, Nass, & Brave, 2000) to linguistic characteristics of synthesized voices. These studies imply that human attributes are inferred readily from linguistic characteristics if available. Moreover, a few studies in human–computer interaction (HCI) have provided direct evidence for the effects of anthropomorphic language on users' perceptions of a computer interface. In an early study, Quintana, Crowell, Pryor, and Adamopoulos (1982) showed that a text-based computer interface with anthropomorphic cues was perceived more humanlike than mechanistic output. Using a synthesized speech output, Kruijff-Korbayová and Kukina (2008) found that anthropomorphic style in an in-car audio system elicited greater perception of humanness than did the impersonal style.

Appreciation of human attributes from language is taken for granted under the notion of *disembodied language* (Clark, 1999; Lee & Nass, 2004). Disembodied language is language stored and reproduced as a disembodied form of written or spoken language (Clark, 1999). Because it is produced prior to the moment of interpretation, a perceiver of the language cannot see its speaker or writer generating the language. Clark (1999) postulates that when interpreting disembodied language, people are likely to *embody* it by imagining its generator and by inferring the generator's characteristics from the linguistic characteristics. Thus, we suggest that people are more likely to engage in the embodying process and perceive human attributes of the computer interface, when the language has anthropomorphic characteristics than when it does not.

The above evidence suggests that people have heightened social perception when they have visual or linguistic anthropomorphic cues than when such cues are absent. Thus, we hypothesize a main effect of visual and linguistic anthropomorphic cues on social perception.

H1 (*a*/*b*). Participants exposed to (a) visual and (b) linguistic anthropomorphic cues will report higher social perception than those not exposed to such anthropomorphic cues.

While we predict the main effects of visual and linguistic anthropomorphic cues, we do not have solid evidence on whether the effects of visual and linguistic anthropomorphic cues depend on the other. Thus, we will explore this issue as a research question.

RQ1: Is there an interaction effect between visual and linguistic cues on social perception?