



# Social snacking with a virtual agent – On the interrelation of need to belong and effects of social responsiveness when interacting with artificial entities



Nicole C. Krämer<sup>a,\*</sup>, Gale Lucas<sup>b</sup>, Lea Schmitt<sup>a</sup>, Jonathan Gratch<sup>b</sup>

<sup>a</sup> University of Duisburg-Essen, Forsthausweg 2, 47057 Duisburg, Germany

<sup>b</sup> USC Institute for Creative Technologies, 12015 Waterfront Drive Playa Vista, CA 90094-2536, USA

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## ABSTRACT

Based on considerations that people's need to belong can be temporarily satisfied by "social snacking" (Gardner et al., 2005) in the sense that in absence of social interactions which adequately satisfy belongingness needs surrogates can bridge lonely times, it was tested whether the interaction with a virtual agent can serve to ease the need for social contact. In a between subjects experimental setting, 79 participants interacted with a virtual agent who either displayed socially responsive nonverbal behavior or not. Results demonstrate that although there was no main effect of socially responsive behavior on participants' subjective experience of rapport and on connectedness with the agent, those people with a high need to belong reported less willingness to engage in social activities after the interaction with a virtual agent – but only if the agent displayed socially responsive behavior.

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## 1. Introduction

In our daily lives, we interact more and more with all kinds of technology. In order to render these interactions with machines more intuitive and usable, research groups engage in developing autonomous virtual agents which are able to interact with the human user by means of verbal and nonverbal cues (Kopp et al., 2007; Bickmore, 2004). This development incorporates human-like cues into the interface, and with this new social dimensions enter human-technology interaction. Previous research demonstrated that people already act socially towards computers which interact with human-like cues such as speech (Nass et al., 1994; Reeves & Nass, 1996). These social reactions, for example, showing politeness or reciprocity towards the agent, become even more pronounced when an interface agent (such as a face) is presented on the screen (Gratch, Wang, Gerten, Fast, & Duffy, 2007; Hoffmann et al., 2009; Krämer et al., 2013b).

While social effects of virtual agents have been well documented (Krämer, 2005) and potential reasons for users' social reactions have been discussed in depth (Nass & Moon, 2000; Shechtman & Horowitz, 2003), there is considerably less research on the question of whether the social interaction with artificial entities is experienced as socially rewarding and can fulfill social needs in a way similar to human-human interaction. These questions, however, become increasingly important as agents are foreseen to not only serve as interface technology in service realms (information kiosks), as navigation support (on websites or

in automatic teller machines) but will most likely also be employed as companions (to provide the opportunity for basic social interaction for senior citizens deprived of social contact). It therefore becomes important to analyze whether conversations with virtual agents are capable of fulfilling social needs in the sense of satisfying people's need for contact. Although it will not be assumed that the conversation with virtual agents might be able to substitute for social contact with fellow humans, it can be argued that virtual humans might serve as "social snacks" as described by Gardner et al. (2005). This would mean that – when social interaction with fellow humans is not available – people might temporarily satisfy their social needs by settling for a snack which helps them to wait for the more adequate need satisfaction. That humans have a fundamental need for contact and belonging has aptly been described in a seminal paper by Baumeister and Leary (1995). Additionally, it has been demonstrated that regular and meaningful social contact is important for people's health (Cacioppo & Patrick, 2008). Although the need to belong as a fundamental need is characteristic for all humans, there are idiosyncratic differences (Kelly, 2001). Also, Leary et al. (2005) have suggested that there are individual differences in need to belong and provide a scale to assess the individual need to belong.

The goal of the present study is to explore to what extent conversations with virtual agents can satisfy social needs and to what degree this is dependent on people's individual need to belong. As a crucial factor which might affect the social satisfaction resulting from a

\* Corresponding author.

E-mail addresses: [nicole.kraemer@uni-due.de](mailto:nicole.kraemer@uni-due.de) (N.C. Krämer), [lucas@ict.usc.edu](mailto:lucas@ict.usc.edu) (G. Lucas), [Lea.schmitt@stud.uni-due.de](mailto:Lea.schmitt@stud.uni-due.de) (L. Schmitt), [gratch@ict.usc.edu](mailto:gratch@ict.usc.edu) (J. Gratch).

conversation with a virtual human, we analyze the influence of the quality of the interaction in terms of socially responsive nonverbal behavior (smiling, nodding) provided by the agent (Gratch et al., 2007b). This work is intended to provide support for the idea that virtual characters under specific circumstances can be considered as real conversation partners and, therefore, can alleviate people's need for social contact. In order to test the presented assumptions, the participants interacted with a virtual character, the so-called Rapport Agent who shows socially responsive behavior (Huang et al., 2011).

## 2. Social effect of virtual agents

Cassell, Bickmore, Campbell, Vilhjálmsón, and Yan (2000) coined the term Embodied Conversational Agents (ECA) to describe computer generated anthropomorphic interface agents that employ humanlike behavior within a dyadic conversation with a human user. ECAs “may [therefore] be defined as those that have the same properties as humans in face-to-face conversations” (Cassell et al., 2000, p. 1) and as such, ECAs are capable of perceiving verbal and nonverbal cues and subsequently reacting on the given input. They are equipped with feedback and turn-taking features. Moreover, they are able to engage the user in a relevant conversation using social cues such as speech, gestures and gaze (Bickmore & Cassell, 2005).

Several researchers assume that people accept virtual characters as fellow conversation partners (Ryokai et al., 2003; Miller et al., 2011). Indeed, numerous studies have shown that people exhibit social behavior towards virtual characters and that their communication strategies resemble those used in human-human interaction (Nass & Moon, 2000; Krämer, 2005; Krämer et al., 2013b). Even though a conversation with a virtual character does not come close to a natural conversation between two individuals, it was demonstrated that numerous forms of social effects occur while interacting with a machine. Social effects in this context are commonly understood as people's display of emotional, cognitive and behavioral manners when a machine is present. These manners are similar to those people display when talking to another individual and range from showing impression management tendencies (Kiesler et al., 1996) to using more natural speech instead of other input modalities (Krämer, 2005) when reciprocating to an agent's smile (Krämer et al., 2013b). While these tendencies have been shown for the interaction with (talking) computers (see studies within the Media Equation and Computers as social actors paradigm, Nass et al., 1997; Fogg & Nass, 1997), current studies indicate that effects might even be more pronounced when humans are confronted with more realistic social cues in terms of an agent's human-like appearance and nonverbal cues (Hoffmann et al., 2009; von der Pütten, Krämer, Kang, & Gratch, 2010).

The reasons for these social reactions have already been discussed widely: while Kiesler et al. (1996) assume that these behaviors are merely triggered by demand characteristics of the (laboratory) situation and can be interpreted as superficial “as though” reactions, Nass and Moon (2000) argue that the behavior is profoundly social (termed *ethopoeia*). They assume that although all users consciously know that the computer does not warrant human treatment, they cannot help acting socially due to humans' social nature. People mindlessly display social behavior as soon as they perceive a potential interaction partner – as long as he/she/it displays basic social cues. The computer or agent triggers a set of behavioral scripts that makes it unlikely for the user to actively process and reflect information (von der Puetten et al., 2010). Kappas (2005) emphasized that humans have a basic need to react socially towards potential interaction partners as they feel incomplete when they are alone and therefore are in persistent search for dyadic interaction and in this sense are “free monadic radicals”.

In summary, previous research supports the idea that people unconsciously act socially towards computers even though they know that it is a computer that does not warrant social treatment. Further, it has been demonstrated that a minimal set of human-like cues are sufficient to en-

courage people to engage in social dialogue with computers. While only a minimal set of cues is required to elicit social manners, however even stronger social reactions occur when humans are presented with more human like cues.

It seems that people are eager to conduct social dialogue with computer agents and that social effects can be generated automatically. The occurrence of social effects and the readiness to interact with virtual characters are of particular interest for this work as this paper explores the potential satisfaction people can get through human-machine interaction. Bickmore (2004) not only presumed a human readiness but even a need to engage in more profound human-machine dialogue.

### 2.1. Need to belong

Both the *ethopoeia* assumption and the notion that humans feel incomplete when they are alone demonstrate that the human need to belong is an integral part and prerequisite of people's willingness to converse with virtual interaction. Most personality theories include the idea that people have a natural drive to affiliate with others. Baumeister and Leary (1995) complemented this idea by claiming that this drive is more than an affiliation desire, it is an actual human need and a fundamental human motivation. Due to this natural need people establish new interpersonal relationships and, at the same time, maintain a certain amount of already existing significant social bonds. People's need to belong is a powerful, universal, and influential human drive that accounts for emotion, cognition and behavior. Social satisfaction can be achieved through social interactions that have to meet certain requirements: on the one hand, the interactions have to take place repeatedly and on a regular basis. Ideally, social bonding is featured with positive or pleasant experiences or should at least be free of negative sensations.

On the other hand, the interaction should bear certain stability and also give both interaction partners the feeling of mutual affective concern (Baumeister & Leary, 1995). There are two ways of satisfying belonging needs: forming bonds and not breaking bonds. Forming new social bonds should happen easily without requiring much effort and has been associated with positive emotions such as joy and happiness (Baumeister & Leary, 1995). People usually refrain from breaking social bonds as it is always related to distress (Cacioppo & Hawkey, 2009; House et al., 1988). Deprivation of social contact is linked to decreasing health and happiness. The effects of social desertion can have impacts on the immune system and can even reach a level where even the human DNA is altered (Cacioppo & Patrick, 2009).

While the need to belong has been described as a fundamental human need, interindividual differences have also been taken into account. People differ with regard to the extent of their need and motivation to engage in social interaction and bonding (Leary et al., 2005). Based on this notion, instruments to assess the individual need to belong in the sense of a trait have been presented (Krämer et al., 2013a; Leary et al., 2005 – the latter scale being especially developed as a predictor for media usage). From this research, we assume that the need to belong helps us to understand people's motives behind social behaviors in human-human interaction and can also be applied to human-computer interaction.

### 2.2. Satiation and social snacking

Belonging needs are a natural human phenomenon and people constantly reach out to others in order to socialize. However, is this need insatiable? Numerous researchers have shown that individuals only form and maintain a certain number of relationships and when that number is exceeded, the drive to socialize declines (Baumeister & Leary, 1995). Those who are well integrated in a stable social network should hold fewer desires to create new bonds than those who are socially depleted. Figuratively speaking, socializing can be referred to as having a meal. When people's need for social contact is satiated, their social seeking behavior decreases. But when individuals are socially starving – because

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