The Influence of Computer Agent Characteristics on User Preferences in Health Contexts

Renato F. L. Azevedo,1 Daniel G. Morrow, PhD,2 Xuangxiao Gu,1 Thomas S. Huang, PhD,3 Mark Hasegawa-Johnson, PhD,4 Priya Soni,1 Shuyuan Tang,1 Tarek Sakakini,1 Suma Bhat, PhD,5 Ann Willemsen-Duncan, PhD,5 James Graumlich, MD6

1 University of Illinois at Urbana-Champaign, Champaign, IL; 2 University of Illinois College of Medicine at Peoria, Peoria, IL; 3 Jumo Simulation Center, Peoria, IL

ABSTRACT

Health technology holds great promise for improving patient education, in part by augmenting provider/patient communication (Charness & Boot, 2009). CAs can emulate best practices of face-to-face communication and can be accessed as needed by patients. They can engender social responses that improve motivation and learning among students (Baylor, 2011; Moreno, 2005; Schroeder et al., 2013), and can improve health outcomes among older adults (Bickmore et al., 2010; Ryu and Baylor 2005) identify two types of CA characteristics that influence outcomes: 1) Credibility, expertise and other characteristics that support learning, (informational role); 2) Emotional expression and other characteristics that engage the user (relational role). Like many social reasons, the similarity between CA and person (e.g., matching gender or age) may influence both informational and relational roles, which may in turn influence self-care (Baylor, Shen, & Huang, 2003). However, the literature has produced mixed findings, with some evidence that CA style objectively matching CA/person characteristics (e.g., Ballonien et al., 2008; Persky et al., 2013; Yanghe, 2016) or perceived similarity (Nuss et al., 1995; Rosenberg-Kima et al., 2008; Zhou et al., 2014) is more important. Furthermore, user preferences depend on the CA role, as people may prefer male CAs especially for informational role and female CAs for relational role (Alviss & Kim, 2008; Baylor, Shen, & Huang, 2003). Level of realism is a general constraint on matching hypothesis – highly stylized CAs may be too dissimilar to evoke preferences related to matching CA/person characteristics.

METHOD

1. We developed CAs that varied in realism, gender, and age to investigate whether participants prefer more realistic CAs that match them on age and gender.

2. In an online (Mechanical Turk) study, we evaluated older (OA) and younger adults’ (YA) responses to medication information delivered by the CAs. Participants either saw older or younger CAs varying in gender and level of detail.

3. After all CAs were presented one-by-one, these CAs were again presented simultaneously in a 1 x 5 array of static images. Participants ranked which CA they would prefer to deliver their health messages and answered an open-ended question about reasons for choosing their preferred CA.

4. Three independent coders categorized the responses into 11 categories (n=439; Flagg, 1979).

5. We analyzed the responses for CA preferences, including how the reasons related to two Agent Personas Instrument (API) constructs (affective interaction and informational usefulness).

RESULTS

Participants CA concordance: Gender and Age

We found no evidence that participants chose CAs matching their gender (p > .05, ns). Since the variable age was manipulated between subjects, we could not directly test whether participants preferred CAs with (roughly) matching age. However, as reported in Azevedo et al. (2018), analysis of trial-by-trial CA evaluation found some evidence that older participants evaluated older versus younger CAs more positively.

Reasons for choice preferences:

- Human-like agents were preferred to the highly stylized emoji, suggesting these agents engaged social responses but were not so realistic that they might fall into the uncanny valley, where people may have trouble distinguishing agents from humans (Mori, 1970).
- Participants tended to prefer both younger and older female over male CAs. They tended to justify their preference in terms of affective/motivational characteristics of the CA (e.g., expressiveness).
- When participants chose male CAs, they tended to mention reasons related to the CAs informational usefulness (e.g., credibility). Similarly, Baylor found that students tend to prefer male CAs because they are perceived as more knowledgeable. These findings suggest gender stereotypes are projected to interactions with CAs.
- Preferences for female CAs did not depend on participant gender, contrary to the matching hypothesis. This may reflect limited interaction with the CAs in this study.
- Results for the discrete choice models also suggested that older versus younger adults tended to prefer the female less realistic CA. Perhaps less realistic female CAs enhanced emotion detection compared to more realistic ones (see Kessler et al., 2016).

Funding: This work was supported by the Jump Applied Research for Community Health through Engineering and Simulation (ARCHES) program, UIUC/OSF Hospital, Peoria IL.

REFERENCES


DISCRETE CHOICE MODEL: Younger CAs: two distinctive factors predicted choice: perceived realism (β = .300, p < .001) and expressiveness (β = .301, p < .001).
Older CAs: only participant age predicted choice. We described each of the choices by participants’ age. While the choices among the older CAs are more evenly distributed for younger participants (MMR=30.9%, FLR=27.8%, FMR=25.8%, except less favoring MLR CAs=15.5%), older adults have a strong preference for FLR CAs (56.9%) compared to others (FMR=23.5%, MMR=11.8%, and MLR=7.8%). Overall, participants preferred the FLR CA because it was more comforting (40.9%) and expressive (31.9%).

CONCLUSIONS

- Human-like agents were preferred to the highly stylized emoji, suggesting these agents engaged social responses but were not so realistic that they might fall into the uncanny valley, where people may have trouble distinguishing agents from humans (Mori, 1970).
- Participants tended to prefer both younger and older female over male CAs. They tended to justify their preference in terms of affective/motivational characteristics of the CA (e.g., expressiveness).
- When participants chose male CAs, they tended to mention reasons related to the CAs informational usefulness (e.g., credibility). Similarly, Baylor found that students tend to prefer male CAs because they are perceived as more knowledgeable. These findings suggest gender stereotypes are projected to interactions with CAs.
- Preferences for female CAs did not depend on participant gender, contrary to the matching hypothesis. This may reflect limited interaction with the CAs in this study.
- Results for the discrete choice models also suggested that older versus younger adults tended to prefer the female less realistic CA. Perhaps less realistic female CAs enhanced emotion detection compared to more realistic ones (see Kessler et al., 2016).

Funding: This work was supported by the Jump Applied Research for Community Health through Engineering and Simulation (ARCHES) program, UIUC/OSF Hospital, Peoria IL.