Computer Agents And Patient Memory for Medication Information

Renato F. L. Azevedo1, Daniel G. Morrow, PhD2, Kuangxiao Gu3, Thomas S. Huang, PhD4, Mark Hasegawa-Johnson, PhD5, James Graumlich, MD6, Victor Sadauskas7, Tarek Sakakini8, Suma Bhat, PhD9, Ann Willemsen-Dunlap, PhD10, Donald J. Halpin11

1University of Illinois at Urbana-Champaign, Champaign, IL; 2University of Illinois College of Medicine at Peoria, Peoria, IL; 3Jump Simulation Center, Peoria, IL; 4Stanford University, Stanford, California.

ABSTRACT

To guide development of a computer agent (CA)-based adviser system that presents patient-centered language to older adults (e.g., medication instructions in portal environments or smartphone apps), we evaluated 360 older and younger adults responses to medication information delivered by a set of CAs. We assessed patient memory for medication information, their affective responses to the information, and their perception of the CAs teaching effectiveness and expressiveness. Each participant saw CAs varying in appearance. To investigate the impact of affective cues on patients, we varied CA message framing, with effects described either as gains of taking or losses of not taking the medication. Our results corroborate the idea that CAs can improve older adults’ learning in part by engendering social responses.

INTRODUCTION

• Goal: Improve memory for medication information (especially by older adults) by leveraging progress in computer agent (CA) communication (Azevedo et al., 2018).
• Reasons for medication nonadherence are manifold, including poor provider communication and inadequate health literacy, especially for older adults (Brown & Bussell, 2011; Fischer et al., 2010). CAs may improve communication by consistently emulating best practices of face-to-face communication with patients (Bickmore et al., 2009; Bickmore et al., 2010; Zhou et al., 2014). For example, nonverbal cues (facial expressions) as well as words convey positive and negative affect associated with benefits of taking (gain frame) or risks of not taking medication (loss frame), respectively. Older adults are especially sensitive to affective aspects of communication (Carstensen et al., 1999).
• We investigated the following questions related to the impact of CAs on older and younger adults’ memory for and responses to the CA-based messages:
  - Are there age differences in affective response to CA-based communication?
  - Are there age differences in message memory and CA preferences? Do these effects depend on CA age?
  - Are gain-framed messages better remembered than loss-framed messages?

METHOD

• Using the CrazyTalk software (Reallusion, 2016), we developed naturalistic CAs that varied in gender and age) to investigate whether participants prefer CAs that match them on these characteristics (Baylor, 2011).

RESULTS

- Gain > Loss messages (p<.001)
- OA > YA (p <.01)
- CAs rated more positively for gain versus loss messages (p<.001)
- Participant Age X CA Age interaction trend (p<.10)
- OA but not YA rated older CAs higher (p<.05)

CONCLUSIONS

• Compared to loss-framed messages, gain messages were responded to more positively and better remembered. CAs were even rated more positively when delivering gain messages.
• Older adults responded positively to CA-based medication information:
  - Responded to CAs with more positive affect, consistent with age increase in emotional self-regulation (Carstensen et al., 1999).
  - Rated CAs more positively, especially the older CAs. This may reflect a ‘matching effect’, with people preferring more simila
• Better remembered the messages.
• Findings add to work of others (e.g., Bickmore et al., 2010; Strassmann & Kramer, 2017; Or et al., 2011) suggesting that CAs can support self-care among older adults.

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