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Feature Article

Pilot testing a digital pet avatar for older adults

Nai-Ching Chi, MS, RN, CNS-BC [a,*], Olivia Sparks, RHIA, MS [a], Shih-Yin Lin, MM [a], Amanda Lazar, PhD [b], Hilaire J. Thompson, PhD, RN, ARNP, CNRN, AGACNP-BC, FAAN [a], George Demiris, PhD, FACMI [a]

[a] University of Washington, Seattle, WA, USA
[b] Northwestern University, Evanston, IL, USA

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ABSTRACT

Social isolation in older adults is a major public health concern. An embodied conversational agent (ECA) has the potential to enhance older adults' social interaction. However, little is known about older adults' experience with an ECA. In this paper, we conducted a pilot study to examine the perceived acceptance and utility of a tablet-based conversational agent in the form of an avatar (termed "digital pet") for older adults. We performed secondary analysis of data collected from a study that employed the use of a digital pet in ten older adults' homes for three months. Most of the participants enjoyed the companionship, entertainment, reminders, and instant assistance from the digital pet. However, participants identified limited conversational ability and technical issues as system challenges. Privacy, dependence, and cost were major concerns. Future applications should maximize the agent's conversational ability and the system's overall usability. Our results can inform future designs of conversational agents for older adults, which need to include older adults as system co-designers to maximize usability and acceptance.

Introduction

The population of aging adults is rising globally, as are the numbers of older adults who live alone. In 2015, the United States Census Bureau reported that 28% of older adults live alone.[1] Some will experience social isolation, which is a major health threat because it often affects mental well-being and is associated with increased morbidity and mortality.[2,3] Thus, interventions that address social isolation in older adults are vital to support healthy aging.

Information and communication technologies (ICTs) allow users to handle information and aid communication and have become a promising tool to support healthy aging.[4] Several review papers examined the effectiveness of smart technologies such as robotics, virtual reality, and gaming systems and found that these technologies can effectively enhance older adults' social connectivity and support them to live at home.[5–9]

An embodied conversational agent (ECA) is a form of ICT. ECAs have a computer-generated character that can facilitate real-time verbal and nonverbal communication between a computer and user.[10] The ECA system can be controlled either by an automated computer or a human to interact with users. ECAs have been used as a health coach to provide health information for consumers and improve health behaviors. Bickmore and colleagues designed a software-based automated health counselor agent to promote health behaviors.[11] The users who interacted with the automated health counselor daily via computer for two months had better outcomes in the amount of walking or fruit and vegetable consumption compared to controls.[11]

As population of older adults grows, social support needs also increase. ECAs have the potential to provide such social support for older adults. However, there are limited studies that examined the usability of ECAs for older adults. Most of the studies that have tested ECAs have either done so in a laboratory setting or failed to include older adults as users in the evaluation. Vardoulakis and colleagues examined a human-controlled conversational agent that could interact with and provide social support for older adults for one week. A computer with audio and video was installed in older adults' home and a research assistant controlled the conversational agent, interacting with participants remotely by choosing pre-programed speech or animation commands from the control-station software. The study found older adults had a positive attitude toward the agent.[12] In the present study, we aimed to extend the time of interaction and assess the overall utility of a human-operated, tabled-based ECA system with a pet avatar for

* Corresponding author. Department of Biobehavioral Nursing and Health Informatics, School of Nursing, University of Washington, Box 357266, Seattle, WA 98195, USA.
E-mail addresses: naiching.chi@gmail.com, ncc17@uw.edu (N.-C. Chi).

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older adults. The purpose of this study was to examine perceived acceptance and utility of a tablet-based human-controlled ECA system with a pet avatar used by older adults during daily interactions over three months.

Methods

Design

We conducted a secondary analysis of data that were collected for a parent study that deployed a tabled-based ECA system with a pet avatar (termed "digital pet") in 10 older adults' home for three months. In the original study, 10 participants' cognition (baseline and exit), health (baseline and exit), social support (baseline and exit), comfort level with technology (baseline), and use of technology (baseline) were assessed by filling out written questionnaires. Participants were interviewed at baseline, midpoint (one and half month), and exit (three months) for thoughts on the system and usability.[13]

Sample

The parent study recruited participants through posting flyers at a retirement community in the Seattle area. Older adults who were interested in this study contacted a research member (AL) and then were screened for the eligibility. The inclusion criteria for participating were: absence of severe cognitive impairment (screened by using Memory Impairment Screen-Telephone tool[14]), ability to interact with the device, and residence in the Seattle metropolitan area. The exclusion criteria were unwillingness to be audio recorded or inability to speak English. The first ten participants who responded to the recruiting flyers were screened and all met the inclusion criteria so they were invited to use the system. Informed consent was obtained from all the participants. The study was approved by the Institutional Review Board of the University of Washington.

Intervention

Participants were invited to use the digital pet avatar for three months. The system is a commercially available ECA system (as part of the GeriJoy service provided by the company "Care.Coach"). The system provides a cat or a dog avatar and participants choose which animal avatar they prefer at enrollment. The system has functionalities such as conversation, reminders, and use of pictures and other media to facilitate sensory awareness and memory support. The avatar is a human-operated ECA. Trained staff provide 24/7 responses to users whenever users wish to talk to their avatar. The pet avatar can be activated by the participant's voice or by tapping on the screen. The pet avatar also checks in with participants every 2–3 h during daytime hours if the participant has not interacted with the pet avatar that day. The staff type in responses that are converted from text to speech. The company developing the system chooses to use a mechanical human voice because it minimizes variability of the avatar for transitions in staff covering various shifts, with the goal of making shift change seamless to the older adult. Conversations are summarized in brief logs that are available via a digital portal. Staff members are trained by the "Care.Coach" company and interact with the system users following standardized protocols.

Measures

At baseline, the participants filled out a written questionnaire that included their basic demographics (gender, age, and race) and 5-Point Scales about their comfort level with technology and use of technology.

Two trained and experienced researchers (AL, SL) conducted semi-structured, individual interviews with participants at baseline, midpoint (one and half month), and exit (three months) following standardized interview guides (see Table 1). All interviews were audio recorded.

Data analysis

The participants' baseline descriptive data were analyzed using the Excel's Descriptive Statistics Tool.

All interviews (30 min to 1 h) were recorded and transcribed verbatim. We employed Braun and Clarke's thematic analysis[15] to specifically explore older adults' acceptance and experience with the digital pet. Three authors (NC, GD, HT) first listened to the interview audios and read the transcripts to become familiar with the data, and then discussed and finalized coding themes related to users' experience with the digital pet. The first author (NC) read through the transcripts of baseline interviews and generated initial codes. Three authors (NC, GD, HT) discussed initial codes to reach a consensus and developed a codebook used by the first author to systematically code all transcripts. The codebook was expanded along with the coding process. All codes and quotes were organized into a table. Each code and quote was examined and discussed by three authors to ensure compatibility and accuracy. The themes were identified among three authors after several rounds of discussion to reflect participants' perceived acceptance and utility of the digital pet.

Treatment fidelity

In order to enhance our treatment fidelity, two trained researchers went to each participant's home to instruct them how to interact with the avatar properly and asked the participants to interact with it on a daily basis. Also, the avatar checked in with participants on a daily basis. System logs summarized all conversations with a date and time stamp. These were reviewed by the research team on a weekly basis as a way to establish that interactions between the avatar and the participant were occurring daily as expected.

Results

Descriptive data

Ten female older adults between 68 and 89 years participated in this study. Nine were Caucasian and one was Native American. Seven felt somewhat comfortable using technology (see Table 2).

Interview data

We interviewed participants at baseline (recruitment), midpoint (one and a half months), and exit (three months) asking them about their experience with, perceived benefits, challenges, and concerns about the system. All participants completed the baseline interviews. Two participants withdrew before the midpoint: one expressed frustration about "problem-solving when the device was not working as expected"; the other one experienced challenges with her Wi-Fi connection, and did not think that the digital pet provided adequate interpersonal connection that she needed. The remaining eight participants completed all study procedures. The following section presents the major themes on participants' perceived utility and