
Palliative care with spiritual support by Conversational Agents



Figure 1. Virtual CA

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Abstract

While conversational agents and robots have been increasingly used for health counseling tasks, palliative care support at end of life remains an important yet underexplored domain. Palliative care includes a range of support services to reduce suffering, including spiritual support. In this work, we discuss the development of a conversational agent that provides end of life planning and spiritual counseling, and results from a pilot study to assess acceptance of this counseling provided by both a virtual agent and an anthropomorphic robot by older adults. We also report on preliminary results from a clinical trial evaluating the virtual palliative care support agent in the homes of older adults.

Author Keywords

Palliative care; Spirituality; Conversational Agents

CSS Concepts

• Human-centered computing → Human computer interaction (HCI) → HCI design and evaluation methods → User studies

1. Introduction

Palliative care is a branch of medicine whose goal is the alleviation of suffering rather than cure, and which plays a particularly important role at end of life.



Figure 2. Robot CA

Palliative care is often under-utilized and provided very late in disease progression when patients have already been suffering for weeks or months. Many aspects of palliative care—including symptom management and management of stress and anxiety—can be provided via counseling. Spiritual support represents an important dimension of palliative care for many patients, and addresses a patient’s religious and spiritual needs, in order to empower them by providing broader perspectives on illnesses and mortality [1].

Conversational agents (CAs) have been shown to be an effective means of delivering automated counseling-based health interventions, in which face-to-face counseling with a human health provider is simulated using virtual agents or anthropomorphic robots. Automated CAs have been successfully used for health interventions in diverse areas, including exercise promotion [2], chronic disease self-care management [3], cancer genetics counseling [4], and substance use counseling [5]. CAs may also be efficacious in providing automated palliative care support to patients at end of life [6], and potentially providing these crucial services to patients at a much earlier point in time. Through dialogue, CAs could provide the same range of support as a palliative care clinician.

In this paper, we build upon our work in developing the palliative care CA and describe a pilot study assessing patient acceptance of the technology, particularly regarding spiritual support alone. We compare the delivery of palliative care support offered via virtual agent to the information delivered via a functionally equivalent anthropomorphic robot. We also briefly report progress on a randomized clinical trial to

evaluate the CA [6] in a home-based longitudinal intervention.

2. Design of a Palliative Care Virtual Agent and Robot

We developed a CA dialogue about end of life planning, including the necessity to prepare a last will and testament, to identify and designate a health care proxy, and to provide spiritual support. Dialogues are scripted using a custom hierarchical transition network-based scripting language and template-based text generation.

We designed the spiritual counseling dialogue to assess user spiritual and religious beliefs and practices and to demonstrate the CAs pro-spiritual stance. The dialogue asks users about their spiritual orientation, specific religious beliefs, family religious background, religious practices, and beliefs regarding the meaning of death. The agent ‘aligns its spiritual and religious beliefs’ with that of the user by asking users what religion they practice. Directly following, the agent states that she also has a similar religious background (e.g., “That’s interesting, I also went to Catholic school!). The dialogue accounts for six major religions (Christianity, Judaism, Islam, Hinduism, Buddhism and Sikhism), as well as for atheism, spiritual humanism, and secular humanism, as described. Further, the agent engages the user in a discussion about the existence of an ‘afterlife.’ The agent shares its thoughts on life after death and further asks users if they think that the agent may have an afterlife once it dies.

The CA speaks using a speech synthesizer, and uses a range of nonverbal conversational behavior, including facial display of affect, communicative eyebrow

movements, directional gazes, and head nods, and with most non-verbal behaviors automatically generated using BEAT [7].

For the purpose of comparative evaluation, we deployed the dialogue on both an anthropomorphic Robot (the Furhat Humanoid Robot¹) and a functionally equivalent and similar looking screen-based Virtual Agent (Figures 1 and 2), with each playing the role of a palliative care coach.

3. Evaluation

We conducted an experiment to evaluate the ability of conversational robot and agent to perform spiritual counseling. We conducted a between subjected study, with participants randomized to either agent or the robot condition and we evaluated their satisfaction, attitude towards the robot (or the agent), and state anxiety before and after the interaction. The study was approved by our institutional IRB and participants were compensated for their time.

3.1 Participants

We recruited 33 older adults (18 males, 15 females, ages 55-82, mean 60.05 years) via an online advertisement, with 18 participants randomized to interact with the robot and the rest with the agent. Our participants had varying degrees of computer experience and educational backgrounds, ranging from not graduating high school to having an advanced degree.

¹ <https://www.furhatrobotics.com/>

3.2 Measures and Results

State Anxiety: Assessed at intake and after interacting with agent using the 20-item 4-point State Trait Anxiety Inventory (STAI) [8].

Death Anxiety: Assessed at intake and after interacting with the agent using the Death Anxiety Scale (DAS) questionnaire. We used the version of DAS with the 20-item 7-point Likert-scale [9].

Working Alliance: Attitude towards the agent and the robot was assessed using the affective bonding subscale of the Working Alliance Inventory (WAI) [10]. WAI contains 12 items on 7-point Likert scale.

Analysis of Interaction logs: We also analyzed the user logs to check responses of the user, when the agent/robot asks them whether they think that the agent/robot has an afterlife.

3.3 Procedure

Following administration of informed consent and demographic and baseline measures, participants had a 20- minute interaction with the agent, followed by post intervention measures and a semi-structured interview about their experience and attitudes towards the agent.

4. Results and Discussion

There was no difference observed between the agent and robot conditions in measures of pre-post state anxiety, pre-post death anxiety and working alliance. Participants in both conditions were receptive to the system, as indicated by working alliance scores above neutral for both the robot (M = 4.76,SD = 1.21) and

agent (M = 4.64,SD = 0.99) conditions. This was also reflected in the qualitative analysis of the interviews [11] as well. Participants in both the conditions also reported high satisfaction with the agent, and a strong desire to continue interaction with the current embodiment (Table 1).

Table 1: Satisfaction and Desire to Continue Scores

Embodiment	Satisfaction M(SD)	Desire to continue with current embodiment M(SD)
Robot	5.28(1.93)	5.17(1.95)
Agent	5.67(1.80)	5.07(2.15)

Participants rated the robot as having an ‘after-life’ more frequently than participants rating the virtual agent. This was echoed in the interviews too, where participants indicated stronger feelings of spiritual alignment with the robot and mentioned the connection with the robot as being “*genuine*”[P15] and “*things her and I agree on*”[P08], compared to the agent condition where some participants described the interaction as being “*superficial*”[P11] and “*phony*”[P07].

Overall, the study demonstrated that older adults were comfortable discussing palliative care and end-of-life topics with a conversational agent, regardless of embodiment. They were also comfortable discussing their spiritual and religious backgrounds with an agent.

5. Conclusion and Future Work

We designed a conversational agent system that interacts with older adult participants about end of life planning, including spiritual counseling. Spirituality is a complex construct and becomes all the more necessary when developing systems for palliative care. Virtual agents with their relational capabilities can take advantage of some of these elements in order to provide better care and counseling to older adults. This presents an interesting space of research for design and evaluation of these agents, the extent to which they can leverage spirituality in their dialogue and other questions of interest to the HCI community at large such as a) improving rapport between the agents and older adults and b) How familiarity with these spiritual systems would affect their perception with older adults.

We have expanded the palliative care virtual agent to provide a range of support counseling and are currently conducting a randomized clinical trial to evaluate it. In the trial, intervention participants are provided with tablet computers with the agent to use at home for six months and compared to participants who only receive standard of care. To date, 202 participants have been enrolled, and preliminary results indicate that participants interact with the agent an average of once every three days during the intervention period.

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