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ABSTRACT

Before determining if an interaction with a social robot benefits the person with dementia (PwD), it is necessary to understand the process of acceptance of the robot by the PwD. Hence, we proposed strategies to facilitate the acceptance by PwD in real environments. We enforced these strategies in a conversational robot - called Eva, and conducted a five-week study with six PwD to analyze the impact of the strategies in the acceptance. Our preliminary results suggest that add a pleasure component such as music to the interaction improve the interaction and could enact a better bonding. Moreover, a facilitator promotes the interaction between PwD and robot, but gradually the participation of the facilitator decrease to become a direct PwD-robot interaction.

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1 INTRODUCTION

The prevalence of dementia is increasing as the population ages. This is driving the search for innovative dementia care strategies [1]. Social interaction and interactive communication are recognized as helpful strategies to maintain the abilities of people with dementia (PwD) and improve their quality of life [2]. Elderly people need to accept social robots into their home environments to profit from favorable outcomes of social robot use [3] . However, before we can determine if an interaction with a social robot benefits the PwD, it is necessary to understand the process of acceptance of the robot by the PwD.

Since cognitive conditions of PwD differ from older adults without the illness, understanding how they interact with robots is crucial to discover which factors could impact the acceptance of a social robot.

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In this paper, we report preliminary findings of a study conducted in a geriatric residence. The study was designed to explore the acceptance of a social robot in real environments by PwD. We enforced strategies to encourage the acceptance of social robots by PwD. Furthermore, we report how these strategies influence the acceptance of the robot by PwD.

2 METHODS

We conducted a five-week study to explore the acceptance of a social robot by PwD. We used an exploratory approach to use strategies to promote the acceptance of social robots. The primary aim of the study was to identify which strategies could have a positive effect on the interaction between PwD and robot improving the acceptance. Thus, we employed a Wizard and Oz model - a human-centric method that uses real technology in a real environment.

2.1 Social robot

During the study, we employed a conversational robot prototype, named Eva, which is a 30 cm anthropomorphic robot [4]. Eva has autonomous features such as natural language understanding, talking, facial expression, and playing music. Furthermore, a human operator can trigger a specific behavior of Eva via a web application.

2.2 Participants

The initial inclusion criteria were: 1) 70-90 old, 2) capacity to speak, 3) appropriate level of diction, and 4) be sociable. Caregivers at the geriatric residence proposed the most viable residents to participate in the study. Six participants (five women and one man) aged between 71 and 85 (M=81.5, SD=4.92) regularly participated in the five-week study. All participants had been diagnosed with dementia with a Mini-Mental State Examination (MMSE) score [6] between 9 and 21 (M=15.67, SD=4.5).

2.3 Strategies

We proposed a set of strategies to encourage the acceptance of a conversational robot by PwD. We obtained these strategies from a literature review and caregivers experience [4]. Thus, we explored to extrapolate these strategies from the domain of human-human to human-robot interaction.

Use intermediaries to get comfortable with the robot. We propose for a trusted person (caregiver) to companion PwD

during the interaction with the robot. This facilitator must adopt a proxy role between the person and the robot. The facilitator's tasks include: talk to the robot, motivate participation, broadcast and repeat robot utterances.

Connecting through music. Listening to music together can be a great way to form a bond with PwD [4, 5]. Thus, we develop a set of components (e.g., play music by user request, volume control, music player controls) to enact an active music therapy - recipients are actively involved in musical improvisation with instruments or voice.

Improving basic communication. There are standard strategies to promote and improve communication with PwD [6]. We enforced some of these strategies in the inherent behavior of the robot Eva. These strategies include: speak clear, slow, and loud, but not yelling; say one utterance at a time, avoid many utterances in a short interval; use emotions and facial expressions to support the utterances that you said.

2.4 Procedure

We divided participants into two groups. One of the caregivers acted as facilitator. A member of our research team operated the robot – Wizard and Oz model, the operator was out of the spotlight of participants, but he had direct audiovisual feedback. Sessions were conducted weekly, and each session lasted approx. 30 minutes and video-recorded. During the sessions, the facilitator had a primary role during the interaction. Hence, the facilitator was instructed to perform activities such as introduce the robot to the participants, requests music, motivate to participants to talk or sing with the robot and others.

2.5 Data collection and analysis

We count the number of music tracks used per session. Furthermore, we define a coding scheme to quantify and measure the behavioral of the strategies. The coding scheme was based on the following activities:

- **Participation of the facilitator:** count explicit utterances from the facilitator to the participants or the robot.
- **Direct utterances to the robot:** any direct utterances from a participant to the robot. We do not include utterances related to singing.

3 RESULTS

We considered a facilitator participation in all sessions. In the first session, the facilitator played a significant role in the interaction, acting as a proxy between participants and the robot. However, during remaining sessions, the facilitator participation tends to decrease in both groups (see Figure 1).

In both groups the number the number of utterances by the participants increased (see Figure 2). The number of music tracks played remained almost constant. This suggests that music plays an important role in maintaining the participants engaged.

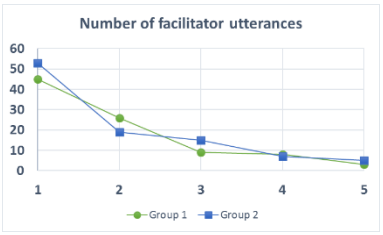

Figure 1: The facilitator utterances over the sessions.

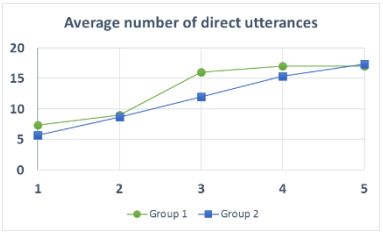

Figure 2: Average number of direct utterances to the robot per session.

We employed a Pearson correlation analysis to test if exist a correlation between the decrease of facilitator participations and the increment of direct dialogues PwD-robot. This analysis was strictly explorative because the size of the sample (five sessions) is small to deploy a regression analysis. Thus, for group 1 there was a negative Pearson correlation = - 0.96, and for group 2 there was a negative Pearson correlation = -0.89. These results provide evidence of the effectiveness of the strategies in the acceptance of the robot.

4 CONCLUSIONS

We proposed strategies to facilitate the acceptance of a social robot by PwD. During a five-week study, we deploy interventions with the robot in a geriatric residence with two groups of PwD. Results suggest that the participation of a facilitator in the early stages of the interaction could help introduce the robot to the PwD. Moreover, a music component lightens the interaction and becomes a trigger for social interaction. Our future work will focus on conducting a long-term study to sustain these preliminary results. Moreover, we will deploy an in-depth analysis combining quantitative and qualitative approaches to get a better understanding of the PwD-robot interaction.

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