

Human-Robot Interaction to Deal with Problematic Behaviors from People with Dementia

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ABSTRACT

People with dementia (PwD) experience behavioral and psychological symptoms, such as anxiety or aggression that can put them, or their caregivers, at risk. In this paper, we describe the results from a case study conducted to assess the viability of using socially assistive robotics (SAR) system to deal with problematic behaviors experienced by PwD. Data was gathered from interviews with specialist and contextual observation of caregiver-PwD interaction. Analysis included interpretation sessions, open coding, and affinity diagramming. Results highlight some of the challenges and opportunities for robot-person interaction to deal with problematic behaviors.

CCS Concepts

• Computer systems organization → Robotics • Human-centered computing → Interaction design → Empirical studies in interaction design

Keywords

Human-Robot Interaction; People with Dementia, Problematic Behaviors, Socially Assistive Robotics.

1. INTRODUCTION

Behavioral and psychological symptoms of dementia (BPSD) are symptoms of disturbed perception, thought content, mood, and behavior that occur frequently in patients with dementia [1]. BPSD include anxiety, depression, psychosis, aggression, apathy, agitation, disinhibited behaviors, wandering, nocturnal disruption, and vocally disruptive behaviors.

A Socially Assistive Robot (SAR) is a system that employs hands-off interaction strategies, including the use of speech, facial expressions, and communicative gestures, to provide assistance in accordance with the particular healthcare context [2]. PARO is a SAR that fills the perceived growing need for PwD, including those in long-term care facilities, to receive meaningful, positive social and emotional stimulation, while at the same time providing caregivers with free time to perform other required functions [3]. Results of the qualitative observations and evaluations showed how elderly with dementia changed their mood and behavior in various ways when using PARO. These results motivate our research on the design of HRI-based interventions to deal with a specific problematic behavior from PwD.

We aim at assisting caregivers that cannot be 24/7 providing

affective assistance to a PwD with the design of robots that enact strategies for effective social interaction. These robots could be used to ameliorate problematic symptoms of dementia and lessen caregiver burden. To achieve this long-term goal, we conducted a contextual and qualitative study to discover and understand needs and opportunities to manage problematic behaviors.

2. STUDY DESIGN

Before designing and developing SAR technologies to support interventions that could eliminate or reduce BPSD, we needed to further understand the needs and opportunities, as well as the shortcomings, of the daily living of PwD. We designed a study to determine the social and affective needs of PwD who live in a residence in order to envision how a SAR could be designed to meet some of these needs. Our approach is based on the use of qualitative methods, including interviews and observation.

2.1 Data Gathering

We conducted interviews with 7 participants. Interviewees included: four caregivers (two male, two female), with an average experience of 2.2 years as caregivers; one specialist (female) in non-pharmacological interventions (NPI) with more than 6 years of experience; one specialist (female) in behavior and cognition (B&C) with 8 years of experience; finally, one geriatrician (male) with 10 years of experience in elderly care. Individual interviews lasted between forty-five minutes and one hour and were semi-structured in nature, audio-recorded and transcribed.

We also conducted three non-participative, non-structured and direct observations studies with 6 PwD (men=2, women=4), caregivers and the therapist. Each observation lasted approximately three hours and focused on a normal day at the nursing home and a therapy session; these observations were video recorded. PwD participants have been diagnosed with different kinds of dementia such as Alzheimer's disease (n=4), dementia with Lewy bodies (n=1), and mild cognitive impairment (n=1); and all of them are between 75 and 85 years-old.

3. ANALYSIS METHODS AND RESULTS

We coded all interview transcripts and detailed notes using an emergent open coding scheme to identify recurring themes related to the most common and dangerous BPSD from PwD, how to manage these problematic behaviors, and what benefits can be obtained from NPI. Additionally, we used themes from the literature to confirm recognized challenges in our PwD population.

3.1 Results – Finding themes

To conduct this analysis, we used an open coding scheme through interpretation sessions. This resulted in four extracted themes, which we describe below.

1) *Most frequent problematic behaviors at the geriatric residence are anxiety, depression and aggression:* Caregivers and the geriatrician reported that although they observe many

problematic behaviors a few of them are more frequent in their population. Three of these behaviors were considered particularly disturbing by the caregivers at the nursing home: aggression, anxiety and depression.

"They [PwD] cannot change their diaper. If we [caregivers] tell them "it's time to change the diaper", then they become aggressive. It's necessary to persuade them to change their diaper. This takes extra time and interferes with our daily activities in the residence." [C4, C=Caregiver]

"Another resident becomes very anxious, for example she [PwD] starts to run inside the house. This is a huge problem, because we [caregivers] need to care for her. Many patients become anxious or depressed at specific times during the day. When that happens, we distract them by focusing them on another activity." [C2]

2) *The main strategy to deal with problematic behaviors is social interaction:* The analysis revealed us that the main strategy to deal with a crisis is social interaction. All caregivers reported that their approach to calm residents involves interacting with them. These interactions are based on verbal communication and signs of affection.

"She [PwD] is a very anxious person, then we need to interact with her, we need to talk to her about her family or some other subject. All this to calm her or to prevent a possible crisis" [C1]

"Social interaction is one of the most important issues for a PwD, and it has many benefits, because the affective system is altered, this has cognitive benefits. The most recommendable for PwD is social interaction." [Specialist in B&C]

3) *PwD who were observed are in need of emotional and affective stimulation:* Mainly, PwD were taken to the geriatric residence because their family cannot care for them. Many times, the family members have work or other activities, and do not have time to visit them. This leads to a lack of affective stimulation for the PwD.

"A simple thing like staying a few minutes with them [PwD] makes a difference. For large periods, they don't have any interactions with their family, it is obvious that they give a great value to these interactions." [C1]

"Social and affective interactions have an essential cognitive impact. The brain is activated because it receives and processes information. Thus, the brain is alert. Basically, if a sense is not stimulated, it will atrophy." [Geriatrician]

4) *NPI can have a relaxing and calming effect for PwD:* The geriatric residence includes several activities such as yoga therapy, physical exercise, and reading and listening to stories. During the analysis, we obtained evidence of the benefits of these interventions.

"... you can quickly see the results. They [PwD] tell me "I feel good; I have slept very well". Many times they don't say anything, but their behavior and mood have changed. Some residents don't perform the activities, however they stay to observe and enjoy the interaction. Their facial expression says a lot about the effects of the therapy. However, sometimes it is hard to keep them motivated and engaged, they get easily distracted." [Specialist in NPI]

"We [caregivers] have observed a difference, because they [PwD] are calm and relaxed during the day. For example, today they had two hours of therapy [yoga], thus, they are tired, calmed and relaxed. Therefore, we [caregivers] will have a very calmed day." [C3]

3.2 Results – Preliminary Scenarios

Drawing from our analysis findings, we designed two preliminary scenarios for HRI-based interventions to deal with BPSD from PwD. Thus, we proposed different kinds of interventions focused on distinct BPSD. Preliminary results obtained suggest some viable scenarios to support intervention with a SAR system.

Scenario 1. *Carmen is a resident in an assisted living facility. She is 82 and suffers from Alzheimer's. She frequently suffers from episodes of anxiety screaming and running around the residence, which puts her and other residents at risk. Carmen is wandering and starts to increase her walking speed, becomes disoriented and talks to herself, clear signs that she is experiencing anxiety. Not far from her is Alan, the robot, who monitors Carmen and other residents who wear a bracelet that records physiological signals. From this data, Alan infers Carmen's anxiety and moves towards her. Carmen recognizes Alan and greets him. Alan moves and makes noises as means of nonverbal communication to distract and reassure Carmen. She hugs Alan and plays with him, which reduces her heart rate and transpiration*

Scenario 2. *Olga is a yoga instructor who has worked with older adults for the last 10 years. As she does every Friday morning she conducts a therapy at a geriatric residence. She brings with her "Eve", her robot assistant and explains the 6 elders participating in the session that Eve will follow the movements they are all going to make. The residents are motivated to see that Eve follows Olga's movements. In the middle of the session, Olga instructs the robot to continue with the next phase of the therapy, and Eve responds by reproducing the movements and playing the appropriate music. While most residents follow Eve's movements, Olga assists one of the residents who has limited mobility and has difficulties following the therapy.*

4. CONCLUSIONS

We conducted a study to support our hypothesis that a robot that enacts strategies for effective social interaction can assist in dealing with problematic behaviors. Preliminary qualitative results reveal opportunities and challenges in the design of HRI-based interventions to deal with some BPSD. However, we need to consider these insights for designing proper HIR solutions:

- The robot does not work in isolation, usually involves the caregiver, proposing tasks and deciding when the interaction with the PwD is appropriate.
- The robot does not replace the caregiver.
- The robot needs to include strategies to create emotional empathy with the PwD.
- Each PwD experiences the disease in a different form, exhibits a particular set of BPSD and might create emotional rapport with a robot in different ways.

5. REFERENCES

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