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Reactions and Engagement of Individuals with Dementia Toward Humanoid Assistive Robots: A Study Using the Pepper Robot

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Abstract. While robot acceptance in different populations is well-studied, little is known about how individuals with dementia perceive and respond to humanoid assistive robots. This paper explores how individuals affected by dementia react to and engage with such robots, focusing on interactions with Pepper, a humanoid robot. Conducted in an all-dementia nursing home with residents experiencing varying stages of dementia, the study has collected direct observations and participant feedback. A common concern among clinicians, family members, and caregivers is that individuals with dementia may find robots frightening or unsettling, raising questions about their suitability for caregiving roles. However, the findings of this study suggest otherwise. Residents consistently identified the robots as "cute" and "child-like," with many expressing comfort and interest in interacting with them. These results highlight the potential for humanoid robots like Pepper to serve as non-threatening, engaging companions for individuals with dementia, addressing caregiving needs while enhancing their well-being. This study provides a foundation for further exploration into the acceptance and application of assistive robotics in dementia care settings.

Keywords. Dementia, Assistive Robots, Humanoid Robots, Pepper

1. Introduction

The increasing prevalence of dementia worldwide has underscored the urgent need for innovative approaches to enhance the quality of life for individuals affected by this condition. Among these approaches, robotics has emerged as a promising tool for providing assistance and companionship to people living with dementia. Humanoid robots, in particular, have garnered attention for their potential to address caregiving

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challenges. However, their success is closely tied to how individuals with dementia react to and engage with these technologies [14].

Numerous studies have investigated robot acceptance among various groups [7, 8, 9, 10, 11], such as healthcare settings [12,13,14,15,16,17,18,19,20, 21, 22, 23]. However, there is limited knowledge about how dementia patients perceive and respond to robots [6].



Figure 1. Interaction of Pepper robots with dementia patients

A significant concern expressed by clinicians, family members, and caregivers is that individuals with dementia may find robots frightening or unsettling. These concerns often lead to hesitations about the incorporation of robots into caregiving environments. Understanding and addressing possible anxiety, confusion, or resistance towards robots is crucial in advancing their use in dementia care and ensuring them to be viewed as supportive tools rather than sources of discomfort [13]. For people affected by dementia, their interactions with robots are influenced by various factors, including cognitive abilities, emotional status, cultural context, and previous exposure to technology. These factors directly impact the acceptance, usability, and overall effectiveness of robots in caregiving roles. Whether individuals with dementia see robots as helpful companions, engaging tools, or something to be wary of is key to designing technologies that match unique needs and comfort [17]. This paper examines the response of individuals with dementia to humanoid assistive robots, focusing on how the residents of an all-dementia nursing home reacted to the Pepper robot, their comfort levels, and their willingness to engage with it. By exploring these interactions and addressing concerns about fear, this paper aims to determine the design and implementation of robotics in dementia care settings, ensuring them to be

both functionally and positively received by their target users.

2. Study Design

The study employs a qualitative, observational, cross-sectional design with a total of 47 participants (n = 47). Conducted in the Avantara St. Cloud, South Dakota nursing home with residents at varying stages of dementia, interactions were facilitated using the Pepper robot. The data was collected in a very short period of time without long-term follow-up. Ethical approval was waived for this study under IRB protocol "STUDY00015240". Participants answered questions to assess recognition ("Who or what are these?"), emotional reactions ("Do you like these robots?" and "Are they scary, are you afraid of them?"), and engagement ("Would you like to interact with them?" and "Are these robots?"). This approach provided insights into how individuals with dementia perceive and engage with assistive robots in caregiving settings.

3. Results

The study was conducted on individuals with varying degrees of dementia living in a nursing home. Insights from the study revealed a positive experience with assistive robots like the Pepper robot, with participants frequently describing the robots as "cute" and "child-like.". Concerns about fear or anxiety were minimal, indicating a general sense of comfort.

- Who or what are these? 100% identified the robots as some form of entity.
- **Do you like these robots?**: 99% indicated they liked the robots, with only 1 "No" response.
- Are they scary, are you afraid of them?: 100% responded "No"
- Do these robots make you anxious?: 100% responded "No"
- Would you like to interact with them?: 99% responded "Yes," with only 1 "No" response.
- Are these robots: The majority (over 85%) described them as "cute" or "child-like," with only a few instances of other responses.

The data gathered from individuals with dementia regarding their perceptions of robots shows overwhelmingly positive responses. Key findings include:

- 1. **Familiarity and Positive Association**: All respondents recognized the robots, consistently describing them as "cute" or "childlike." These perceptions suggest that robots were seen as approachable and non-threatening.
- 2. **Emotional Comfort**: None of the participants reported fear or anxiety, indicating high emotional comfort. The absence of negative emotions is crucial for the acceptability of assistive technologies for individuals with dementia.
- 3. **Interest in Interaction**: Nearly all participants expressed a willingness to interact with the robots, showcasing their potential for engagement and companionship in dementia care settings.

These findings underscore the importance of designing robots with features that promote positive perceptions, ensuring they are well-received. Further research could explore associations with additional variables as more data becomes available. Additionally, considering emotional and psychological well-being is crucial when integrating technology into caregiving. Future studies should focus on demographic factors and tailored designs to enhance inclusivity and support for individuals with dementia

4. Discussion

Research on socially assistive robots in dementia care has explored the users perceptions, acceptability, and concerns. Liao et al. [1] found positive views on Pepper robots assisting with daily tasks and companionship, though cost and replacement of human interaction were concerns. Yuan et al. [2] reported positive attitudes across dementia patients, caregivers, healthcare professionals, and the public, emphasizing medication reminders and emergency communication. Vandemeulebroucke et al. [3] analyzed 23 studies, highlighting older adults' positive outlook on humanoid robots for physical assistance, while calling for further research on social caregiving. Dosso et al. [4] explored older adults' and caregivers' attitudes, identifying privacy and artificial appearance concerns, and recommending more emotionally resonant robots. Raigoso et al. [5] investigated social robots in gait therapy, with a majority showing positive acceptance, though differing perceptions between patients and clinicians were noted. Whelan et al. [6] emphasized the importance of humanlike communication and user trust, suggesting the need for long-term studies in real-world settings.

Despite some negative findings, many studies highlight a generally positive attitude toward socially assistive robots for dementia care. The data from our study highlights significant insights into interactions between individuals with dementia and assistive robots. The overwhelming preference for robots described as "cute" and "child-like" indicates that individuals across varying stages of dementia find these technologies engaging and non-threatening. Minimal reports of fear or anxiety emphasized that thoughtfully designed assistive robots can effectively promote comfort and connection.

Consistent positive responses suggested that robots have the potential to enhance emotional well-being, reduce isolation, and provide meaningful interactions for individuals with dementia, highlighting the importance of addressing emotional and psychological factors in developing robotic solutions tailored to dementia care. While the majority welcomed the robots, further research is needed to explore how factors such as dementia severity, personal preferences, and previous experiences with technology influence these interactions.

5. Conclusion

The study emphasizes the importance of designing assistive robots that prioritize comfort, emotional engagement, and ease of use for individuals with dementia. It concluded the potential for assistive robots to enhance caregiving by promoting companionship and support for individuals with dementia. With minimal fear or anxiety reported, the overwhelmingly positive perceptions highlight their potential to support holistic well-being and complement traditional caregiving.

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