

Social HRI for People with Dementia: One Size Fits All?

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ABSTRACT

Motivational and emotional disorders (*i.e.* apathy and depression) are very frequent in dementia and might greatly affect the positive psychological state experienced during social HRI. We conducted a six-weeks study in two nursing homes comparing the affective states that two playful activities, board cognitive games and social robot play (Pleo), were able to elicit in people with dementia. Results show that a significant increase in pleasure (positive affect) is present in the robot condition when participants are considered in their totality, but once they are grouped based on the presence of motivational and emotional disorders, the pleasure experienced in the robot condition is significantly lower in the group with such disorders.

Keywords

Affect; Dementia; Human-Robot Interaction; Playful interactions.

1. INTRODUCTION

Research on the use of assistive social robots in elderly care [1] pinpoints a variety of effects of social robots on the wellbeing of the person with dementia: an increase in positive mood, a decrease in loneliness, a reduction of stress, and an enhancement of societal ties. Such effects are evident also on a physiological level, as measured by EEG and urinalysis [1]. Robinson et al. [2] and Šabanovic et al. [3] found that interacting with a social robot results in a decrease in loneliness, and augments social interactions in nursing homes. What is more, Moyle et al. [4] observed that interaction with social robots positively affects quality of life and pleasure scores in dementia, as measured respectively with the Quality of Life in Alzheimer's Disease Scale (QOL-AD) and the Observed Emotion Rating Scale (OERS).

Within this paper we report the results of a six-weeks study carried out in two nursing homes. The study was designed to compare the psychological states that two very different playful activities, a game-based cognitive stimulation and a free-play robot interaction with a dinosaur robot, were able to engender in people with dementia, and to disclose potential interferences of motivational disorders and dementia severity on such states.

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2. METHODS

2.1 Participants

Fourteen participants (12 women and 2 men) aged between 69 and 92 years (average age: 84 years) with mild to moderate dementia took part in the study. Subjects were included in the study if they had a confirmed dementia diagnosis and a dementia level ranging from mild to moderate, as measured through the Reisberg Global Deterioration Scale (scores 4 and 5) [5]. The presence of motivational disorders was measured through the Neuropsychiatric Inventory (NPI) (sub-scales: apathy and depression; clinical significance: score ≥ 4) [6].

2.2 Activities

The study followed a repeated measurement design with two experimental conditions: a game-based cognitive stimulation and a robot-based free play (Pleo). Conditions were repeated three times, for a total of six sessions, three with cognitive games and three with the social robot, and were presented in alternated order, the sessions with cognitive games and with the robot were carried out every other week starting with cognitive stimulation. Participants were coupled randomly and took part in the activities in pairs. Each session was carried out by a facilitator, the social educator or psychologist of the nursing home.

The game-based cognitive stimulation consisted of three cognitive games that participants were to play collaboratively: a jigsaw puzzle, a shape puzzle, and domino (20-25 minutes). Robot-based free play consisted of an interaction with a dinosaur robot, Pleo (20 minutes). We selected Pleo as a robot, instead of other available ones, because, while being highly responsive and interactive, it still keeps those traits of cuteness and tenderness that are so appealing to old people. Responsiveness and interactivity are very important features when it comes to people with mild and moderate dementia. Indeed, these people are still able to sustain highly dynamic interactions if compared to people with severe dementia. Pleo was presented to participants in its childhood mode to foster their sense of caring and parenthood.

2.3 Measures

After each session, facilitators were asked to fill out the OERS [7]. The OERS measures on a 5-point Likert scale the intensity or duration of the following affective states: pleasure, anger, anxiety/fear, sadness, and general alertness. The items of OERS are scored according to the presence of a series of behaviours during the activity. For instance, pleasure is scored when the participant laughs, sings, smiles, kisses, strokes or gently touches others, reaches out warmly to others, responds to music.

2.4 Results

The use of categorical ordinal variables as dependent variables made us opt for the use of non-parametric statistics. We performed a Wilcoxon Signed Rank test (software used: IBM SPSS 22.0) to check for differences in pleasure between the two activities. Results show that the interaction with Pleo produced significantly more pleasure compared to cognitive games ($z = -3.086$, $p = .002$, Figure 1).

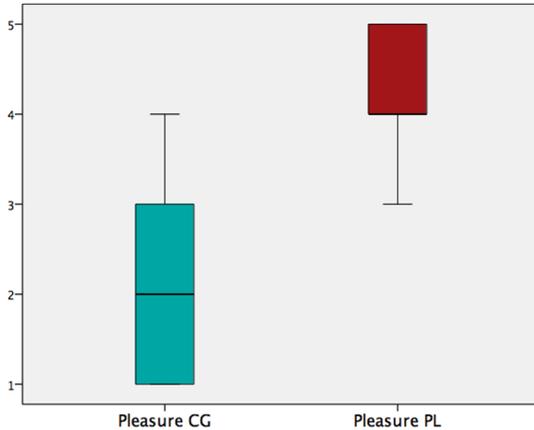


Figure 1. Differences in Pleasure in the two Conditions (CG: Cognitive Games, PL: Pleo)

Through a Kruskal-Wallis test, we checked whether these results still held once participants were grouped according to characteristics such as dementia severity and presence of motivational disorders. For what concerns the former, although one would have expected a lower pleasure in cognitive games for people with moderate dementia with respect to people with mild dementia, due to the higher challenge of the games for the former dementia group, no such difference was present ($H(1) = .217$, $p > .05$), nor any difference was present in the interactions with Pleo ($H(1) = .219$, $p > .05$). For the latter, when participants were grouped according to the presence of motivational and emotional disorders, a highly significant difference was present in pleasure in the Pleo condition ($H(1) = 7.044$, $p = .008$, Figure 2), but absent in cognitive games ($H(1) = .869$, $p > .05$).

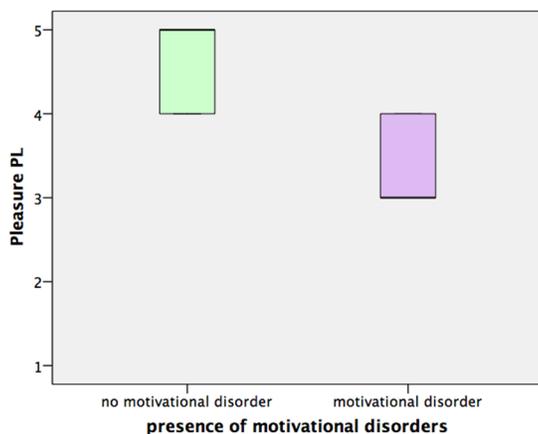


Figure 2. Differences in Pleasure in the Pleo Condition between People with and without Motivational Disorders

Note that in Figure 2, the median pleasure in the robot condition in people without motivational disorders corresponds to the upper quartile, whereas the median pleasure in the robot condition in people with motivational disorders corresponds to the lower quartile.

Participants affected with apathetic and depressive syndromes, as measured with NPI, showed significantly less pleasure during interactions with Pleo with respect to participants without such disorders. This was evident also on a qualitative level. During sessions, we assisted to episodes of refusal of the robot and very strong outbursts and cursing at the robot from people with apathy and depression. In some cases, when facilitators tried to prompt a positive affective reaction from participants, approaching Pleo to their bodies, the robot was very briskly rejected and distanced.

3. CONCLUSIONS

With this report, we would like to bring attention to the influence of dementia associated motivational and emotional disorders on the positive affective state that interactions with social robots are able to prompt. In agreement with previous studies, we found a significant increase in pleasure during sessions with the social robot when considering participants in their totality. Nevertheless, once we grouped participants based on apathy and depression, we found out that a significantly lower pleasure was present in people affected with such syndromes. Interestingly, no such effect was present when discriminating between mild and moderate dementia. These preliminary results pinpoint the need to profile people with dementia on more dimensions and use this profiling to check whether engagement with social robots still holds.

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