Position paper: Robots as companions and therapists in elderly care

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Abstract. Given the increasing portion of elderly people in the western world and severe lacks in care-taking, we believe that we should research possibilities to employ robots in elderly care. Social robots could offer companionship as well as treatment of physical and psychological disturbances. In our research, we propose to adapt treatments from positive psychology to robots in order to increase the wellbeing of elderly people in the long run. In a first study, we suggest that the role that the users will subscribe to the robot (therapist or companion) might make a severe difference on the effectiveness of the treatment and the social acceptance of the robot systems.

Keywords: elderly care companion robots, companion robots for therapy, positive psychology

1 Why can robots be useful as companions and therapists for the elderly?

Based on intense efforts in research on human-robot interaction, social robots emerge that have the ability to relate to people respecting their social bonds and to support their physical as well as mental wellbeing. Some studies have already focused on various types of psychological effects that robots could potentially exert on humans. The most prominent examples are robots and virtual agents as coaches, typically as motivators to lose weight, do more exercise, or be more active in the rehabilitation process ([1],[2]).

One group of people that have been identified as being particularly in need for such treatments is the growing number of elderly that - with increasing age - suffer from physical and mental impairment ([3],[4]). Thus, research has started to look into the topic of robots for elderly care. In a recent study, Fasola and Matarić [5] found that elderly users preferred a robot that showed behaviors which are known to improve one’s intrinsic motivation, such as praising the user upon completion of an exercise, providing reassurance in case of failing, showing humor or calling the participant by name. Another example of robots to improve elderly people’s mood is Paro, the seal robot. In studies, Paro is typically brought to nursing homes where older people - often suffering from dementia - hold the robot and interact with it [6]. Some of the reported positive effects
of interacting with Paro are general improvement in feelings and reduction in depression. As an example of on-going research, the EU FP7 project ACCOM-PANY aims to develop an assistive robot that, as part of an intelligent home environment, will be able to support independent living of elderly in their own homes (http://www.accompanyproject.eu/).

2 How should robots be used as companions and therapists for the elderly?

In our own work, we envision robots that at the same time are elderly care companion robots and companion robots for therapy. One major task of these robots should be to perform activities from positive psychology with elderly people in order to improve their psychological wellbeing. Seligman and Csikszentmihalyi have coined the field known as positive psychology to refer to studies that tackle valued subjective experiences (such as contentment, hope, and optimism), positive individual traits (for example perseverance and originality) and civic and institutional virtues (for instance responsibility and altruism) [7]. Their view contrasts previous psychological approaches that have focused on mental suffering, aiming to develop cures for mental illnesses, while paying little attention to happiness and wellbeing.

Given that the robots should at the same time be companions and therapists, we consider two types of scenarios when applying techniques of positive psychology to robotics. Robots could openly act as coaches or therapists, directly delivering a treatment; or, alternatively, they could interact with participants through activities such as games and conversations, which would contain a psychological exercise in a hidden manner. In other words, in the first type of scenario participants would be made aware of the psychological exercise that is taking place, whereas in the second type of scenario participants would not be made aware. The question connected to this is how these two roles would increase the social acceptance of the robot by the users and the effectiveness of the treatment.

3 What do our first results suggest?

We conducted a first study with the Giraff robot (http://www.giraff.org/) either administering a psychological treatment directly (the robot was presented as a coach with the intention to perform a psychological exercise) or indirectly (the robot was presented as a conversation partner having a chat with the participants). Experiments were carried out individually and in a lab. After the introduction by the experimenter and filling in various questionnaires, the participant would interact alone with the robot, remaining seated, with the robot static and in front of the participant. In both role conditions, the interaction with the robot consisted in having a conversation which served as basis for the psychological exercise. This intervention from positive psychology was based on the so-called
"three good things in life" exercise [8] consisting in telling the robot three things that went well on that day and their causes. After the interaction with the robot, participants completed more questionnaires and were interviewed. Two days after the experiment, participants received a survey questionnaire by email to report on longer-term effects.

We analyzed the data of 37 participants. Two subgroups were considered as part of the sample: non-elderly and elderly participants. The non-elderly subgroup was composed of 29 participants, with ages ranging from 20 to 55 (M = 30.48, SD = 7.49; 11 male, 18 female). The elderly group was composed of 8 individuals, 5 male and 3 female. Their ages ranged between 62 and 83 (M = 70.38, SD = 7.84).

First results of our analysis of the Positive Affect Scale, which is part of the Positive and Negative Affect Scale (PANAS) developed by Watson and colleagues [9], showed that the mood of the participants actually improved only after the direct treatment ($m_{direct-post} = 31.15, sd_{direct-post} = 4.58$; in a possible range of 10 to 50 resulting from 10 items on a 5-point scale) compared to the same measure taken before the interaction ($m_{direct-pre} = 28.95, sd_{direct-pre} = 4.78$); $T(20) = 1.971, p = .032$, one-tailed. In fact, the mood even seemed to have decreased after the indirect treatment ($m_{indirect-post} = 26.41, sd_{indirect-post} = 6.51$) compared to before the interaction ($m_{indirect-pre} = 29.00, sd_{indirect-pre} = 4.89$); $T(17) = 2.053, p = .057$, two-tailed.

One week after the trials, all participants rated their mood the same as before the experiment ($m_{indirect-followup} = 28.71, sd_{indirect-followup} = 6.75; m_{direct-followup} = 28.31, sd_{direct-followup} = 5.84$). A long-term effect would also not have been expected given that the treatment was only administered to the participants in one session.

Acceptance of the robot was similar in both conditions. We did not discover any significant differences on the Godspeed scales [10]. However, in both conditions the users found the robot very likeable (Cronbach’s $\alpha$ .861; $m = 3.89, sd = .64$) and safe (Cronbach’s $\alpha$ .793 (without the item quiescent - surprised); $m = 3.72, sd = .79$). Liking the robot and feeling safe in its surrounding are highly important factors that most likely lead to social acceptance of the robot by the users. Thus, it is very positive that they are high, independent of the condition. Participants liked to chat with the robot as well as to undergo the treatment.

4 What questions should future research address?

We believe that our first study is very promising and shows that robots can indeed be employed to deliver treatments inspired by positive psychology to elderly patients. The finding that participants experienced a greater improvement in mood when they knew the robot’s goal (to improve mood of participants) indicates that robots will more efficiently do so when playing the role of a therapist rather than the role of a companion. However, these results might have been influenced by the fact that participants in the direct condition with overt
treatment might have had higher hopes or expectations or have simply aimed to confirm to the experimenter’s expectations. Also, the results obtained in one-session experiments do not necessarily need to be congruent with results from longer-term experiments. Therefore, long-term studies are needed to determine how exactly the robot roles need to be designed in order to - at the same time - achieve the most efficient therapy for the users and the highest possible social acceptance of the robots. Furthermore, we need to determine which treatments from positive psychology are the most promising ones in the long run and how these can be best integrated in the daily life of elderly people, always keeping the goal of improving their wellbeing in mind.

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References