

Touch or Talk? - Comparing Social Robots and Tablet PCs for an Elderly Assistant Recommender System

Stephan Hammer¹, Kim Kirchner², Elisabeth André¹, Birgit Lugrin²

¹Human Centered Multimedia, Augsburg University, Augsburg, Germany

²Human Computer Interaction, University of Wuerzburg, Wuerzburg, Germany
hammer|andre@hcm-lab.com, birgit.lugrin@uni-wuerzburg.de

ABSTRACT

This work is targeted towards the development of a recommender system that fosters the well-being of elderly people in their domestic environment. Since seniors can have a rather high barrier of using newer technologies, the interaction device utilized in such a system has to be selected carefully. This paper compares an anthropomorphic presentation of recommendations by a social robot with a graphical presentation on a tablet PC in terms of the perceived usability, the users' experience and the system's persuasion.

Keywords

Elderly Assistant, Social Robot, Tablet PC, Acceptance

1. INTRODUCTION

One challenge of the demographic change is to enable seniors to live at home for as long as possible. There is a growing number of projects that aim to increase quality of life and overall well-being. Different mobile devices were explored to convey health and lifestyle related information to users. However, seniors often refuse the use of such systems due to usability issues that are often caused by the small size of the utilized touch interfaces [1]. One idea that improves usability as well as the seniors' engagement is using bigger devices, such as tablet PCs [4]. Another way is using a virtual or robotic agent for interaction, as the mere presence of such an agent can decrease the perceived difficulty of a task [6]. Furthermore, a trusting relationship between user and system might be established [7]. Comparisons of social robots and virtual agents as a medium to provide recommendations showed that robots, through their embodiment, affect the users' decision-making process more effectively [2].

However, there is a lack of studies that compare the impact of recommendations provided by social robots or touch interfaces - in particular for the target group of the elderly.

Therefore, we compared seniors' reactions to a health- and well-being promoting recommender system that utilizes a tablet PC (TPC) or a robotic elderly assistant (REA).

2. METHODOLOGY

A system's success depends on the senior's willingness to use it long-term and to perform the recommended actions. Critical factors are the perceived usability, the user experience and the system's persuasive power. In this paper, we investigate the potential benefits of a REA compared to a TPC regarding these factors. To implement the REA, we made use of a *Robopec Reeti*¹, a social robot with an expressive head.

The study was performed as a between-subject experiment, with participants being randomly assigned to one of two groups, interacting with a TPC or a REA respectively. After an introduction, all participants received a set of ten recommendations, presented by either the TPC or the REA, see Figure 1. The recommendations were taken from the CARE project [5] where we developed a system that recommends activities to increase elderly people's well-being in terms of physical, mental, emotional, social, and environmental aspects.



Figure 1: Recommendations of the categories physical (blue) and emotional (pink) well-being presented by the REA (left) and via the TPC (right).

Then the seniors had to answer a questionnaire. It included the System Usability Scale (SUS) [3] consisting of ten items related to different aspects of usability that had to be rated on a 5-point Likert scale. Furthermore, it contained questions to measure the participants willingness to follow the recommendations and to use the system at home. These questions could be answered with "Yes", "Maybe", and "No".

¹<http://www.reeti.fr>

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Finally, the elderly were asked about aspects they liked and disliked as well as potential improvements.

3. RESULTS & DISCUSSION

24 seniors aged between 53 and 83 (≈ 69) participated.

According to [3], the ratings for the SUS items were converted into scores from 0=“bad” to 4=“good” and an overall SUS score was calculated (ranging from 0 to 100; with 50 meaning ok, and 70 indicating good and acceptable). For this SUS score and some of the items, one-sided independent t-tests showed significantly better ratings for the REA, see Table 1. Our assumption, based on [6], that REA would be perceived less complex (good complexity) and easier to learn (good learnability) was confirmed. Surprisingly, the presence of the REA also led to significantly better ratings concerning the items related to “Inconsistencies” and “Integration of Functions”. There were also strong tendencies that REA users felt more confident in using the system and were more willing to use it frequently. 42% of the REA users could imagine to use the system at home (“No”: 25%, “Maybe”: 33%). Only 8% of the TPC users answered this question with “Yes” (“No”: 50%, “Maybe”: 42%). The results might be affected by the audibility or readability. However, in both groups about the same number of positive and negative statements were provided.

A χ^2 test revealed no significant relationship between the utilized device and the system’s persuasion, $\chi^2(2, N=24) = 1.76, p=.59$. However, while half of the REA users considered to follow the recommendations (“No”: 33%, “Maybe”: 17%), the proportion for the TPC users was only 25% (“No”: 42%, “Maybe”: 33%). Seniors in both groups stated that the recommendations were not personalized and rather obvious. A TPC user even felt patronized. Just some of the REA users assessed the recommendations as useful.

To analyze the user experience, we had a closer look at statements concerning the system’s appearance and the interaction. The TPC users liked the recommendations’ design (color, contrast) and descriptive images. The REA users’ opinions differed. Some perceived the REA’s appearance and mimic as appealing and rather human-like. Others assessed it as neither human-like, nor animal-like. In their opinion the design and behavior could be further improved. Two users stated that the robot’s white color was too cold and reminded them of a hospital. Some seniors also disliked the limited possibilities to interact with the REA.

4. CONCLUSIONS & FUTURE WORK

We compared the presentation of recommendations by a REA and a TPC. The elderly liked the system’s concept regardless of the utilized device. Although the elderly experienced mainly the presentation of recommendations, they perceived the REA as more usable than the TPC. The REA was rated, amongst others, as less complex and easier to learn. The elderly also felt slightly more confident if they used the REA and showed a slightly stronger willingness to use the system at home. However, there was no significant relationship between the utilized device and the system’s persuasion. A long-term study with personalized recommendations might lead to more meaningful results concerning this aspect. Additionally, further investigations of the REA’s design and behavior might increase its positive effect

Table 1: SUS score and scores of some SUS items. Higher scores stand for a better rating in terms of usability. (M=Mean; SD=Standard Deviation)

	REA		TPC		t-Test
	M	SD	M	SD	
SUS score	71.46	13.21	55.63	23.53	t(22)=2.03 p<.05
Complexity	3.25	.62	2	1.65	t(22)=2.45 p<.05
Learnability	3.5	.90	2.67	.89	t(22)=2.28 p<.05
Inconsistency	2.92	.79	2	1.21	t(22)=2.20 p<.05
Integration of functions	3.25	.97	1.58	1.50	t(22)=3.23 p<.05
Confidence	2.92	1	2.17	1.34	t(22)=1.56 p=.07
Frequent usage	2.08	1.08	1.50	1.31	t(22)=1.19 p=.13

on the elderly’s user experience and thus the acceptance of an assistant recommender system.

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