

The Healthcare and Motivation Seat – A survey with the GewoS Chair

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Abstract

The demographic change in the world's population raises new problems for healthcare, such as rising costs for caretaking on elderly people. Ambient Assisted Living (AAL) aims at assisting elderly people through technical equipment to manage their daily tasks in their own homes. One of the important approaches is to monitor vital parameters without actually sending nursing staff to the person in need of care. Additionally, by including motivational factors (e.g. sports and fitness programs), the person's health state can be influenced. In this paper, we present a survey within a group of elderly people aged between 40 and 70 years, which is representative for the end-user group the GewoS Chair is designed for. Furthermore, we will discuss the elderly people's behavior when dealing with new technologies and systems improving further attempts on this target group.

1 Introduction

With an aging society, healthcare monitoring becomes an important part of daily and social life. Due to the increasing healthcare standards, costs for healthcare and caretaking on elderly people will rise. The goal of the approach of this AAL project is to design an attractive living environment for elderly people. This design is achieved by integrating both medical sensor equipment and a fitness and sports training program. The result of this unity is the so called fitness activating chair (*GewoS Chair*), which can be used as medical measurement device as well as a fitness and training device.

In this paper, we present a survey within this *GewoS Chair* (Erdt et al. 2012), which can be easily integrated into an existing living environment. The *GewoS Chair* provides a local

platform for collecting health parameters (blood pressure, oxygen level, ECG) and to visualize health and training sequences on a remotely connected TV monitor. The system thereby integrates seamlessly into the living room. The survey investigated the potential adoption of the chair within the target group and identified usage motives as well as remaining problems.

This paper is structured as follows. In Section 2 we present the current state of the art, summarizing existing solutions. Our approach of keeping elderly people moving and healthy is described in Section 3. Section 4 describes the initial user studies and user experiences. Finally, we conclude by discussing the experiences and giving an outlook for future directions of research.

2 Background

Community and healthcare costs rise with the aging society and the associated need for homecare (Meerding et al. 2010). AAL pursues the goal to support autonomy and a constant level of fitness for elderly people living in their own homes. In order to reduce costs for human caretakers (Ulrich 2005), it has been investigated how technical equipment such as robotic environments can assist in recurring tasks and daily routines (Roalter et al. 2011) (Linner et al. 2011) and the necessity for actual caretakers can be reduced. However, the transformation of existing flats into environments augmented with assistive technologies, like it has been done e.g. in Japan (Linner et al. 2011), might entail acceptance problems in Europe that have not yet investigated in the field so far.

Therefore, other approaches combine automated health and fitness support and monitoring with conventional sports equipment (Schmidt et al. 2004) or integrated in everyday furniture (Kranz et al. 2007). Since there is a correlation between fitness training and personal well-being (Judge 2003), such approaches can support life quality with appropriate exercising for elderly without having to change the existing and familiar living environment. These healthcare and motivation factors can also be achieved when the fitness program is conducted in combination with a smartphone device (Kranz et al. 2012).

In previous work (Erdt et al. 2012), the *GewoS Chair* was proposed as a solution that combines autonomous health monitoring through integrated sensors and actuators (e.g. measuring blood pressure or oxygen level) with simple sports activities (e.g. paddling), that can easily be integrated in the own living room.

When people try to stay at home longer, systems at home must adapt to the needs of the users. This implies to create an easily modifiable infrastructure (movable pieces of furniture, reconfigurable electrical installation ...) which can be reorganized, without a serious intrusion in people's home and private life (Kranz et al. 2010). The use of biomedical products typically implies a disease or similar limitation in daily life, which does not add to the product's attractiveness, e.g. in a preventive scenario. In our understanding of the term *Healthcare Monitoring*, the monitoring function should not stand in focus, but be available in an unobtrusive, ambient way. Our approach with the *GewoS Chair* is to combine a lifestyle

with embedded medical functionality as logging the blood pressure over a certain period of time. Thereby we integrate social life with continuously monitoring personal parameters.

3 Initial situation



*Figure 1: The basic scenario as seen by the AAL project GewoS. People's healthiness should be increased by providing them a sport and fitness device, which is able to interfere in the case of an emergency.
(Source: BMBF, GewoS AAL Project, www.gewos.org)*

Elderly people (aged 50 years and up) often face the dilemma that they are inclined to pursue a healthy lifestyle, incorporating e.g. sports and outdoor activities, but their health conditions no longer permit them to follow those activities to the desired extent. Even if personal home training equipment could be a choice, health conditions often require monitoring of the vital signs either personally or by a caretaker.

The integration of assistive computing technology in the familiar environment can be seen as a general challenge in the field of ambient assisted living. Besides a strong orientation towards the user and his habits, the integration in the functional daily living plays a central role. The *GewoS Chair* integrates seamlessly into the living environment and the connect activities and processes taking place there. Typical activities in the living environment are:

- Social interaction, using the seat as relaxing device
- Reading newspapers, books or watching TV
- Communicating using telephone or video-conferencing

Besides relaxation, the *GewoS Chair* provides further functions in the environment by seamlessly integrating into the home automation (e.g. controlling and monitoring the currently running devices in the environment). It can be seen as a controlling device which concentrates activities to one place. This helps caregivers to focus healthcare activities to a certain place, including measurement of the user's vital parameters. Additionally, it is important to understand the living environment of a person as a system that consists of various sub-systems. The integration and acceptance of the *GewoS Chair* depends on size of the apartment, functional and spatial connections and the daily routine (e.g. some activities

need free space). Each location and apartment is different, influencing the scenario and the events in the environment. The healthcare monitoring seat has to be integrated into the context of a classical living room. At the same time, the whole system needs to be inhabitable by several residents to encourage communication, for instance via gaming or social functions.

For the problem of user acceptance, fitness and sports can be a promotional factor. Clearly recognizable advantages could increase the motivation for integrating a medical measurement and fitness device in his living-environment. Regarding our approach, the main goal is to keep elderly people healthy, providing a highly acceptable platform for collecting fitness exercises and medical measurement results as shown in Figure 1. The *GewoS Chair* combines the product of a comfortable seat, a care monitoring platform and a fitness device, where the user can interact in health and fitness affairs.

4 Initial study

New technologies, especially when designated to be used by elderly people, needs to be evaluated within the target group. This acceptance of the first prototype of the healthcare monitoring seat was investigated in an explorative study conducted at the “*Deutscher Seniorentag 2012*” exhibition in Hamburg. Goals of the study were to evaluate needs of end users and gather reactions to the *GewoS Chair*. Furthermore, we wanted to gain information about people’s current health situation and if sports and motivation for movement was an aspired target. The acceptance of health-measurements using the integrated sensor was not part of this survey. The overall acceptance of the *GewoS Chair* is subject of the study presented in this paper.

During the survey, the users where allowed to make use of the prototype and to test all the functions they were interested in. Currently not implemented functions where conducted by the survey’s supervisor acting as Wizard of Oz, interacting with the user as the system would interact in the future. The supervisor also assisted in case of problems or questions of participants. After the practical test with the prototype, a questionnaire survey was conducted using a tablet computer. The participant was interviewed about the impression of using the prototype. The answer where given on a Likert scale ranging from 1 (totally agree) to 5 (totally disagree). In case of visual or physical impairments using the tablet device, the supervisor helped the participant. There were n=29 participants in this survey, 90% of the participants were female. This can probably be explained with the study taking place at the *Deutscher Seniorentag*. Also, we further assume that woman still care more about health then men, also in higher age. The age of the participants was between 40 and 70 years.

4.1 Integration of the chair in an apartment

Participants were quite interested in using such a healthcare monitoring and activity motivating chair (avg. 2.7, SD=1.2). Most of the participants also confirmed (avg. 1.8, SD=0.8) that movement is an important part of their daily life. Furthermore, participants

would (avg. 2.0, SD=1.2) tend to use the chair for more than the designed use. They would like to use the device for social interaction as part of the living-relaxing environment, others would also like to share the chair among other family members participating in their daily exercising process (avg. 2.8, SD=1.2). Participants liked the interaction and visualization using their own home television as visualization component of the system (avg. 1.7, SD=0.5) and they agreed that they would use such a device for increasing their daily lifestyle (avg. 2.4, SD=0.8).

4.2 Usage of the device

Participants were moderately excited about the new technical equipment (avg. 2.2, SD=1.0). As expected for the target group of elderly's the usage of the new equipment can highly vary. Several participants found that the *GewoS Chair* with the connected interaction methods (tablet and television) was simple to use (avg. 3.2, SD=0.9). However, most of the participants (avg. 1.6, SD=0.9) estimate to be able to use the device personally without limitations. Even though they agreed to learn how to use the device (avg. 2.0, SD=0.8), a high amount of participants answered would prefer a personal introduction and assistance for start using the chair for themselves (avg. 1.8, SD=0.9). Participants were asked about their personal situation to find out if they would match to the preferred target group. As the *GewoS Chair* is intended to be used by elderly people who are not completely dependent on personal assistance, most of the participants agreed, that they do not need intensive assistance (avg. 3.9, SD=0.6). A similar result (avg. 3.4, SD=1.1) was obtained by asking them whether they disabled in movement at the moment or not.

Question	Avg.	Std. Dev.
I could use such a chair in my flat.	2.7	1.2
I am not disabled in movement.	3.4	1.1
I need daily ambulant assistance.	3.9	0.6
Agitation is part of my daily life.	1.8	0.8
It is fun to use new technical equipment.	2.2	1.0
I would regularly use the chair.	2.4	0.8
I think the interaction model is to complex.	3.2	0.9
I would be able to use the chair.	1.6	0.9
I would prefer a personal introduction for using the chair.	1.8	0.9
It is a requirement to rapidly learn the usage.	2.0	0.8
I like the interaction using the television.	1.7	0.5
I would like to share the chair with others.	2.8	1.2
I would like to use the chair during other daily routines.	2.0	1.2

Table 1: Survey results on participant's acceptance and usage of the *GewoS Chair* prototype. There were $n=29$ participants in this survey. Answers are given on a Likert scale from 1 (totally agree) to 5 (totally disagree).



Figure 2: On the left, a participant is instructed to use the healthcare monitoring seat. The seat integrates biomedical sensors. On the right the participant is evaluating the agility possibilities of the chair (Source: BMBF, GewoS AAL Project, www.gewos.org)

5 Discussion

Survey participants were unexpectedly motivated using new technologies. From observations of the prototype trial, the usability of the healthcare monitoring seat seemed clear and easily understood by the participants. We believe the ease and intuitive usage of our first prototype considered most of the elderly's needs and problems. We also believe, that the tight integration of the healthcare technology with a visually appealing piece of furniture contributed significantly to this. A group of participants asked whether it would be possible to rent such a device when needed. Results indicate a change towards openness of the elderly people for new technologies and we think we are focusing on the right technology for this group of users. We believe this *GewoS Chair* could increase people's life quality, decreasing the workload of caretaking personnel. Certainly, the acceptance of the integrated medicine sensor still needs to be investigated in a future study, also long-term effects have to be proven.

6 Conclusion and Outlook

In this work, we have presented an initial survey with the *GewoS Chair* acquiring feedback from elderly people using new technology seamlessly integrated into the living environment. The *GewoS Chair* can increase elderly's people quality of life. In the initial study, we gathered an impression of the needs and abilities in the target group when dealing with new technologies. Another important question was the acceptance of healthcare monitoring equipment which would regularly measure people vital data. In general elderly people are not intimidated of the new technical equipment. We have seen, that the interaction of the *GewoS Chair* should not be limited on biomedical sensing or motivating the user with fitness and sport activities. As part of the relax-living-environment, the chair must come up with additional benefit as for example a social communication and event platform. The user of the

chair can share his results on an online platform, starting a competition with other users. This results out of the acceptance in sharing the *GewoS Chair* with other members. In the future, we will further extend the system and evaluate it qualitatively with a larger group of users. Further studies will include a survey on the acceptance of medicine sensors integrated in the *GewoS Chair*.

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