SYMPOSIUM PRESENTATION 7: OTHERS

Current trends in Gerontechnology: Recent findings from the Austrian-German-Swiss chapter
B. Klein, S. Merkel (Convener)

Participants: A. Baumeister (GERMANY), J. Bleja (Germany), B. Klein (Germany), A. Kucharski (GERMANY) S. MERKEL (GERMANY), M. Ringwald (GERMANY), B. KLEIN (discussant) **ISSUE:** The session circles around new technologies that have gained increasing relevance for the field of gerontechnology. It follows the idea that these new technologies ask for new theories and methods not only to understand their technical functionality but also social aspects and consequences. Applying theories and methods of social sciences, sciences, and technology studies (STS) and media studies, the session follows an interdisciplinary approach. **CONTENT:** The symposium brings together research and evidence of the German speaking chapters of the ISG (Austria, Germany, and Switzerland) and covers a broad spectrum of recent developments. **STRUCTURE:** Alexander Kucharski shares insights from an exploratory study on the domestication of smart speakers by older persons in Germany. Drawing on seven case studies he explores perspectives of older smart speaker users on their real-world domestication processes of smart speakers to understand how older users negotiate(d) the appropriation, meaning and (non)-use of smart speakers and its contents/applications within their individual socio-technical contexts, i.e. life-worlds. Sebastian Merkel also deals with the topic of smart speakers by focusing on applications or so-called skills and images of ageing. He concludes that most skills addressed at older persons rather emphasize deficit-oriented/medicalized images of aging and hence user representations. J. Bleja reports on the development of a chatbot operated via smart speakers for care consultation. As a first task expert interviews have been carried out. The results indicate potential use cases, support of the anamnesis procedure being one of them. In the next two contributions, the focus is on assistive robotics. Annalies Baumeister presents a project to improve the use of a robotic arm for people with little or no arm function by an adaptive AI-based control system. In Workshops and interviews with the user groups everyday scenarios were identified which can improve significantly by this new way of user-robot-interaction. Key factor for acceptance is the embodiment of robots. Marina Ringwald presents the interdisciplinary development of an embodiment utilizing participatory design with older people as potential user group. Design options are realized in 3D models in augmented reality and evaluated in an iterative approach before a physical prototype is produced. Finally, Barbara Klein addresses the need to train professionals in the health and social care sector in these assistive digital technologies by presenting a certification course developed by a consortium of twelve partner in a European project. The materials will help professionals learn about and further communicate new solutions to support the independence and self-determination of their clients and beneficiaries. **CONCLUSION:** Consequently, it is argued that gerontechnology benefits from a closer cooperation and knowledge exchange of interdisciplinary research teams including professionals and user groups. Participatory design and involving older users and other stakeholders are key elements, but still more research is needed, especially when utilizing new methods such as augmented reality in the design and development processes.

Relationships between ICT use and subjective well-being among the oldest-old in Germany: Findings from the NRWBO+ study, older persons and the domestication of smart speakers

A. B. Kucharski, S. Merkel

Purpose Commercial voice controlled personal assistants – so-called smart speakers, e. g. Amazon Echo/Google Home – have gained increasing attention within the field of gerontechnology. Studies have investigated different aspects, e.g. technology acceptance of smart speakers (Koon et al., 2020), reasons for (non-)use (Trajkova/Martin-Hammond, 2020), ontological perceptions of smart speakers (Pradhan et al., 2019), privacy concerns (Bonilla/Martin-Hammond, 2020), and domestication of such devices (Nimrod/Edan, 2021). Most of these studies report results of technology deployment projects with instructed use and lack a perspective on the domestication of smart speakers in old age. This paper aims to explore perspectives of older smart speaker users on their real-world domestication processes of smart speakers to understand how older users negotiate(d) the appropriation, meaning and (non)-use of smart speakers and its contents/applications within their individual socio-technical contexts, i. e. life-worlds. Therefore, this case study analyzes seven empirical cases to reconstruct/understand the perspective of users on the emergence of real-world ageing-smart-speaker relations and to investigate possible implications of smart speaker use, e. g. the co-constitution of usage practices, subjectivities, values (Peine/Neven, 2020). **Method** Seven semi-structured interviews were conducted, two via telephone and five via online video conference. Following a theoretical sampling approach participants had to be aged 60+ and own/use commercial domestic smart speakers for at least four months. Participants were recruited through member organisations of a digital initiative (Digital-Kompass) of the German National Association of Senior Citizens' Organisations (BAGSO) and signed informed consent to participate. All interviews were audio-recorded and transcribed verbatim. Data was analyzed via content analysis, using an inductive-deductive coding approach. **Results and Discussion** Results show that smart speakers can have multiple effects in life-worlds of older adults, i. e. change/create new daily routines, values (e. g. attitudes towards privacy), self-perceptions (e. g. being a part of the modern world). Usage practices range from using smart speakers for entertainment or information, using applications to compensate physical limitations or improve one's well-being, to organizing care/communication with elderly parents during the pandemic.

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"Computer, how do smart speakers support aging in place?" – Smart speakers and images of ageing
S. Merkel, A. B. Kucharski, S. Schorr

Purpose Voice operated virtual personal assistants – or smart speakers – like *Amazon's Echo* or *Apple's HomePod* have shown high rates of diffusion in private households in Europe and North America: Since Amazon launched the first smart speaker in the USA in 2015, 38.5% of the total US population have adopted such devices in 2020 (Petrock, 2020). Given this trend, the use of smart speakers is also becoming interesting for gerontechnology. Benefits of smart speakers for older users seem obvious: The devices can be operated despite visual impairments or limitation in mobility and smart speakers can be operated without a visual interface (see e.g. O'Brien et al., 2019; Nimrod & Edan, 2021). Companies like *Amazon* have started offering specific services such as "*Alexa together*", that aim at supporting older persons living independently by offering multiple features like fall detection alerts and activity responses (Amazon, 2022). A recurring critique on technologies for older persons particularly within aging research is the deficit-oriented design approach. As Vines et al. (2015) point out, the mainstream public discourse on technology and aging has been dominated by images, which view aging as a societal problem and connect to more deficit-oriented images of older persons. Thus, aging processes are primarily associated with multiple declines (Peine et al., 2014) and characteristics such as frailty, immobility and passivity are stereotypically ascribed to all older persons (see e.g. Katz, 2015). Against this background, the objective of this presentation is to identify smart speaker applications for older persons and to analyze the features offered to users focusing on images of aging.
Method Due to the lack of a standardized procedure for the evaluation of smart speaker skills (Chung et al., 2018), we applied a method called feature analysis (Hasinoff & Bivens, 2021). A feature analysis consists of four steps: (1) identification of a problem and apps addressing this problem, (2) identification of features offered by apps, (3) categorization of how the features address the problem, and (4) using speculative design to imaging alternative apps (ibd.). We concentrated on the first three parts. To identify apps, we searched Amazon's skill store for the terms "elderly", "senior", "older person", and abbreviations and included skills that explicitly target older users. To extract information, we developed a template that included aspects like name, description, features, user rating, etc.
Results and Discussion The search revealed 67 skills targeting older persons. The dominant category was "Health and fitness" encompassing the most skills (26), followed by "Education and Reference" with 18 skills. Considering the features, we found multiple applications that advertise events at assisted living facilities and within the community. Other features of skills provide information on various aspects of ageing, informed relatives about health and in emergencies, physical and mental exercises, reminders to take medication, podcasts, affirmations, and health monitoring. We found that most skills emphasize rather deficit-oriented images of aging and address certain shortcomings or enforce more convenience for users. Therefore, their intended usage mostly rearranges actions to compensate or to feel relief. A new critical perspective to understand the implications of smart speaker use in old age, could try to examine how this skill replaces a prior practice to remember.

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Smart speakers and chatbots in care consultation – Evaluation of use cases and challenges
J. Bleja, S. Neumann, U. Grossmann

Purpose The use of smart speakers is on the rise (Bentley et al., 2018). Over 50% of Germans use at least one smart device (Beyto, 2022). In majority, especially simple language applications with low interaction levels are commonly used (Beyto, 2022). In the health, care and Ambient Assisted Living area, smart speakers gain relevance (Ayimdji Tekemetieu et al., 2022; Kucharski & Merkel 2020; Waldhör, 2021). Relating care consultation, smart speakers have the potential to take over anamnesis and the booking of care services and products. Within the framework of the joint project Smart Care Service, funded by the EU and the state of North Rhine-Westphalia, a digital platform using voice assistants and chatbots for anamnesis and care service recommendation is developed (Smart Care Service, 2022). Against this background, this study aims to examine, how chatbots and smart speakers can be implemented in care consultation and to evaluate them. **Method** To include relevant perspectives of potential stakeholders, a human-centered design approach was conducted iteratively (ISO 9241-210). Qualitative expert interviews have already been taken place to analyze the benefits a care platform promises. Furthermore, a survey of potential users was conducted to develop a first mock-up of the platform. First, the chatbot and the smart speaker were evaluated by the project team. After a revision phase, the chatbot and the smart speaker will be evaluated in workshops with informal caregivers and relatives. For this purpose, workshops using the focus group will be carried out to examine different perspectives (Richard et al., 2021). Additionally, participatory observations take place to record in-depth emotions, feelings, and interactions concerning the chatbot and the smart speaker (Brüsemeister, 2008). The workshops will be held starting May 2022. **Results and Discussion** During the expert interviews, service providers increasingly expressed the desire to be relieved of administrative workloads by a care platform. The respondents saw great potential for digital solutions in this area. In the consultation process, persons with assistance needs and their relatives must repeatedly provide similar information about their personal and medical history. This is time-intensive and distracting from the actual consultation. Facilitation of the anamnesis procedure was stated as desirable as well as the need of a digital assistant that serves as a guide providing necessary information to book care services. The users fill out an anamnesis form and is guided through the process via chat or voice function to answer questions and to identify offers or provide information. For the chatbot and the voice assistant, different languages are integrated and users have natural conversations. The biggest challenge is the intuitive operation and comprehensibility of the smart speaker, especially with limited hearing capabilities as well as the readiness to buy services through voice assistants. The results of the focus group interviews and participant observations are intended to contribute to the evaluation and improvement of the use cases presented. Furthermore, they should provide information on which additional ethical, legal and social implications (ELSI), (Ake-Kob et al., 2021) need to be considered in the further development phase.

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AI for simplifying the use of an assistive robotic arm for people with severe body impairments

A. Baumeister, M. Pascher, Y. Shivashankar, F. Goldau, U. Frese, J. Gerken, E. Gardó, B. Klein, P. Tolle

Purpose Assistive robotic arms, e.g., the Kinova JACO, aim to assist people with upper-body disabilities in everyday tasks and thus increase their autonomy (Brose et al. 2010; Beaudoin et al.2019). A long-term survey with seven JACO users showed that they were satisfied with the technology and that JACO had a positive psychosocial impact. Still, the users had some difficulties performing daily activities with the arm, e.g., it took them some time to finish a task (Beaudoin et al. 2019). Herlant et al. claim that the main problem for a user is that mode switching is time-consuming and tiring (Herlant et al. 2017). To tackle this issue, deep neural network(s) will be developed to facilitate the use of the robotic arm. A sensor-based situation recognition will be combined with an algorithm-based control to form an adaptive AI-based control system. The project focuses on three main aspects: 1) A neural network providing suggestions for movement options based on training data generated in virtual reality. 2) Exploring data glasses as a possibility for displaying feedback in a user-centered design process. 3) Elicitation of requirements, risks and ethical system evaluation using a participatory approach. **Method** In a first step, everyday scenarios that are relevant for the user, like eating and drinking (Pascher et al. 2021), were identified. Based on the iterative, cyclical process of action research by Riel (2020), two workshops and six interviews with people from our target groups were conducted to learn about their care situations and needs. Four scenarios were elaborated and decided on together. The simulation system consists of these scenarios along with detailed movements and manipulations (Kronhardt & Rübner et al. 2022). The user controls the simulated robot's hand via a VR controller. This makes it possible to record movements quickly, which is necessary to achieve a large training data set. Thus, the generated data is used for training a neural network to provide an adaptive set of controls. In the next step, a novel control method and possible visual cues for the DoF mappings were developed. The objective is to explore how the novel adaptive control method performs in a 3D environment compared to the standard mode-switch approach with cardinal DoF mappings and whether changes in the visual cues impact the performance of the adaptive control method. The participants repeatedly performed a simple pick-and-place task, controlling a virtual robot arm using the three control types. **Results and Discussion** The everyday scenarios that most correspond to the needs of the target group are: "eating and drinking", "open and close doors", "supermarket shelf/pick up", and "microwave". Simulation of these scenarios enables the user to control the robot akin to a normal hand, allowing more direct motions which are not influenced by the limitations of the input device and thus offer the possibility of quickly recording extensive data. Results show that the number of mode switches necessary to complete a simple pick-and-place task decreases significantly when using an adaptive control type.

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Kronhardt, K., Rübner, S., Pascher, M., Goldau, F. F., Frese, U. & Gerken, J. (2022). Adapt or Perish? Exploring the Effectiveness of Adaptive DoF Control Interaction Methods for Assistive Robot Arms. *Technologies 10*(1)

Figure 1 Scenario: User controls a robotic arm by head movements to eat and drink; Source: Own representation.

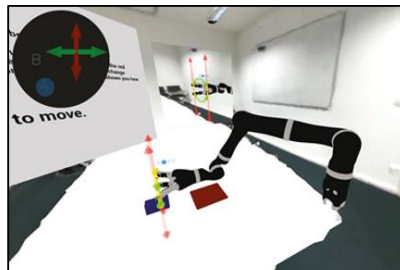**Figure 2** VR Study: Screenshot from the study in virtual reality to evaluate the DoF mapping; Source: Own research.

Evaluation of design options for an assistive robot in augmented reality
M. Ringwald, J. Sehrt, B. Klein, H. Solis, J. Umansky, P. Nauth

Purpose Caring for an increasing number of older people in their own homes will continue to gain in importance in Germany and Europe in the next years. Assistive technologies such as robotic systems might be able to support people with assistance needs and their caregivers. These are expected to mitigate the shortage of formal and informal caregivers. However, robots in the health and social care system belong to those technologies that potential users and professional caregivers are skeptical about (European Commission, 2017; Merda et al., 2017). Research shows that acceptance is affected by function and also by the appearance of the robot as this evokes emotions in users (Hwang et al., 2013; Otterbacher & Talias, 2017). **Method** With its university's own robot platform ROSWITHA (RObot System WITH Autonomy) a project team at Frankfurt UAS aims to contribute to acceptable solutions in the field of embodiment. Objective is to develop with participatory methods an accepted embodiment for ROSWITHA by utilizing augmented reality. The project has three evaluation phases: In phase 1, the results of a systematic literature review based on people's preferences for robot appearance and the technical requirements of the platform provided three design options. The 3D models of these options were evaluated by 14 older adults (8 female, 6 male, age 69-87 years) viewing them through augmented reality glasses. In a mixed-methods design, these potential users expressed their impressions, voted for their favorite model, indicated their change requests, and provided information about their potential use of the robot. Their outcomes were compared with those of a younger group. The results will be incorporated in the two new models which will be evaluated in phase 2. These results will in turn influence the final model, which will be created as a physical prototype, also using 3D printing. **Results and Discussion** Six of the respondents preferred a design with a rounded body and a head with an implied, playful face (Fig.2, model 2). Four persons chose a model with a human face on a monitor (model 3). Two people each chose model 1 or no model. A lower height of the robot, a rounder shape of the body, and a friendlier facial expression were among the aspects that the potential user group indicated as necessary changes. A majority also preferred the color orange instead of green or blue. Suggested purposes for the designed robot comprised household tasks, fetching and bringing items. Involving potential user groups in the design process is necessary, as it provides a deeper insight into users' needs. Evaluation in augmented reality promises to be a time- and material-saving method, which offers the possibility to get a realistic image of the model e.g. at home. More research is needed, especially with older target groups, in order to validate procedures and validity of results.

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Figure 1: The robot platform ROSWITHA
(Picture: J. Umansky, Frankfurt UAS)

Figure 2: Model 1, 2 and 3 (from left) from the first evaluation
phase in different colours (Models: J. Sehrt)

Qualification of health and social care professionals in digital technologies

B. Klein, M. Ringwald, M. Schmidt, F. Paschou, L. Trebienė, H. Lydon, A. Riccio, M. Panzironi, A. Papadopoulos, K. Karaiskos, M. Xiari, C. Papadopoulou, A. Hannotte, T. Gomez-Sanchez Otero, K. Gkeka

Purpose Technological advancements in recent years contributed to an increase of new technologies for assistive purposes in the social and health care sector. However, these are still being implemented hesitantly in Europe because there is a lack of knowledge about their benefits and access. Funding sources are often unclear or the applications cannot be adapted to the users' needs (Taylor et al., 2020; Zigante, 2020). Training is extremely important as it is a key factor for acceptance and subsequent use of digital technologies. Trained professionals can communicate new solutions to different target groups. However, it is still not widespread (WIPO, 2019). This was also apparent in a survey with professionals from different groups in health and social care (Fondazione Santa Lucia, 2020) in six of the participating countries of the Erasmus+ project "DDSkillls - Cutting-Edge Digital Skills for Professional Caregivers of Persons with Disabilities and Mental Health Problems". The European project aims to promote the qualification of professionals in the health and social care sector in order to help them shape decision-making processes, support their clients in the self-determined use of technologies and formulate needs with regard to the development of new adapted applications. **Method** A consortium of twelve European partners from seven countries with professional and application-oriented expertise in various technologies is developing a certification course in cooperation with different target groups of social work and rehabilitation as well as certification partners in a three-year period. This course can be conducted asynchronously as a Massive Open Online Course (MOOC) or synchronously as a face-to-face course. It includes the four topics (1) new technologies, with the subtopics: assistive technologies and aids, smart home, robotics, green ICT, virtual and augmented reality and brain-computer interface (2) self-determination and technology acceptance (3) development of social networks and (4) therapeutic role play for the use of new technologies in practice. **Results and Discussion** A manual, presentation slides for course delivery, and learning videos demonstrating individual technologies and presenting application topics were developed. These are made available on an online platform in an open-access format in five languages (English, German, Greek, Italian, Lithuanian). In addition, a toolkit has been developed for demonstrating three applications: a virtual reality application for social skills training, an augmented reality application promoting self-advocacy through role playing, and a smart home application for a telepresence robot. After passing an exam, course participants will receive a certificate with ECVET (European Credit System for Vocational Education and Training) points. This qualification measure is intended to promote the digital transformation in the health and social care sector for the benefit of beneficiaries and employees.

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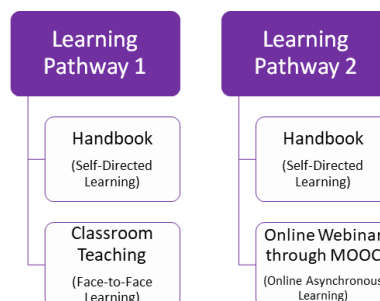
Figure 1: The two learning pathways of the certificate course