Symposium

Using Extended Reality for Training, Education, and Social Engagement W.A. Rogers (Convener).
Gerontechnology 25(s*)*
Participants*:* S.J. Czaja (US), D. Völz (Germany), J. Sehrt (Germany), W. Boot (US), and B. Klein (Germany).
ISSUE: Extended reality is a broad term that refers to systems that either replace the physical world or blend the physical and virtual worlds. Virtual reality (VR) is a simulated, computer-generated environment that immerses users in a three-dimensional space, often experienced through specialized headsets [1]. Augmented reality (AR) is overlaying digital graphics or information over the physical world to enhance it with digital details, such that the computer-generated objects and the physical world coexist in the same space in real time [2]. Mixed reality (MR) blends physical and virtual worlds, allowing users to interact with both simultaneously [3]. These systems have evolved, are more powerful and accessible, and present unique opportunities to provide training and education as well as to support opportunities for cognitive and social engagement. Research with extended reality platforms is growing in a wide range of arenas to harness the potential of this technology in different domains. Fundamental questions remain such as what technical components will best lead to the necessary fidelity and immersiveness to reach outcome goals; how does user acceptance and willingness to engage with the systems influence their effectiveness; what are the adaptability requirements for different user groups; and which measures are reliable and valid to assess success of these platforms. **CONTENT:** 1. Czaja (US) will present an overview of research on the perceptions and preferences of older adults for using a range of virtual reality applications. 2. Völz (Germany) will describe a project developing a mixed reality environment as a platform for evaluating the functionality and effectiveness of digital assistive technologies. 3. Sehrt (Germany) will describe the potential of using mixed reality for training healthcare professionals. 4. Boot (US) will delineate a research agenda for the use of augmented and virtual reality to support older adults with cognitive impairment. 5. Klein (Germany), will serve as the discussant, bringing together the themes of the presentation, highlighting the potential of extended reality applications, and moderating the discussion with the audience members. **CONCLUSION:** This symposium will provide a breadth of examples to explore extended reality in the context of training, education, and social engagement for older adults as well as healthcare providers. The presentations will spark discussion amongst the audience about the potential and remaining implementation challenges and design considerations to advance developments in this area.

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Symposium

Older Adults Perceptions of and Preferences for Virtual Reality Applications S. J. Czaja, S. Zhang, P. Bhowmick, W. R. Boot, N. Charness, W. A. Rogers. *Gerontechnology* 25(s*)*

Purpose Virtual reality (VR) systems have evolved, are more powerful and accessible to consumers, and present unique opportunities to foster cognitive, social, and activity engagement in older adults in their own homes. VR provides an immersive and engaging experience that gives users the realistic impression of being present in a context or situation outside their home, alone or with others [1]. As such, VR applications can be used to mediate social interactions, cognitive and activity engagement [2, 3, 4,5]. Despite the potential of VR, only a few high-quality studies have examined the usability and acceptance of VR solutions or their efficacy with older adults. The aim of this study was to systematically gather information on VR application preferences (e.g. types of activity experiences) and usability of VR programs among a diverse sample of older adults. **Methods** The sample included 48 older adults recruited from two geographic locations in the United States, including 34 females and 14 males (M_{age} = 72.3; SD_{age} = 5.4). Initially two teams engage in a multi-step systematic process to identify and select apps falling into the following categories: cognitive, activity, social, and technology engagement. The criteria for app selection included comfort, content, safety, and usability; a total of 16 apps were selected. Each participant experienced eight different applications presented in one of two modalities: Four applications were experienced via five-minute hands-on engagements, and four were experienced by watching videos of engagement taken from a first-person perspective. Four experimental protocols were created following a counterbalanced design to account for order effects. During testing, an application was first introduced via a scripted presentation. This was followed by user testing of the app and completion of the experience rating scale. The participant experienced applications in the two modalities in alternation, with the first two applications experienced hands-on, the next two via video, and so on. Participants were also asked to rate their overall experience and overall interest in VR. **Results and Discussion** Bayesian one sample Wilcoxon signed rank test was applied for each application with each item on the user experience scale as the dependent variable. There was strong evidence that the content of most applications was enjoyable. The effect sizes ranged from medium to large (δ range from 0.60 to 2.04). Results also showed strong evidence that the content of the majority of applications was of interest. The effect sizes ranged from medium to large (δ ranges from 0.64 to 2.26). Further the findings indicated that most of the applications were rated as easy to navigate and understand, enjoyable, and easy to use. Participants expressed interest in using art, cultural, education, entertainment, and travel applications. Finally, the results indicated that VR did not cause any physical discomfort. Overall, the experience of the participants was positive, and the participants expressed positive attitudes towards VR. Generally, the findings demonstrated the feasibility, usability, and acceptability of VR applications for cognitive and activity engagement among older adults. They also help to guide the content of future development of VR applications for older adults.

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Symposium

Virtual Evaluation, Real Impact: Developing a Mixed Reality-Environment for evaluation of Digital Assistive Technologies in care of older adults. D. Völz, L. Schmidt, S. Resch. *Gerontechnology* 25(s*)*

Purpose Due to demographic change and the associated aging of the population, there is an urgent need for digital assistive technologies to ease the burden on the German care system. While numerous innovative concepts have been proposed to support indirect care activities, their implementation often consumes resources that could be more effectively used for direct patient care. The research project GiDEA [2] aims to develop a holistic methodology for identifying, evaluating, and integrating digital assistive technologies to assess their effectiveness and sustainability before the technology is introduced. The MR environment to be developed, as an essential part of the methodology, thus closes a gap in the application of MR technologies in healthcare [1]. The accelerated digital transformation of indirect care activities should result in more time being available for the direct care of older adults. Studies on ecological validity in other contexts have shown that MR environments can reproduce the complex requirements of real-life tasks and can be used for our application. **Methods** The MR environment is methodically developed to integrate technical requirements (e.g., headset, sensors, interfaces), ergonomic aspects relevant to both nursing homes and home care settings, and user-centered criteria such as usability and acceptance. These needs and requirements are identified in preliminary focus groups with care professionals and patients and systematized in a requirements catalog. Implementation includes the development of the user interface, interaction and feedback mechanisms (visual, auditory, haptic), and interfaces for optional sensor integration. Relevant care scenarios are modeled within the MR environment, into which digital assistive technologies are integrated and prototyped for their compatibility with everyday care. Before practical evaluation, the environment is tested, calibrated, and optimized in laboratory experiments. Subjective user experiences are recorded using validated questionnaires, in particular the NASA Task Load Index (NASA-TLX [4]) for perceived workload and the System Usability Scale (SUS [5]) for usability. The result is a functional, evaluated MR environment, accompanied by a guideline for future application. **Results and Discussion** Research indicates that MR environments provide a robust platform for evaluating the functionality and effectiveness of digital assistive technologies under near-realistic conditions. To ensure valid and comparable results, a concept of a digital twin of the care environment is defined, reflecting real-world conditions. A requirements catalog and an initial MR prototype concept have been developed, enabling systematic prototypical testing of assistive technologies. The next step involves focus group evaluations with care professionals and care recipients to refine usability, acceptance, and practical integration into daily care routines. To our knowledge, this constitutes the first MR environment specifically designed for the pretesting of digital assistive technologies for indirect care activities.

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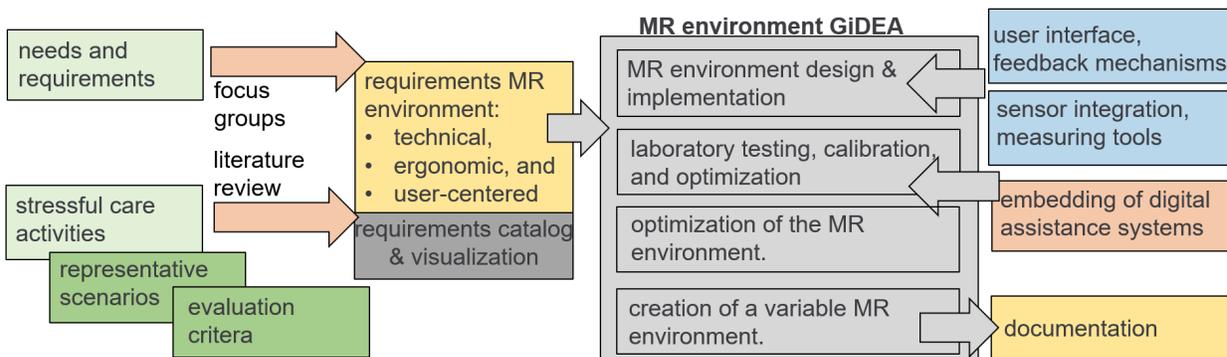
Symposium

Development and Evaluation of Mixed Reality Training Scenario for Surgical Technologist Trainees J. Sehrt, Y. Söleyici, C. Severino, S. Minsch. *Gerontechnology* 25(s)

Purpose With the increasing digitalization of healthcare education, immersive technologies offer promising opportunities to enhance the practical training of healthcare professionals [1]. Mixed Reality (MR) learning environments have been shown to be effective in increasing engagement in surgical training scenarios [2]. Surgical Technologist trainees are guided and supervised in the operating room from the start, but under time and space constraints. This can lead to situational overload, and tasks in the operating room cannot always be performed at the trainees' own learning pace [3]. To support trainees in the field of Surgical Technology (STs), a hybrid virtual training scenario has been developed to facilitate safe and effective learning of correct patient positioning techniques. The application particularly focuses on preventing nerve compression injuries caused by improper positioning during surgical procedures [4]. **Methods** The MR environment is designed to simulate realistic operating room conditions. The environment is shown as an immersive visual representation on the patient and the equipment that is physically present and tracked by a motion capture system. This setup allows permanent control of the patient's body position, fully realistic haptic feedback while it enables multifaceted additional augmentation with didactic content. On base of guided learning modules, trainees can practice patient positioning on their own learning pace in a controlled and repeatable environment. To ensure professional relevance and acceptance, focus groups with experienced Surgical Technologists is conducted to provide expert feedback on the design, instructional clarity, professional accuracy. This feedback alongside a systematic evaluation of engagement during the use of the application is analyzed to iteratively refine the prototype [5, 6]. **Results and Discussion** Preliminary results indicate that VR-based learning environments can effectively complement conventional ST training by promoting active learning, spatial awareness, and procedural confidence. Professional feedback from the focus group provides valuable insights into clinical realism, ergonomics, and potential barriers to implementation in training contexts. The iterative evaluation approach contributes to the development of a validated, user-centered VR tool that supports both safety and competence in surgical education. The scenario can be adapted to new environments by moving the markers to new settings and equipment.

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Symposium

A Research Agenda for Using Extended Reality to Support Older Adults with Cognitive Impairment W.R. Boot, S.J. Czaja, S. Kalantari. *Gerontechnology* 25(s*)*

Purpose Extended Reality (XR) solutions, including Augmented Reality (AR) and Virtual Reality (VR), hold strong potential to support the well-being, quality of life, and social connectivity of older adults with cognitive impairments [1]. AR can overlay virtual elements onto real environments, consistent with "knowledge in the world" design principles and the environmental support hypothesis [2]. VR can provide consequence-free skills practice with guidance and feedback and can support social connection by bringing geographically distant individuals together in shared virtual spaces. However, most XR systems are not designed for older adults with cognitive challenges, limiting their accessibility and effectiveness. **Methods** The Enhancing Neurocognitive Health, Abilities, Networks, and Community Engagement (ENHANCE) Center (NIDILRR-funded) examines how XR technologies can support older adults with mild cognitive impairment and cognitive challenges due to traumatic brain injury, stroke, Parkinson's disease, and long-term HIV exposure. Five development projects include: a VR indoor wayfinding training program, an AR outdoor navigation app, a VR meal-preparation skills program, an AR prospective memory reminder system, and a VR social support program. Each will be developed and evaluated with diverse older adults to assess acceptability, usability, and feasibility. **Results and Discussion** Preliminary results with older adults [3] and with older adults with and without MCI [4, 5] indicate that VR-based wayfinding training is feasible and that VR can support social and cognitive engagement. Next steps include refining these technologies to meet the varied needs of older adults with cognitive impairment. A user-centered design process that considers individuals' needs, preferences, and abilities will help ensure these solutions are useful and usable [6]. Outcomes of significance include greater community engagement and independence as XR solutions support skill learning, social connection and communication, navigation and wayfinding, and everyday memory.

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