

# Rehearsal For Ageing: Reimagining Empathy through Ageing Preparation Using An Augmented Reality Visual Impairment Simulation

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## Abstract

Impairment simulation has been criticised for promoting voyeurism of disability, which centres on superficial experiences of simulated difficulty, which can unintentionally reinforce stereotypes which framing disability primarily as suffering rather than as lived experience shaped by environmental and systemic factors. In this paper, we conduct a 2-week study with 2 participants and their family units to explore how an Augmented Reality visual impairment simulation can be leveraged as a domestic reflective tool for ageing preparation and family dialogue at home as part of situated collaborative practices. Our results showed that the proposed AR experience elicited older adults' self-reflection, helped them to explore strategies to cope with potential challenges and supported discussions amongst participants and their families. On this basis, we discuss the future potential of visual impairment simulation in the context of supporting ageing preparation as a dialectical tool.

## Keywords

older adults visual impairments, simulation, augmented reality, positive ageing, empathy



Concept images of (a) an embodied experience of "Rehearsal for Ageing" Using the Augmented Reality Visual Impairment Simulation, (b) the 2-week diary study with family units, (c) an example of participants' self-reflection after the 2-week study.<sup>1</sup> (a) Concept images of (a) an embodied experience of "Rehearsal for Agein" Using the Augmented Reality Visual Impairment Simulation, (b) the 2-week diary study with family units, (c) an example of participants' self-reflection after the 2-week study.

## 1. Introduction

Proactive interventions for ageing are effective in leading to less retirement-related anxiety [1], reduced depression [2], and higher level of well-being in old age [3]. Common ageing preparation involves activities on the financial [4], psychological [3], social [5], and physical [6] aspects of life to ensure a holistic approach to one's future well-being. These existing approaches rarely incorporate mechanisms for the preparation of the physical symptoms, such as age-related eye disease, which are prevalent in the ageing population worldwide [7]. While many eye conditions can't be entirely prevented [8, 9], it is still

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important to lower the risk, slow down the progression, or manage ongoing symptoms [10]. Therefore, there is a missing opportunity to understand whether the exploration of physical symptoms, even in the absence of disease, can foster early detection, proactive adaptation, and long-term preparedness [11, 12, 13].

In the field of Human-Computer Interaction (HCI) and accessibility research, impairment simulation technologies have been used to support empathy training [14, 15], foster disability awareness [16, 17], and promote accessible design [18]. For example, Melthis et al. [17] constructed a computer game that simulates partial vision loss and full blindness, and used it to raise awareness of visual impairment. Choo et al. [18] investigated the utility of a cataract and glaucoma symptoms simulation application for improving the design of mobile app design targeting cataract users. However, disability simulation practices have been criticized as they fail to represent the complexity of the lived experience of disability, and can lead to oversimplification, othering and stereotyping [19, 20].

Remaining mindful of existing critiques as well as potential opportunities, this work aims to explore a new application of visual impairment simulation as a situated dialectical practice, which focuses to stimulate proactive thinking towards ageing preparation. We conducted a 2-week study with 2 healthy older adults and their family units to investigate how they leveraged an Augmented Reality Visual Impairment Simulation (AR VIS) tool during daily activities as a way to promote personal reflections and exchanges within the family unit. Our findings suggest that participants acquired a more informative understanding of ageing preparation strategies after two weeks of using the AR tool. Moreover, engaging in the AR tool activities facilitated communication between family members of different ages. We further elaborate on implications for the role of simulation activities to promote discussions and proactive collective measures for ageing preparation.

## **2. A Two-Week Study On The At-Home Use of the AR Visual Impairment Simulation**

We used the AR VIS application described in [21] to support exploration of age-related perceptual changes in daily activities within the family unit. This study received IRB approval from our institution.

### **2.1. Methods**

We adopted a mixed-method study featuring cultural probes [22] and interviews. Participants received the AR VIS tool with a power bank and a cultural package after participating in a 1.5-hour opening interview and were then interviewed at the end of each week. During the first eight days, participants were asked to use the AR application with a pre-designed combination of symptoms, which could be loaded with one single click, and explore one room in their house (e.g., living room, bedroom, toilet) every other day. During the last four days, participants were asked to freely adjust the intensity of the symptoms by themselves and explore different spaces outside their homes every other day.

### **2.2. Participants and Procedure**

We contacted a Japanese social welfare community centre to advertise the study and help us identify interested participants. After an initial screening with volunteers, we recruited two participants. We use pseudonyms for our participants. *Taro (P1)* is a 55-year-old Japanese working man living next door to his parents. He hoped to explore this simulation experience with his parents. *Yoko (P2)* is a 75-year-old Japanese woman living with her husband, and whose daughter's family lives next door. She has a post-retirement part-time job at an elderly home, and volunteered to participate in this study because she wanted to improve her care service. Over the 2-week period, participants were asked to use the AR VIS to complete the cultural probe tasks, alone or with their family members. A 1-hour weekly semi-structured interview was conducted in person or online, depending on individual preferences. Participants gave informed consent prior to the study.

### 2.3. Data Analysis

We used a reflexive thematic analysis approach [23] to analyse interview transcripts and participants' notes and pictures in the diaries. We leveraged a narrative approach to identify and present meaningful individual experiences which resonate around a particular concept rather than seeking to aggregate them, highlighting both their similarities and differences to preserve unique contextualised perspectives [24, 25]. All sessions were video-documented, and later transcribed and translated by the main researcher for analysis.

### 2.4. Results

Throughout the study, the simulation experience elicited reflections from participants regarding themselves but also their relationships with others.

**Thinking About 'Me'.** The simulation experience enhanced participants' understanding of the importance ageing preparation interventions for themselves and society more broadly. *Taro* reflected on the importance of making informed decision about living arrangements, and organizing one's care support system:

In the future, there might be people who don't have anyone to rely on. So when you think about it like that, it's good to have this kind of experience early on, to understand the difficulties of going out and about. If you know your rights, at least, before things get tough, you can set up a support system, or plan to live with family when the time comes. And if that's not an option, then you have to consider professional help. It's possible to think about these preventative measures. I'd probably end up in a long lie <sup>2</sup> (P1).

*Yoko* was surprised at the extent to which visual impairments could cause mobility problems in daily life, and remembered the how her doctor talked about the importance of preventative care:

I'm really starting to understand that I shouldn't just be idle or 'spacing out'. I often hear that it's important to do something every day to stimulate my brain, especially tasks that require the use of my hands. I'm beginning to feel strongly that it's probably better to always be engaged in such activities. I'm curious about people who can still sew even at 100 years old – I wonder what's going on in their brains. I wish I could take a peek." (P2)

**Connecting 'Us'.** Interacting with the AR VIS tool helped both participants reflect on their interactions with others who experienced similar symptoms.

In the first follow-up interview, *Taro* noticed that the simulation experience reminded him and his parents of family relatives who had since passed away, which elicited memories about the past. Leveraging this as a starting point, the three of them sat down together to chat about the past family stories:

"After experiencing this simulation, it turns out that when I was young, we had relatives who had dementia and acted like this. [...] We normally don't talk about the past anymore, but through this experience, we talked about the past stories as a family, and it would be nice if this experience could lead to something like that other than research. I'm not sure if it's just a Japanese thing, but particularly men seem to find it somewhat embarrassing or bothersome to talk with their parents. I don't usually spend more than a few seconds or minutes talking to my parents. I think the first time I really talked to them in a long time was for my first interview [before the 2-week study began]." (P1)

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<sup>2</sup>long lie: a situation where a person has fallen on the ground and is unable to get up for a prolonged period, often because they cannot call for help.

*Yoko* noticed that she was performing similar movements as what she had witnessed on her patients before. Therefore, she believed that experiencing the simulation could help her to make more informed care provision decisions as well as engage with them with a more curious and open mind:

"You know, I've been thinking... What does it look like from their perspective? Take the balcony, for instance, is it all white? And doing laundry, I would like to push things around [...] But, you know, it's not easy to step into their shoes. You can't see your feet, and sitting in the chair, it's really tough. It's hard to know when it's okay one day and not the next. I want to be able to make those calls based on their feelings at the time." (P2)

### **3. Discussion: Leveraging Simulation Activities for Proactive Ageing Preparation**

In this work, we explored the use of an AR VIS with healthy older adults. The experience helped participants to reflect on the importance of several preparation strategies, such as moving close to family and establishing a support system to prevent long lies, being proactive about attending eye checks or engaging in regular activities that could stimulate their brains. This suggests that participants realistically thought about what they could do in terms of care planning and individual activities after the simulation experience. This further indicates that impairment simulation can elicit self-oriented thoughts about realistic ageing preparation strategies.

Furthermore, the simulation tasks also represented a prompt to engage in meaningful discussions with others and reflections around care relationships. This points to a new direction of using technologies for simulation in a social context as a dialectical tool for conversations about ageing which directly involve older adults who often play a dual role of givers and receivers of care. Taro's case highlights the potential of this approach to trigger family discussions and exchanges rather than as a tool intended to gain knowledge by replacing dialogue with the other [20]. *Yoko's* case points to opportunities to stimulate reflections on one's own actions as carer in formal or informal contexts. This proposal is grounded in previous findings that perspective-taking simulations can be effective tools in conflict management [26] and communication [27]. We highlight that for implementing simulations in the area of collective proactive ageing, simulation activities should be designed in a manner that fosters thoughts and collaborations towards active preparation strategies and should be contextualised as a vehicle to prompt dialogue on a specific topic instead of providing general awareness or understanding of lived experiences of functional decline.

### **4. Conclusion**

In this paper, we present a 2-week study to explore how healthy older adults interact with an AR visual impairment simulation for ageing preparation. Our findings show that participants reflected on their ageing preparation strategies through a self-projection of the visual impairment experience. Existing HCI research in this field focuses on using disability simulation to understand and support those who are simulated. This work offers a different approach by using disability simulation to let individuals see an alternative future self to facilitate their future preparation.

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## Declaration on Generative AI

The first author used ChatGPT 5o for the teaser figure in order to: Generate images. After using the tool, the first author reviewed and edited the content as needed and took full responsibility for the publication's content.

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