

Co-design of a serious game with Alexa for older adults

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Abstract

This work presents a serious game, "Back to the Past", co-designed with older adults in care homes using Amazon Alexa as a voice-based interface. The game aims to combat social isolation and cognitive decline by leveraging reminiscence therapy and group interaction. Through a participatory design methodology, four co-creation sessions were conducted with elderly residents to identify their preferences, technological barriers, and emotional needs. Key themes—such as nostalgia for family, music, and traditional activities—guided the game's design, which combines adaptive memory prompts, multisensory cues (e.g., images and audio clips), and non-competitive gameplay to encourage engagement. Preliminary observations revealed enthusiasm for voice assistants despite initial usability challenges, underscoring the potential of accessible technology to foster connection. The paper details the co-design process, game mechanics, and lessons learned, offering insights for developing inclusive digital experiences for aging populations.

Keywords

serious games, co-design, older adults,
Alexa, voice assistants, reminiscence, social interaction

1. Introduction

The rapid aging of the global population presents significant challenges, particularly in ensuring the well-being and inclusion of older adults in an increasingly digital society. Many seniors face social isolation, cognitive decline, and difficulties adapting to new technologies, all of which can profoundly affect their quality of life. Care homes and day centers have become essential spaces for fostering active aging through innovative interventions.

The proportion of Europeans 65 years and older has increased steadily in the last decade, with projections indicating continued growth [1]. These demographic changes underscore the need for strategies that improve emotional, cognitive, and social well-being among older adults [2]. With this objective, this work proposes the use of conversational assistants to promote healthy aging [3]. This research is part of a final degree project in Computer Engineering at the University of Granada, titled "Evaluating the use of social robots and conversational systems in residential and day care centers to promote healthy aging" (2024), supervised by Prof. Nuria Medina-Medina. It is framed within a broader research initiative evaluating the use of social robots and conversational systems in care homes and day centers to promote healthy aging.

Consequently, the challenge addressed is twofold: first, the increasing risk of social isolation and cognitive decline among older adults; and second, the barriers they face in accessing and using digital technologies. According to the World Health Organization, active aging requires not only physical and medical care but also opportunities for meaningful social engagement and mental stimulation [4]. However, older adults are often excluded from digital environments due to usability issues and the lack of tailored design. In this context, voice-based interaction emerges as a particularly promising modality, as it does not require visual interfaces (which could be problematic given the visual impairment that older adults tend to experience). Thus, spoken interaction is one of the most natural and accessible forms

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of communication for older users, helping overcome the barriers associated with complex graphical interfaces and digital literacy [3].

On the other hand, serious games [5] are particularly well suited for this purpose, as they integrate playful interaction with objectives such as memory stimulation and social participation [6]. Unlike conventional games, they are designed with explicit educational or therapeutic goals, making them highly relevant in care environments. To ensure relevance and engagement of these games, a co-design approach should be adopted, involving older adults directly in the development of voice-based games [7]. By embedding co-design principles specific for older adults into the development process of these systems, this project sought to bridge the digital gap through meaningful, playful experiences that resonate with the interests and memories of older users. Finally, observations from early exploratory sessions could be used to reveal whether participants express curiosity and even prior experience with voice assistants, reinforcing the suitability of this technology for the target audience.

Consequently, this article presents the design of the serious game *Return to the past*, co-created through participatory sessions with residents of two care homes. The game will leverage reminiscence and cultural references to foster engagement and emotional connection, positioning technology not as a barrier but as a bridge to shared memories and interpersonal bonds. The rest of the paper is structured as follows: Section 2 presents the context of the project, section 3 describes the co-design sessions, section 4 describes the game, and finally, section 5 summarizes the conclusions and future works.

2. Related work and context

Traditionally, video games have been associated with a younger audience. However, in recent years, this landscape has changed, and the number of older adults who play has increased significantly. This has led to a growing interest in the development of games aimed at the needs and particularities of this demographic group. In fact, digital games have been associated with successful aging and there are numerous applications within the field of Playful Gerontechnology [8], particularly in the form of serious games [9].

The concept of *serious games* refers to games that are designed with purposes beyond entertainment. They are used in education, therapy, training, and health to engage users in meaningful activities [10]. Serious games aim to generate deeper learning experiences, using gameplay to explore complex ideas or foster critical thinking. In the context of aging, serious games offer a way to promote cognitive stimulation, emotional expression, and peer interaction to experience solutions to real problems but without real consequences [11]. These games generate positive emotions and enjoyment, boost older adults' self-esteem, and also address aspects essential for improving their quality of life. In addition, games are often employed to prevent or improve conditions associated with aging, such as cognitive decline and dementia. As a result, there has been increasing interest in using digital games to support dementia care, including cognitive rehabilitation games and reminiscence games [8].

Some examples of serious games developed for older adults include Tovertafel and Sea Hero Quest. Tovertafel is an interactive system that projects games onto surfaces, allowing older adults to engage through movement and visual stimuli. It has been widely used in dementia care settings, as it encourages physical activity and enhances social interaction among residents [12]. Sea Hero Quest, on the other hand, is a mobile game designed to collect spatial navigation data to support Alzheimer's research. Through its gameplay, users navigate virtual environments while contributing to the study of cognitive decline [13].

However, despite the growing number of serious games, none to date have been specifically designed for care homes using voice assistants like Alexa, nor co-designed with residents as primary stakeholders. This project addresses that gap by targeting social interaction, accessibility, and reminiscence through conversational technology.

Furthermore, this playful component is beginning to be included in Assistive Technology Systems, especially those that help older adults perform everyday tasks, such as taking medication correctly or preparing lunch. It has been found that if interaction with such technology is poor, complicated, or

tedious, older adults tend to stop using the system. This playful approach may be the most promising in achieving inclusion and accessibility in aging, as the focus is not so much on achieving goals, but on the overall experience and the pleasure derived from attempting to complete game challenges. In this line, conversational Assistants have a great potential to work together with social robot technology to foster relationships and social interactions to reduce people's loneliness and promote their social engagement [14].

Focusing on the use of game-based playful experiences within care homes, according to the systematic literature review conducted in [9], it is concluded that most game systems designed for older adults are intended for home use, while systems developed specifically for nursing homes are scarcely represented in the literature. In fact, in [8], only the use of an affective robot named Matilda is documented; it was brought to a nursing home in Australia and used to play Bingo at the residents' request [15]. Care homes and day centers thus represent environments for older adults where little intervention has occurred so far, despite the fact that they could greatly benefit from the motivation and improved social relationships that gameplay can foster.

In summary, the phenomenon of loneliness in the context of the elderly population in general, and even more so in residences, often leads to the manifestation of problems related to the loss of cognitive faculties, depression and social isolation, which could be mitigated using ICT [16]. With this aim, the main objective of this proposal is to design and implement a serious game using a voice assistant (Alexa) to stimulate autobiographical memory and foster social interaction among older adults living in care homes. This initiative is rooted in the broader goal of promoting healthy aging through technology that is both accessible and meaningful for seniors. More specifically, the project pursues the following aims:

- Understand the concept and value of serious games for elderly users.
- Explore the co-design methodology as a participatory tool to include users' voices in the development process.
- Identify the preferences, interests, and technological barriers faced by older adults.
- Learn to design and develop voice-based applications using Alexa.
- Build a game that facilitates storytelling, reminiscence, and emotional connection among players.

3. Co-design methodology

In order to ensure the serious game is relevant and meaningful for older adults, a participatory co-design methodology was adopted. Sessions were conducted in two nursing homes in the city of Granada (EntreÁlamos and María Auxiliadora), involving both residents and care staff. In each nursing home, four structured sessions were held, each lasting about one hour. Older adults with varying levels of autonomy and cognitive abilities participated, allowing for a wide range of perspectives to be collected.

Participant selection was carried out through initial assessments in collaboration with staff at both care homes. Specifically, the Barthel Index [17] was used to evaluate each person's level of autonomy in performing basic activities of daily living. Based on this index, participants who were sufficiently autonomous to engage in group sessions and game-based activities were selected. A total of 42 individuals were chosen: 14 men and 28 women. Sessions were conducted within the facilities themselves—18 participants from María Auxiliadora and 24 from EntreÁlamos.

Nursing Home	Participants	Men	Women
EntreÁlamos	24	8	16
María Auxiliadora	18	6	12
Total	42	14	28

Table 1

Summary of participants by nursing home and gender.

3.1. Session 1: exploring preferences and attitudes toward technology

The first session aimed to understand the residents' preferences, needs, and attitudes toward technology, particularly virtual assistants like Alexa, to inform the design of a serious game. Individual surveys revealed that while some residents already used smartphones, tablets, or Alexa (one resident used it for music and shopping), others expressed interest but needed adaptations for visual or mobility limitations. During group discussions, key interests emerged: creative activities (embroidery, painting, gardening), reading and poetry (with mentions of Federico García Lorca), classical music (especially the Vienna New Year's Concert), physical exercise (gymnastics, walking), and traditional games (bingo, cards, board games). Many also enjoyed reminiscence activities, sharing past experiences. The session highlighted curiosity about Alexa but emphasized the need for accessible, easy-to-use designs.

3.2. Session 2: introducing Alexa and robots

This session focused on familiarizing residents with Alexa and robots to assess usability and engagement. Participants interacted with two Alexa devices (with and without a screen) and two robots: a large robot (Buddy) and a small robot (Rux). While some struggled with low voices or Alexa misunderstanding commands, they enjoyed asking questions (e.g., about music, animals, or personal trivia) and playing games like "I Spy." Reactions to the robots were mixed—initial surprise turned into curiosity, with residents petting them and asking questions. The larger robot was preferred for its expressive face, while the smaller one was criticized for slow responses (see Figure 4). Key takeaways included the need for clearer voice recognition and higher volume settings, as well as the potential for using Alexa for entertainment and memory exercises.



Figure 1: Older adult caressing a robot that simulates emotions

3.3. Session 3: co-designing with images and reflections

In this co-design session, residents discussed how they might use Alexa and robots in daily life and selected meaningful images in small groups (4-6 persons). Many envisioned Alexa as a tool for reminders, historical storytelling, or family communication. Image selections reflected nostalgia—farm animals (especially chickens), landscapes, work tools, and family photos—often tied to personal memories. One resident even crafted a story linking the images. The session reinforced that reminiscence, family, and nature themes should be central to the game, with technology serving as a bridge to emotional connections and shared experiences.

3.4. Session 4: deepening co-design through visual storytelling

The final session expanded on image-based co-design, with residents again choosing pictures that resonated with them (see Figure 2). The residents were divided into subgroups of six or seven persons. Recurring themes included family (photos of children), animals (chickens, pets), travel (Venice, Paris, trains), and nature (the sea, landscapes). These choices underscored a desire for connection—to their past, loved ones, and the wider world. Some expressed unmet wishes, like traveling more, suggesting the game could incorporate virtual exploration. The strong emphasis on storytelling and memory confirmed that a successful design should blend nostalgia, social interaction, and accessible technology to foster engagement and joy. When the residents agreed on the images they liked the most, they made a panel with those images pasted on a poster board (see Figure 3). There was a lot of agreement among the subgroups even though the total number of cards was high (40 cards in total, selecting only 9 cards).



Figure 2: Older adults choosing their favorite cards

This process ensured that the game design was truly aligned with the interests and preferences of the target users, promoting a sense of ownership.

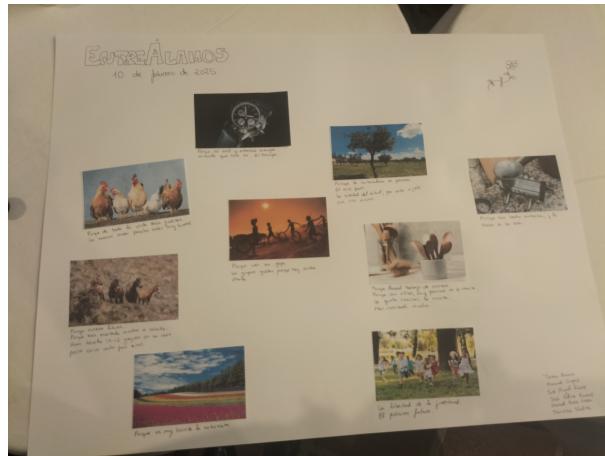


Figure 3: Poster board with the cards chosen by consensus by a subgroup of residents

4. The game “*Return to the past*”

The final design selected for the serious game is *Return to the past*, a memory-based activity where Alexa asks questions about past events, music, films, and traditions. This game was chosen because it closely aligns with preferences identified during co-design sessions, where older adults showed strong engagement with reminiscence, music, and social interaction.

Return to the past combines memory stimulation, visual aids, and group dynamics in a structured yet flexible format. Its intentionally simple and repeatable structure allows it to accommodate different group sizes and varying cognitive abilities.

The game features a non-competitive scoring system that highlights players who share the most memories, helping to avoid stress. Social interaction is encouraged through team questions that promote conversation, while individual turns ensure inclusivity for all participants.

Multimodal support, including images and audio clips, enhances accessibility, particularly for players with hearing or cognitive challenges. Overall, the design blends nostalgia, accessibility, and social engagement to provide a meaningful experience that fosters reminiscence and social bonding in a collaborative and positive environment.

4.1. Question types and adaptive content

Questions were developed through participatory co-design activities with older adults in care homes. Specifically, during the third and fourth co-design sessions, participants collaboratively selected meaningful images and associated themes, which were then used as the basis for question design.

Participants grouped and pasted photographs on large paper boards according to emotional relevance or thematic resonance. A count of the most frequently selected images allowed us to categorize content into several key themes. Table 2 shows the most popular images (based on co-design sessions) and Table 3 shows the grouped categories of images created from the first table.

Based on these clusters, a set of over 60 questions was created, each one linked to an image and designed to stimulate autobiographical memory or general cultural recall. The game design incorporated several key strategies to enhance accessibility, engagement, and emotional relevance:

- **Adaptive questions tied to life experiences:** Designed to engage autobiographical and semantic memory. Example: “What 1960s band was called ‘The Fantastic Four’?” These questions are selected based on themes and preferences identified during co-design sessions.
- **Multimodal support:** Use of images and audio clips to reinforce memory recall. For example, showing a photo of Paris for a question about the “City of Love” helps contextualize and stimulate responses.

Table 2

Count of most popular images based on co-design sessions

Image	Count	Category
Children playing	11	Children
Venice	6	Travel
Animals	6	Animals
Orange tree	5	Landscape
Food	4	Food
Cruise	4	Travel
Paris	3	Travel
Doorknob	3	Antique object
House in China	3	Travel
Green landscape	3	Landscape
Train	3	Travel
Games by the fireplace	2	Travel
Beach	2	Landscape
Colorful landscape	2	Landscape
Kitchen utensils	2	Work
Old telephone	1	Antique object
Mobile phone	1	Technology
Robot	1	Technology
Swing	1	Children
Sport	1	Physical activity
Car	1	Travel
Medicine	1	Medicine
Clock	1	Antique object
Tractor	1	Work

Table 3

Grouped image categories and total counts

Category	Total Count
Travel	19
Landscapes	12
Children	12
Animals	6
Food	4
Antique objects	4
Work	3
Technology	2
Physical activity	1
Medicine	1

- **Social interaction:** Team-based questions encourage conversation and group bonding, while individual turns ensure that all participants can contribute and feel included.
- **Non-competitive scoring:** The game uses a positive ranking system that highlights players who shared the most memories, avoiding stress and promoting a supportive atmosphere.
- **Question categories:**
 - *Cultural knowledge questions:* Target semantic memory. Example: "Which city is known as the 'City of Love'?" (Image: Eiffel Tower).
 - *Personalized memory prompts:* Encourage autobiographical storytelling. Example: "What food reminds you of your childhood?" (Image: traditional meal).
 - *Media and pop culture references:* Designed to trigger group reminiscence. Example: "What was the name of the show featuring characters Espinete and Don Pimpón?" (Image: Espinete).

Based on the co-design sessions, the most frequently selected images were related to children playing

(11 mentions), Venice (6), and animals (6). Other popular choices included orange trees (5), cruises (4), and various food-related images. When grouped by category, the most common themes were travel (19 images), landscapes (12), and children (12).

These preferences indicate strong emotional or experiential connections with themes like travel, nature, and childhood (because it reminds them of family). Therefore, the game will primarily focus on question prompts related to these categories to maximize engagement, familiarity, and reminiscence.

Here is a simple schema of how the game works (Figure 4) It outlines the main stages of interaction between Alexa and the elderly users, including how questions are managed, how the system handles turns, and how players can exit the game if they choose to. This schema helps visualize the core logic behind the conversational structure:

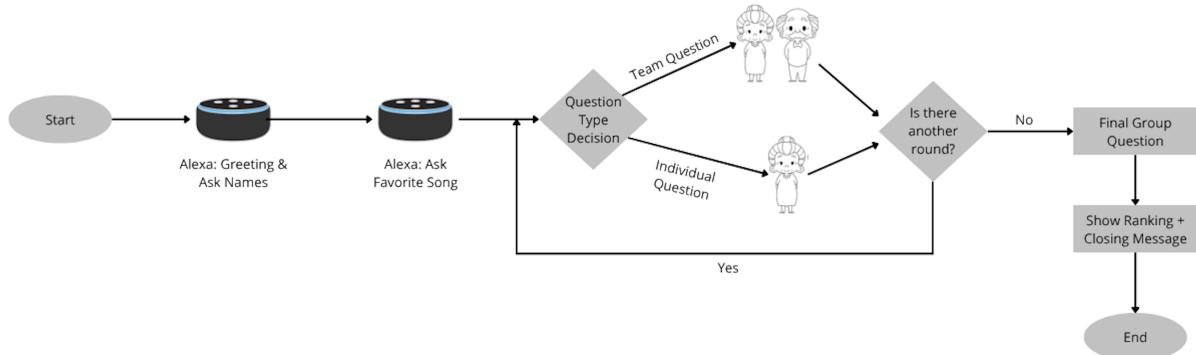


Figure 4: Diagram representing the interaction between older adults and Alexa in the game

5. Technical implementation

The Alexa skill “*Return to the Past*” was developed combining Amazon’s voice services and AWS cloud infrastructure. The architecture was specifically designed to address the needs of elderly users through natural language processing and accessible interaction patterns.

5.1. Interaction model design

The voice interaction model combines custom and built-in components to create a fluid user experience:

- **Custom intents** form the core game mechanics:
 - AnswerIntent handles trivia responses with multiple acceptable answer variations
 - GetFavoriteSongIntent processes musical preferences using natural language patterns
 - PlayerCountIntent manages group dynamics with numeric validation
- **Slot types** enhance recognition accuracy:
 - AMAZON.SearchQuery accommodates diverse response phrasing
 - AMAZON.FirstName recognizes names with cultural variations
 - Contextual help system using AMAZON.HelpIntent
- The utterance library includes 50+ variations per intent, accounting for regional dialects and speech patterns common among elderly users.

5.2. Backend infrastructure

The architecture was built on AWS services to ensure scalability and reliability. At the core, Node.js Lambda functions handle all game logic and state transitions, maintaining session continuity through DynamoDB persistence.

For data management, the system employs DynamoDB tables optimized for fast key-value access patterns. The `JuegoRegresoPasado` table serves as the primary data store, storing real-time player information, game states, and scoring. A secondary `CancionesRegresoPasado` table functions as a media catalog, storing metadata and references to audio files in S3. This separation of concerns allows for efficient data retrieval while maintaining clean architectural boundaries.

Media handling follows strict technical requirements to ensure optimal voice interaction quality. All audio clips are processed to meet Alexa's specifications (24kHz/128kbps MP3 format) and stored in S3 buckets with appropriate access policies. The system leverages SSML (Speech Synthesis Markup Language) to dynamically embed these audio elements into responses, creating a more engaging user experience. Content delivery is further optimized through regional endpoint selection, minimizing latency for voice interactions [18].

5.3. Deployment and voice

The deployment pipeline integrates multiple specialized components to ensure consistent performance. Amazon Polly's voices provide the foundation for natural-sounding responses, with additional logic for time-aware tone modulation (adjusting cheerfulness for morning/evening/night interactions) and adaptive speech rates based on context. This voice personality system helps create a more intuitive and comforting experience for elderly users [19].

Security is enforced through configured IAM roles following the principle of least privilege.

Accessibility was a primary consideration throughout development. The implementation includes multimodal feedback channels that combine voice responses with visual display content. A progressive help system provides contextual assistance when needed, while carefully designed error recovery paths handle common misunderstandings gracefully. These features work together to create an inclusive experience that accommodates the diverse needs of elderly users.

5.4. Why “*Return to the past*” is a serious game

Return to the past is not merely a leisure activity, but a carefully crafted serious game—one that integrates entertainment with meaningful, non-entertainment goals. It was designed to address specific psychological, social, and cognitive needs of older adults through play. Serious games are those in which the primary purpose is not solely amusement, but rather education, training, therapy, or social impact.

In this case, the game targets key challenges commonly faced by older adults, such as memory decline, social isolation, and low digital inclusion. Through carefully selected questions and mechanics, it promotes autobiographical storytelling, reinforces identity, and creates space for meaningful interpersonal interaction.

The game qualifies as “serious” for several reasons:

- **Therapeutic intent:** It draws on reminiscence therapy principles, encouraging players to recall and share personal memories that are emotionally significant.
- **Structured intervention:** Unlike open-ended or casual games, it has a predefined framework with purposeful prompts, progression logic, and reflective closure.
- **Designed with a target population in mind:** The co-design sessions ensured that the game content, pace, and interface were adapted to the interests, capabilities, and limitations of older users in care homes.
- **Technology as facilitator:** By integrating Alexa as a voice assistant, the game also serves a digital literacy function, helping seniors interact with accessible technologies in a low-pressure setting.
- **Dual outcomes:** The game stimulates cognitive processes (memory, attention, language) while also fostering emotional well-being and social bonding, all embedded within a pleasurable game format.

The game's simplicity is intentional, enabling older adults with varying cognitive abilities to participate. At the same time, each element is purposefully designed to serve a dual function: creating a fun and engaging experience while supporting measurable psychological and social benefits.

The following table illustrates how each serious objective is addressed through specific ludic strategies within the game.

Table 4
Alignment between serious objectives and game mechanics

Serious objective	Related game mechanic
Stimulate autobiographical memory	Questions about cultural events, music, and popular places from the past, supported with images and sound clips
Reduce social isolation	Team-based questions, group interactions, and introductory questions to promote personal connections
Promote accessible technology use	Voice interface via Alexa, no need for advanced digital skills
Reinforce self-esteem through positive memories	Continuous positive feedback from Alexa and end-of-game recognition based on participation
Encourage mutual knowledge among residents	Personal prompts like "What's your favorite song?" to foster conversation
Provide an inclusive and accessible experience	Multimodal approach (audio-visual), adaptive timing, and clear instructions
Support active and meaningful participation	Turn-based structure, role variety (individual vs. team), and player-driven input

By fulfilling these characteristics, *Return to the past* aligns with the definition of serious games and extends the potential of gaming to serve vulnerable populations through accessible, inclusive, and emotionally enriching experiences.

Although the game has not yet undergone formal evaluation, a series of user experiences in the two care homes "Maria Auxiliadora" and "EntreÁlamos" are planned to assess its effectiveness. These evaluations will provide valuable feedback to refine both the content and the game dynamics.

5.5. Limitations

This study presents several limitations that should be considered when interpreting the results and evaluating the generalizability of the proposed game.

First, the sample is not gender-balanced: out of 42 participants, 28 were women and 14 were men. While this partially reflects the demographics of residential care settings, where women tend to be the majority due to longer life expectancy [1], it may also influence the preferences expressed during the co-design sessions. For instance, the emotional tone of the selected images, themes of family and reminiscence, and interest in music and storytelling could be more representative of female perspectives [20].

Second, as discussed in Section 4.2, the game was intentionally designed to be simple and accessible to accommodate users with different levels of cognitive and sensory abilities. However, this simplicity may limit engagement for more independent or technologically experienced users. Moreover, initial sessions revealed technical issues such as Alexa's difficulty recognizing low-volume speech or group responses, which affected the flow of interaction.

Finally, the cultural and geographical context of the study, focused on two nursing homes in southern Spain, means that preferences may vary in other regions or settings.

5.6. Ethical considerations

The use of voice assistants and social technologies in care homes raises important ethical considerations, particularly when engaging with older adults who may experience cognitive decline or sensory

impairments. While the game *Return to the past* was always introduced as a voice-based tool moderated by a non-human assistant (Alexa), future autonomous use of such systems requires careful reflection on transparency, user understanding, and emotional safety.

During the co-design sessions, participants were explicitly informed that Alexa is not a human being, but a programmed device designed to facilitate interaction. However, as conversational agents become more sophisticated and natural-sounding, the line between human and machine interaction can become blurred. This evolution raises important considerations about how such interactions might impact the dignity and identity of older persons, especially in eldercare settings. There are potential effects of robot and conversational agent interactions on dignity. Robots could negatively (or positively) impact on people's dignity of identity, and on their feelings of self respect or of humiliation. As interaction capabilities improve, there is a risk that older adults may develop attachments or form perceptions of personalized relationships with these devices, which could influence their sense of self and social identity, underscoring the importance of respectful design and implementation of such technologies [21].

To address this, any future deployment of the system in autonomous settings should:

- Respect the inviolable dignity of individuals by designing robots that avoid objectification and promote self-respect [21].
- Support a person's Dignity of Identity by ensuring robot interactions preserve autonomy, self-esteem, and a sense of control [21].
- Enhance, rather than replace, human interaction, ensuring robots complement social relationships and emotional well-being [21].
- Use technology ethically and sensitively to prevent humiliating or demeaning treatment that could harm dignity [21].
- Assess the impact on capabilities and dignity before deploying robots, ensuring they promote a dignified life [21].

These tools should supplement, not replace, human interaction. While serious games and digital companions can promote social engagement, they should always be embedded in a broader context of interpersonal support and monitored use.

The design and deployment of such systems must respect users' autonomy and dignity, while safeguarding against emotional manipulation or misunderstanding.

6. Conclusions and further works

The co-design methodology proved to be a key factor in the development of a game that is not only functional but also emotionally resonant and socially engaging. By involving older adults directly in the design process, the project ensured that the game reflected their real preferences, needs, and life experiences.

Participants contributed valuable insights that shaped the content and structure of the game. Through the selection of meaningful images and open conversations, themes such as family, nature, music, and memories of childhood and work emerged as emotionally significant. These themes were later embedded into the gameplay and question design, reinforcing the personal relevance of the experience.

The project also provided useful observations on the interaction between older adults and technology. While some participants initially expressed hesitation or experienced difficulties using voice interfaces—such as low speech volume or Alexa not recognizing group speech—many demonstrated curiosity and a willingness to learn. A few already had experience with Alexa, and most enjoyed the interaction once familiarized with it.

Preferences clearly leaned toward non-competitive, narrative-driven games that promote conversation and reminiscence. Musical cues, storytelling elements, and cooperative dynamics were especially appreciated. These findings validate the design choices made and confirm the importance of adapting digital experiences to the cognitive and emotional context of older adults.

Our first line of future work will be the full implementation of a functional version of the application that can be brought to nursing homes for use. During these sessions, an observation process will be carried out, followed by the administration of a simple usability test adapted for this demographic. Additionally, another test will be conducted to evaluate the entertainment generated and any improvement in social relationships among participants. This will allow us to validate the usefulness of the proposal at both the individual and group levels.

In summary, the project not only resulted in a serious game prototype, but also highlighted the value of participatory design and voice-based interaction as tools for inclusive and meaningful digital experiences for the elderly.

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Declaration on generative AI

During the preparation of this work, the author(s) used X-GPT-4 and Gramby in order to: Grammar and spelling check.

References

- [1] Eurostat, Demography of europe – 2023 interactive edition, 2023. URL: <https://ec.europa.eu/eurostat/web/interactive-publications/demography-2023#ageing-population>.
- [2] A. Reis, D. Paulino, H. Paredes, J. Barroso, Using intelligent personal assistants to strengthen the elderlies' social bonds: A preliminary evaluation of amazon alexa, google assistant, microsoft cortana, and apple siri, in: Universal Access in Human–Computer Interaction. Human and Technological Environments: 11th International Conference, UAHCI 2017, Held as Part of HCI International 2017, Vancouver, BC, Canada, July 9–14, 2017, Proceedings, Part III 11, Springer, 2017, pp. 593–602.
- [3] S. Dogra, D. W. Dunstan, T. Sugiyama, A. Stathi, P. A. Gardiner, N. Owen, Active aging and public health: evidence, implications, and opportunities, *Annual review of public health* 43 (2022) 439–459.
- [4] E. Rudnicka, P. Napierała, A. Podfigurna, B. Męczekalski, R. Smolarczyk, M. Grymowicz, The world health organization (who) approach to healthy ageing, *Maturitas* 139 (2020) 6–11.
- [5] R. P. De Lope, N. Medina-Medina, A comprehensive taxonomy for serious games, *Journal of Educational Computing Research* 55 (2017) 629–672.
- [6] A. Abd-Alrazaq, M. Alajlani, D. Alhuwail, C. T. Toro, A. Giannicchi, A. Ahmed, A. Makhlof, M. Househ, The effectiveness and safety of serious games for improving cognitive abilities among elderly people with cognitive impairment: systematic review and meta-analysis, *JMIR serious games* 10 (2022) e34592.
- [7] G. Dewsbury, I. Sommerville, P. Bagnall, M. Rouncefield, V. Onditi, Software co-design with older people, in: *Designing accessible technology*, Springer, 2006, pp. 199–208.
- [8] C. Dormann, Toward ludic gerontechnology: a review of games for dementia care, in: *1st International Joint Conference of DiGRA and FDG*, 2016.
- [9] D. Martinho, J. Carneiro, J. M. Corchado, G. Marreiros, A systematic review of gamification techniques applied to elderly care, *Artificial Intelligence Review* 53 (2020) 4863–4901.
- [10] J. Chipia Lobo, Juegos serios: Alternativa innovadora, *Revista Conocimiento Libre y Educación* 1 (2011) 1–18.

- [11] C. López Raventós, El videojuego como herramienta educativa. posibilidades y problemáticas acerca de los serious games, *Apertura* (Guadalajara, Jal.) 8 (2015) 15.
- [12] Tover Health Tech B.V., Tovertafel for people living with dementia, 2023. URL: https://www.youtube.com/watch?v=2UB6E1K1q_4.
- [13] Alzheimer's Research UK, Sea hero quest, 2016. URL: <https://www.alzheimersresearchuk.org/research/for-researchers/resources-and-information/sea-hero-quest/>.
- [14] A. K. Ostrowski, H. W. Park, C. Breazeal, Design research in hri: Roboticists, design features, and users as co-designers, in: *Workshop on Designerly HRI Knowledge*, 2020.
- [15] R. Khosla, M.-T. Chu, K. Nguyen, Affective robot enabled capacity and quality improvement of nursing home aged care services in Australia, in: 2013 IEEE 37th annual computer software and applications conference workshops, IEEE, 2013, pp. 409–414.
- [16] Q. Fan, Utilizing ict to prevent loneliness and social isolation of the elderly. a literature review, *Cuadernos de trabajo social* 29 (2016) 185–200.
- [17] F. I. Mahoney, D. W. Barthel, Functional evaluation: the barthel index, *Maryland State Medical Journal* 14 (1965) 61–65.
- [18] Amazon Alexa, Speech synthesis markup language (ssml) reference, 2023. URL: <https://developer.amazon.com/en-US/docs/alexa/custom-skills/speech-synthesis-markup-language-ssml-reference.html>.
- [19] Amazon Web Services, Amazon polly, 2022. URL: <https://aws.amazon.com/es/polly/>.
- [20] R. Sánchez Aragón, B. E. Retana Franco, E. Carrasco Chávez, Evaluación psicológica del entendimiento emocional: Diferencias y similitudes entre hombres y mujeres, *Revista Iberoamericana de Diagnóstico y Evaluación - e Avaliação Psicológica* 2 (2008) 193–216. URL: <http://www.redalyc.org/articulo.oa?id=459647347010>.
- [21] A. Sharkey, Robots and human dignity: a consideration of the effects of robot care on the dignity of older people, *Ethics and Information Technology* 16 (2014) 63–75. URL: <https://doi.org/10.1007/s10676-014-9338-5>.