A Digital Health Platform for Home Cognitive Training and Monitoring of Seniors in Southern Switzerland

13a Giornata della ricerca e dell'Innovazione in Medicina Umana della Svizzera Italiana

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Introduction

The aging population is resulting in a worldwide rising prevalence of individuals experiencing cognitive decline, whether it be normal age-related changes or pathological conditions. In response to this growing challenge, serious games – defined as games developed with a primary focus on education, training, or skill development – have emerged as a highly innovative and promising approach to promote cognitive health and maintain mental sharpness among older adults.

The aims of this research are: 1) to develop a digital health system for home cognitive training and monitoring and 2) to evaluate the usability and acceptability of our custom-designed serious games and monitoring platform, which have been specifically developed to train and monitor the cognitive performance of seniors who are receiving home care assistance. Our partner is the Associazione assistenza e cura a domicilio del Mendrisiotto e Basso Ceresio (ACD Mendrisiotto), in Southern Switzerland.

Games & Platform development

We have built an engaging, user-centered solution that is fun for seniors, insightful for caregivers, and scalable for the healthcare system. The app includes six custom-designed games - *Find the Word, Whack-a-Mole, Three Towers, Guess the Sequence, Maze, and Jigsaw* - each created specifically to meet the needs and preferences of older adults. Instead of adapting existing games, we built them from the ground up through a co-design approach involving nurses, seniors, and a neuropsychologist. The games are integrated into the *beSerious* app, which takes users on a virtual tour of European capitals. Feedback gathered from seniors through interviews, workshops (Figure 1), and usability tests played a crucial role in shaping the final version of the app.

Meanwhile, a web platform was developed to provide nurses with data on the frequency of games played by each participant. By clicking on the corresponding graph, ad-hoc performance data for each game can be accessed (Figure 2). This information allows nurses to indirectly monitor changes in participants' cognitive abilities over time.

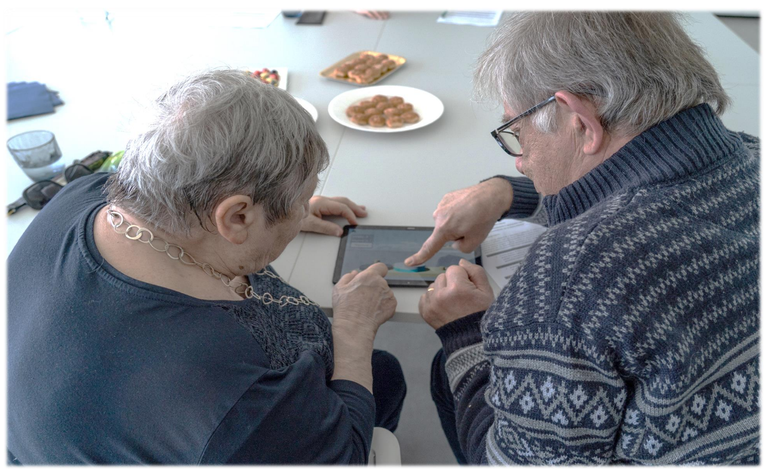


Figure 1. Participants testing games during a workshop

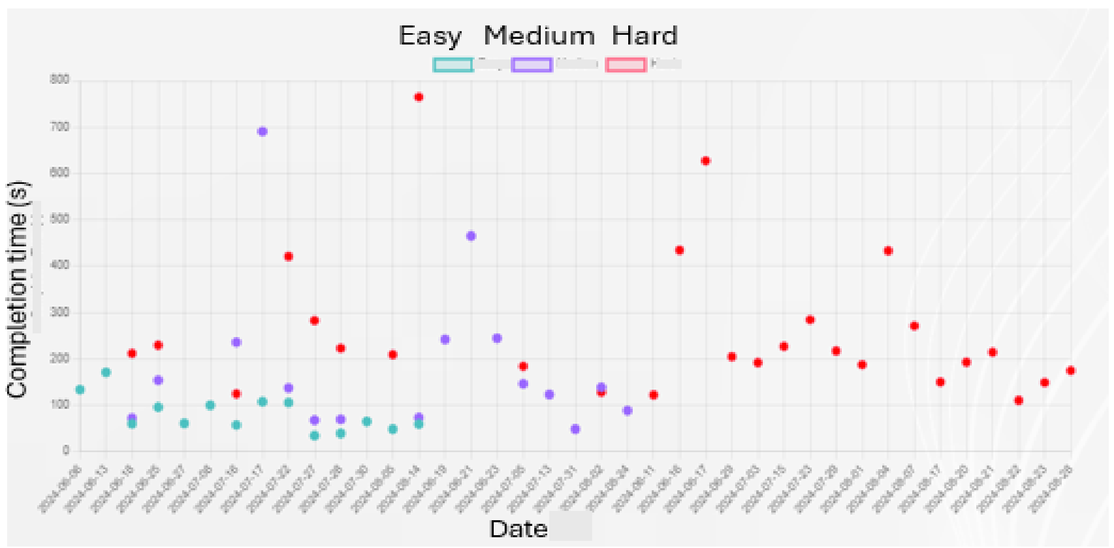


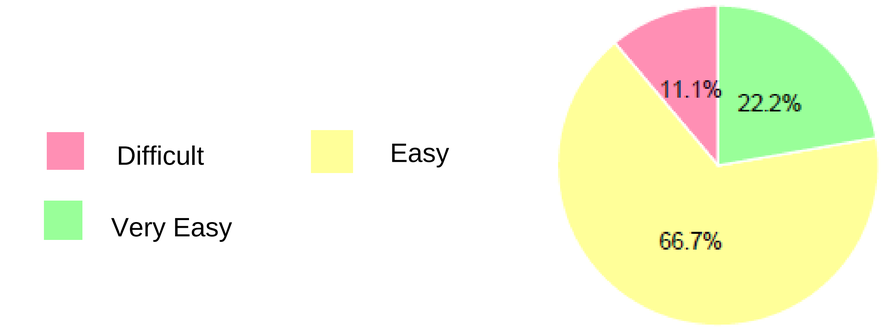
Figure 2. Web platform's feedback on the Jigsaw game played by one of the users

Following the development phase, the games and the platform have been tested with a group of seniors. The evaluation phase of the study is structured in two rounds. The first round involved the recruitment of 10 participants, that were asked to engage in at least three gaming sessions per week over a three-month period (June-August 2024). The data collected during these sessions were analyzed to guide improvements in the web platform used for monitoring purposes. Participants were selected based on the following inclusion criteria: being 60 years of age or older, being able to provide written informed consent, and receiving home care assistance from ACD Mendrisiotto (Spitex). In addition, participants were required to have normal or corrected vision, being native/fluent Italian speakers, and live in Ticino. Patients with significant health conditions were excluded. The second round is scheduled to begin in October 2024, during which both the serious games and the finalized web platform will be implemented with a new cohort of participants. The same eligibility criteria applies.

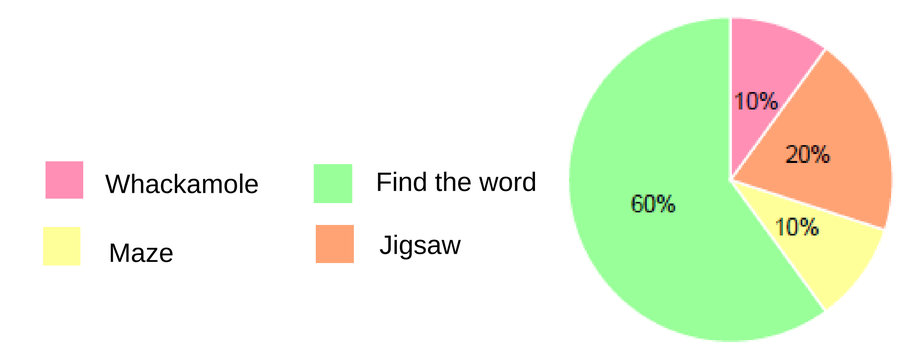
Preliminary results

The usability and game evaluation questionnaires revealed that 90% of participants found both the tablet and games easy to use, with 78% being confident in using tablet commands (e.g., tapping, lifting). These results are consistent with the findings from the "Mobile Device Proficiency Questionnaire", which demonstrated that participants possess a moderate level of confidence in performing both basic and entertainment-related tasks. All participants rated the instructions as clear, with 80% that fully understood the game rules and 90% that grasped the overall purpose - training cognitive functions. 80% found the games enjoyable and useful for learning, and all the participants believed that the games helped them keeping their minds active. Only 10% reported being bored while playing, and 10% found the gameplay tiring. In terms of frequency, 44.4% played more than three hours per week, 22.2% played 30 minutes to one hour, and 33.3% played less than 30 minutes. "Find the word" was the most preferred game (60%), followed by "Jigsaw" (20%), with "Three towers" and "Guess the sequence" being the least preferred. Participants appreciated the design, expressed interest in continuing to play, and recommended the serious games. Further results will follow the second round of evaluation.

How easy was it for you to learn how to use the tablet and games



My favorite game is



beSERIOUS