

# 11 GAMES FOR THE COGNITIVE ASSESSMENT OF OLDER ADULTS

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## ABSTRACT

Cognitive Screening Instruments (CSIs) are used to diagnose neurocognitive disorders. Previous studies have investigated the potential of games as alternative tools to perform a cognitive assessment. Correlation with traditional methods shows promising results; however, challenges to design and develop fun and engaging games while focusing on accurate diagnosis remain open. This article introduces CogWorldTravel, a game-based CSI focusing on the attractiveness to older adults.

## KEYWORDS

Serious games; healthcare; cognitive assessment; cognitive screening instruments; older adults.

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## CONTEXT

Over the past 45 years, several Cognitive Screening Instruments (CSIs) have been developed and extensively researched. Among many other reasons, instruments variants were proposed to facilitate quicker administration, assess a broader range of cognitive domains, adapt to different target groups, translate to other languages, improve screening performance, and address omissions [1]. With the increasing technological advances, tests also evolved to electronic versions. Many advantages are associated with the use of digital tests: reduced staff time and cost, higher reliability and clinical efficiency thanks to the adoption of automatic scoring, the possibility of remote administration, and suitability for frequently repeated assessment [2]. Ultimately, serious games have been investigated as a promising approach to improve cognitive screening. Beyond sharing the same advantages as electronic versions of classical CSI, the use of game elements can encourage (and persuade) to undertake the assessment by offering a “gameful” experience while collecting precise data [3].

## TARGET ISSUE

Using games for cognitive assessment is still a new field of research. Most previous studies have adopted an exploratory approach and investigated the feasibility of using such a tool for cognitive screening purposes. A mix of well-known and non-conventional games was used in the studies [3]. However, both game types are associated with great challenges. On the one hand, commercial or well-known games designed for other purposes do not address CSI requirements. In addition, they do not necessarily take into consideration the age-related changes of older adults. Older adults, who are at a higher risk for the onset of neurocognitive disorders, are the ones who CSI need mainly to target.

On the other hand, bespoke games offer the freedom to include any design requirements but often at the cost of fun and engagement. The design and development of ideal games remain an open challenge. Identifying the factors that increase adherence and make the game more attractive to older adults while keeping a strong focus on accurate diagnosis is still worthy of investigation.

## PROPOSED SOLUTION

We propose CogWorldTravel, a serious game that screens for the early signs of neurocognitive disorders in older adults. The game approach is twofold:

- Designing an engaging and appealing game for older adults,
- Satisfying the requirements of an effective CSI [1].

We chose slower-paced game mechanics with some intellectual challenge. As many older adults present difficulties in their hearing, vision, cognition, or mobility, the game is designed using great color contrast, adapting the font size, reducing movement control complexity, and avoiding cognitive load. The proposed game also includes samples from major cognitive domains: Complex attention, executive function, learning-and-memory, language, and perceptual-motor are all addressed by at least one of the mechanics included in the game.

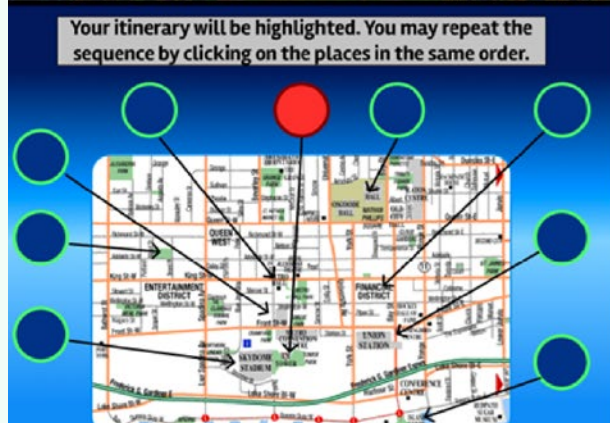
## RELEVANT INNOVATION

CogWorldTravel is a serious game as an alternative CSI with an original story. The

game has Linda as main character, who just retired after 30 years as a successful accountant. After so many years of dedication to her career and beloved family, she feels it is the good time to look after herself, and she plans to travel around the world. Linda invites the player to come along in this adventure. Traveling is a theme most people enjoy and accept. The connection that the player might feel with the character’s story and its

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valued traits can increase engagement. CogWorldTravel goes beyond the infusion of game-like mechanics in digital tests; it is a full-blown game with a story progression that includes traveling within 46 countries on six continents. Traveling around the world is fun but nevertheless expensive. The travelers must watch out for the budget, plan the next moves, and solve challenges to make money and be able to carry on with the trip. The design focused on the elderly preferences and age-related changes to provide a pleasant experience while measuring cognitive functions.

## PROJECT OUTCOMES & RESULTS

Eight game mechanics were designed to measure cognitive performance. “Local Culture” is inspired by the Warrington Recognition Memory Test and assesses discrimination between old and new culture-related items [4]. “International Cuisine” is based on Verbal Learning List Tests, where the player learns a typical recipe to be recalled later in “Family Call”. Delayed recall and recognition memory are two important parameters of episodic memory [5]. Language Lesson tests language abilities in a contextualized word generation activity. “Touristic Attractions” is inspired by the Corsi Blocks Test and involves memorizing the order in which places are shown on a map. It is used to measure visuospatial short-term memory. Executive control is required when sequences are in reversed order. The “Native Fauna” is inspired by the “Whac-a-mole” arcade game and the Wisconsin Card Sorting Test. While the player takes pictures of wild animals as they pop up in the scenario, reaction time is recorded as it measures the information processing speed and is used in a variety of mental activities to provide important information about cognitive efficiency [6]. “Packing Time” involves visual-spatial problem-solving and motor coordination skills as the player organizes Tetromino-shaped clothes. “Luggage Tracking” is designed to boost scoring and unlock other destinations while testing selective visual attention, which is the ability to select information among other visual inputs.

## CONCLUSION

This article presents an original game that collects important information about older adults’ cognitive performance while offering them a fun activity. Game mechanics are adapted from validated and well-researched neuropsychological tests and immersed in an engaging trip around the world.



## PERSPECTIVES & NEEDS

Continuing this research includes experimental studies to evaluate CogWorldTravel validity as a CSI. To incorporate the game in practices detecting neurocognitive disorders, we still need to define the psychometric properties. In addition, analyzing the game acceptance by older adults is of paramount importance for us to identify what motivates them.

## ACKNOWLEDGEMENTS

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