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Gamifying the Mini-Cog: A Narrative-Based Digital Approach to Cognitive Screening

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Abstract: Early detection of cognitive impairment is crucial for timely intervention in conditions like dementia and Parkinson's disease. While the Mini-Cog is a validated tool for such screening, its traditional clinical format may disengage some users. This study introduces a gamified, narrative-based version of the Mini-Cog as a web-mobile application, tested with 30 healthy volunteers (ages 45–72) and one patient. Two story variants were developed, featuring a mayor and a dinosaur, embedded in a relaxed everyday narrative mentioning a park, bakery, and birthday party. Feedback highlights positive engagement through visuals and icons, with suggestions for age-adapted stories and improved screen adaptation. Results support the feasibility of gamified cognitive screening while noting the need for broader clinical validation.

Keywords: Gamified testing, mobile applications, cognitive decline, mini-cog test and self-management.

1 Introduction

The complete PDF version of The Mini-Cog is a widely used screening tool for cognitive impairment, combining word recall with a clock-drawing task [1]. Despite its efficiency, its clinical setting may cause anxiety or disinterest, particularly among older adults. Gamification—the use of game-design elements in non-game contexts—has shown promise in reducing stress and improving motivation in cognitive tasks [2,3]. Yet few tools embed validated assessments like the Mini-Cog in gamified or narrative-based environments. This study introduces a Mini-Cog prototype delivered through interactive stories to improve engagement and reduce

test-related stress. It also explores feedback from a small, mostly healthy group, highlighting the need for broader validation.

2 Methods

Design: The application replicates the Mini-Cog structure; (1) word recall, (2) clock number placement, and (3) clock-hand adjustment—within two lighthearted storylines: one featuring a dinosaur, the other a mayor. Both narratives begin in a calm neighborhood with the opening of a new bakery. Participants earn a virtual cake by completing small tasks corresponding to the Mini-Cog components. Icons replace textual cues to reduce cognitive load. The interface includes soft color palettes, relaxing background music, and touch-based interaction, optimized for mobile and tablet use [4]. The design emphasizes low-stress interaction and accessibility across varying screen sizes.

Participants: Thirty healthy adult volunteers (ages 45–72) and one patient (age 68) recently diagnosed with a cognitive disorder evaluated the application. The sample was intentionally limited, with a strong bias toward healthy individuals, which may influence subjective feedback. Broader clinical validation is planned.

Evaluation: Participants interacted with both versions of the game and completed informal interviews and the System Usability Scale (SUS). They provided feedback on usability, design, narrative quality, and clarity. The patient offered detailed insights on task accessibility and visual elements, which informed interface refinements.

3 Results

User feedback was largely positive. Visual design, iconography, and the calm narrative framing were frequently mentioned as engaging features. The mayor-themed version was preferred for its relatability, while the dinosaur version was seen as more playful but less appealing to older participants. Several users found the introductory scene too long and recommended customizable or age-adapted stories (e.g., nature walks).

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All 30 healthy participants successfully completed the Mini-Cog tasks embedded in the game, suggesting that the application maintains the test's functional structure. The patient (aged 68) also completed all tasks, though with a slight spatial inaccuracy in the clock-drawing component, consistent with her diagnosis. These early outcomes indicate potential alignment with expected screening results, though the sample was heavily weighted toward healthy adults, which may introduce feedback bias.

Participants favored larger screens for clarity and ease of use, while the patient emphasized the need to reduce visual and audio distractions to better support focus. These findings support the feasibility of gamified cognitive screening and suggest that tailoring narrative pacing and offering screen adaptation options may enhance user experience.

4 Discussion

This study contributes to the growing body of research on gamified cognitive assessments by embedding a clinically validated screening tool—the Mini-Cog—into a narrative-driven, mobile-friendly format. Our findings show that even light gamification can enhance user experience, reduce anxiety, and improve engagement, particularly when age-appropriate design and visual clarity are prioritized.

The results echo Allam et al. [2], who reported improved motivation and satisfaction among older adults using gamified interventions. In our study, both healthy participants and a patient with a recent diagnosis found the game environment accessible and calming, with the narrative structure perceived as less intimidating than traditional clinical tests.

While Anguera et al. [6] demonstrated that gameplay can enhance cognitive control in older adults through training, our tool focuses on screening rather than intervention. Still, the positive reception of its interactive elements supports the idea that gamified design can boost attention and reduce emotional barriers in cognitive tasks.

The recent study by Bauge and Babic [8] further supports this direction, highlighting a gap in validated, accessible, and engaging self-assessment tools for cognitive screening. They emphasize the need for tools that integrate clinical validity with user-centered design—particularly for non-expert older users. Our application directly responds to that call by combining the simplicity and structure of the Mini-Cog with a familiar, story-driven context optimized for mobile use.

Consistent with Sardi et al. [7] and Lumsden et al. [3], our results emphasize that relatability, visual simplicity, and personalization play a key role in successful gamified assessments. Participants preferred the mayor storyline for its realism and suggested age-adapted alternatives like nature walks. While soft visuals and icons were well received, some

users—especially the clinical participant—requested reduced distractions, reinforcing Deveau et al.'s [5] advice to minimize cognitive load for better task performance.

Notably, our results should be interpreted with caution due to the imbalance in the sample; with only one clinical participant, usability feedback may skew overly positive. Nonetheless, all users completed the core Mini-Cog tasks successfully, suggesting that the diagnostic structure remains intact within the gamified version.

Future development should prioritize adjustable pacing, user-selectable story modules, and optimization for smaller screens. These features, paired with broader clinical validation, could help scale the tool for real-world healthcare settings. As Bauge and Babic [8] underline, the intersection of scientific rigor and engaging design is essential to the next generation of digital cognitive assessments.

5 Conclusions

This pilot study supports the potential of gamifying validated tools like the Mini-Cog to deliver approachable, low-stress cognitive assessments tailored for older users. Embedding screening tasks within relatable, narrative-driven interfaces—supported by calming visuals and intuitive icon-based interaction—can enhance usability, reduce test anxiety, and foster higher engagement.

The tool's successful use by a newly diagnosed patient, alongside healthy participants, demonstrates early feasibility for broader clinical applications. While the sample was limited and skewed toward healthy individuals, consistent task completion across users suggests the core diagnostic structure remains intact.

Future research should involve more diverse clinical populations and formal comparisons with standard test formats to evaluate diagnostic equivalence. In addition, developing modular narratives with user-selected themes, adjustable pacing, and screen-size optimization will be critical to enhancing accessibility and maintaining engagement across varied user groups.

As the field moves toward more integrated digital health solutions, aligning clinical rigor with user-centered design, as highlighted by Bauge and Babic [8], will be essential to advancing meaningful, scalable tools for cognitive assessment in aging populations.

Author Statement

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