

ACTIVE-U: PLAYING TO STIMULATE YOUR BRAIN

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Abstract. *The purpose of Active-U is to adapt a playful game (Unlocked) to a therapeutic game (Active-U) to stimulate cognitive functions. Active-U emerges as a therapeutic play with a great potential for stimulating cognitive functions, which will get motivate the target population and thus reduce the withdrawal of cognitive remediation. Use the motivational elements of the game with the following elements: fiction, narrative, rules, goals and reward. We use also the principles of cognitive stimulation based on brain plasticity to adapt a commercialized game (Unlocked) to a therapeutic game (Active-U). We design exercises to stimulate attention, working memory and speed of processing information. We assess the Unlocked's usability and Active-U usability in patients with Mild Cognitive Impairment. Our results show similar usability in Unlocked and Active-U. Subjects value require more cognitive resources to play Active-u than Unlocked. Active-U is shown as a promising therapeutic play, well appreciated by users. The adaptation of playful games to learn from other therapeutic purposes to stimulate cognitive functions can be considered a useful method to achieve therapeutic goals and to optimize technology resources to expand their areas of application.*

Keywords: Serious Game, Cognitive Stimulation, Gamification, Mild Cognitive Impairment, Health

1. INTRODUCTION

Mild Cognitive Impairment (MCI) is characterized by a cognitive decline greater than expected for an individual age and education level, but does not significantly interfere with everyday function (Petersen et al., 1999; Petersen and Negash, 2008). MCI has a prevalence of 16% of the total population aged 65 and older, it increases with age, from 15% under age 75 and 30% over 85 years. Importantly, amnesic is a well recognized

risk factor for Alzheimer disease (AD): according to the different studies, between 8.3% and 15% in the following year, up to 80% in the five subsequent years will be demented (Amieva et al., 2004; Petersen, 2004).

The Spanish Society of Geriatrics and Gerontology does not recommend prescribing acetylcholinesterase inhibitors (IACE) to delay the progression of MCI to dementia. Meanwhile, it is recommended nonpharmacological therapies (NPT) as a treatment. Among NPT are cognitive rehabilitation or cognitive stimulation, which aims to encourage and maintain the various cognitive functions so that will slow or stop the deterioration process. Currently, Serious Games (SG) is considered a non-pharmacological promising tool to evaluate, train and stimulate cognitive functions (Robert et al., 2014).

On the other hand, the increasing number of users using new technologies has led to the creation of products with therapeutic goal, using the advantages of the game, called "Serious Games" (SG). These games can work physical, cognitive, social and emotional aspects. SG represents a motivating, sustainable and relatively economic method for improving or slow the onset of deficits in the social, emotional, and sensorimotor (Mc Callum et al., 2012). In addition, the SG should allow any player to play the game; from casual gamers to the usual, they would have to learn the game and to enjoy it. According to Chen (2006), the playing experience is described as a state of total immersion where the challenges fit perfectly with the skills of the players. If the challenge is too great, easily the player can feel anxiety or frustration; if it's too easy, the player may consider it boring. To get these features, the game must submit four elements: clear goals, constant feedback, ability to focus on the task and ability to complete the task.

Unlocked! is the first mobile game developed for iPhone by Periferia Creative. There are four concepts: fast game, funny, engaging and challenging. Unlocked! offers 40 levels full of challenges of skill against the clock. Using an elegant design and simple gestures on the screen of the smartphone (slide, turn, hit and separate) the player will unlock one after the other, filled doors security systems, always with a set time limit avoid being discovered. The game puts players in the role of thief whose mission is to recover a number of valuable objects in different emblematic buildings. Besides these objects can stay with the rest of the booty, consisting of gems in less or more depending on the time it takes to pass the level. To achieve the level should open doors interacting properly with all elements within the defined time. So far, the game is available only for the IOS operating system, although in the future it is planned to extend it to Android.

2. OBJECTIVES

Active-U is intended to adapt "Unlocked," a game designed and commercialized by Periferia Creative keeping their playful aspect, modifying the content of their challenges in order incorporating the therapeutic component.

Considering the technical features of Unlocked, which dominates motor skills, and given the demand generated fewer elements to orient newly decides version therapeutic

ActiveU towards empowerment cognitive functions such as attention, working memory and speed of information processing.

General objectives

- a) To adapt a playful game (Unlocked) to a therapeutic game (Active-U) designed to stimulate cognitive functions (attention, working memory and speed of processing information)
- b) To assess the usability of Active-U and to compare it with usability of Unlocked

3. METHOD

3.1. SUBJECTS

The sample consisted of a total of 17 subjects recruited from day hospital for cognitive impairment (Hospital de dia Sant Llatzer-Consorci Sanitari de Terrassa). For the selection of subjects the following inclusion criteria were followed. 1) Informed consent approved by the Ethics and Clinical Trails Committee, signed by the subject. 2) Age 50 to 90 years. 3) Diagnosed Mild Cognitive Impairment. 4) MMSE value greater than or equal to 24. 5) Rating scale or global dementia 0.5. 6) Enough capacity to read and write. 7) State medical and pharmacological stable for three consecutive months immediately before the start of the study. 8) Absence of abnormalities or clinically significant medical history. And the following exclusion criteria: 1) Neurological disorders, psychiatric. 2) medical or intellectual deficiency (Vocabulary, under 85). 3) 4 or less years of education. 4) Decrease or severe visual acuity. 5) Moderate or severe depression according score > 11 (moderate depression) or 19 (severe depression) in the Geriatric Depression Scale (GDS-Yessavage). 6) Presence or tremor. 7) History or presence of alcohol or other drug abuse in the 24 months prior to the study. 8) Negative front or the use of new technologies. 9) existence of any situation that could make the subject, in the opinion of the principal investigator for the study inadequate.

3.2. MATERIAL AND PROCEDURE

Instruments:

The System Usability Scale (SUS) is a tool for measuring the usability. It consists of a 10-item questionnaire with five response options for respondents; from Strongly agree to Strongly disagree. The participant's scores for each question are converted to a new number, added together and then multiplied by 2.5 to convert the original scores of 0-40 to 0-100. Though the scores are 0-100. Based on research, a SUS score above a 68 would be considered above average and anything below 68 is below average.

Procedure:

The study is performed on the following phases

Phase 0. Usability Unlocked!

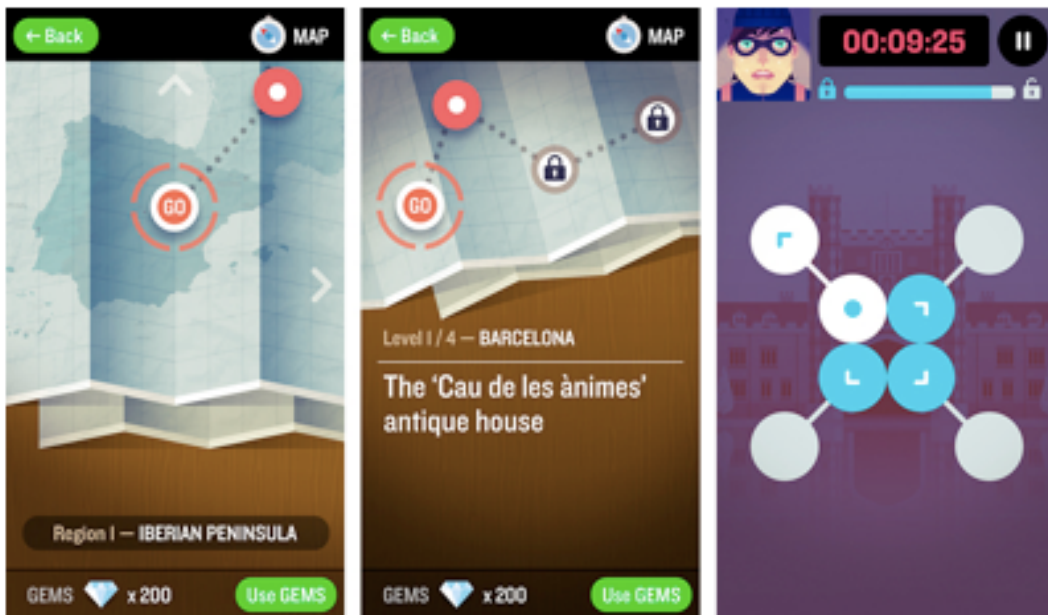


Figure 1. Structure of the game (Geographical area - Building - Level). Source: Periferia Creative

In conducting the usability test, we used System Usability Scale (SUS). We administered the game at 6 patients during three times. At the end of the process we administered de SUS to check the usability.

Phase 1. Adaptation Unlocked! to Active-U

For the process of adapting the Unlocked to the creation of Active-U three aspects are considered: model of cognitive training of attention of Sohlberg i Mateer, the results of usability testing of phase 0 and the technical requirements.

When structuring the different challenges of the levels, that has to consider administering simple tasks that minimize the frustration first and go progressively increasing difficulty until about half and propose new tasks relatively simple to the end.

Phase 2. Usability Active-U

As in phase 0, it proceeds to perform a usability test on Active-U (playful game adapted to therapeutic game). The same usability scale in the phase 0 is used to permit comparison.

Statistical analysis

To compare usability results (outcome measures) we will use for the total score a two-tailed t test for independent sample. To compare specific questions from the usability between to groups (Unlocked usability versus Active-U Usability) we used a two-sided chi-square test. Alpha level for statistical significance was set at 0.5. Analyses were performed by using PASW statistics for Windows, version 18.0

4. RESULTS

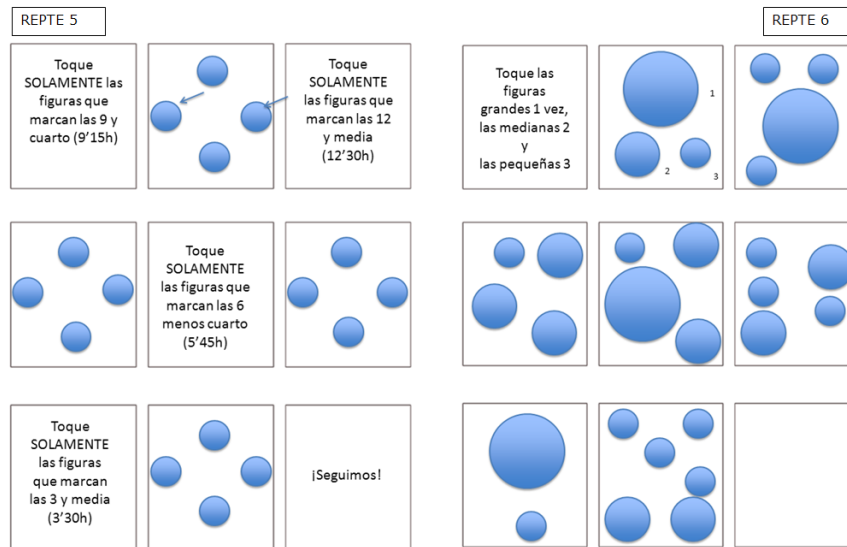


Figure 1. Example of Active-U exercises

	Mean	Minimum	Maximum	SD
Usability Unlocked!	81,67	65	88	8,612
Usability Active-U	76,36	65	88	7,447

Table 1. System Usability Scale

	Valor	gl	Sig.
Question 1	1,346	3	0,718
Question 2	0,298	1	0,585
Question 3	0,069	1	0,793
Question 4	0,944	2	0,624
Pregunta 7	3,766	3	0,288
Pregunta 8	0,58	1	0,446
Pregunta 9	0,701	1	0,402
Pregunta 10	6,491	2	0,039

Table 2. Comparison SUS's questions Unlocked and Active-U

Seventeen subjects were recruited from day hospital for cognitive impairment (Hospital de dia Sant Llatzer-Consorci Sanitari de Terrassa) all of them accepted to participate and signed the informed consent.

Outcomes

Table 1 shows stimuli adaptation to cognitive stimuli. Table 2 shows usability total score of the two groups (Unlocked and Active-U). No significant differences were observed for the usability total score between Unlocked and Active-U. Furthermore only a significant effect on question 10 (“I needed to learn a lot of things before I could get going with this system”) was found ($p=0.039$) favoring Unlocked.

5. CONCLUSIONS

The aim of this study was to adapt a playful game to a therapeutic game to stimulate cognitive functions, taking into account the results of Unlocked’s usability and making the fewest possible technological changes. Results indicated similar level of usability, except feel of needing more knowledge to use Active-U, and the instructions were easy to understand in Active-U.

The adaptation of playful games to learn from other therapeutic purposes to stimulate cognitive functions can be considered a useful method to achieve therapeutic goals and to optimize technology resources to expand their areas of application.

6. REFERENCES

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