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"Mementia" description and first usability testing with the end-users from "Cognitiva Unidad de Memoria" centres

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1 Objetives

This document describes the cognitive stimulation platform "Mementia" and the characteristics of the end-users who use it in "Cognitiva Unidad de Memoria" centres. Likewise, it describes the conclusions obtained after performing an initial testing to reflect and capture, in objective terms, how the subjects using "Mementia" platform as a cognitive stimulation tool, and which variables need to be considered in terms of usability of this kinds of applications.

2 Short description of "Mementia"

It is a digital environment created using HTML5. It is multiplatform and multi-device so it is operative on tablets, touch computers and computers with mouse. In addition it can be used normally in the most common browsers. "Mementia" consists of a dynamic catalogue, formed by numerous activities which are created and adapted to the needs of the end-users.

To access to the platform the user must enter his "user number" and his personal password associated with his user, then the start screen will appear to performing the exercises specifically assigned based on their features.
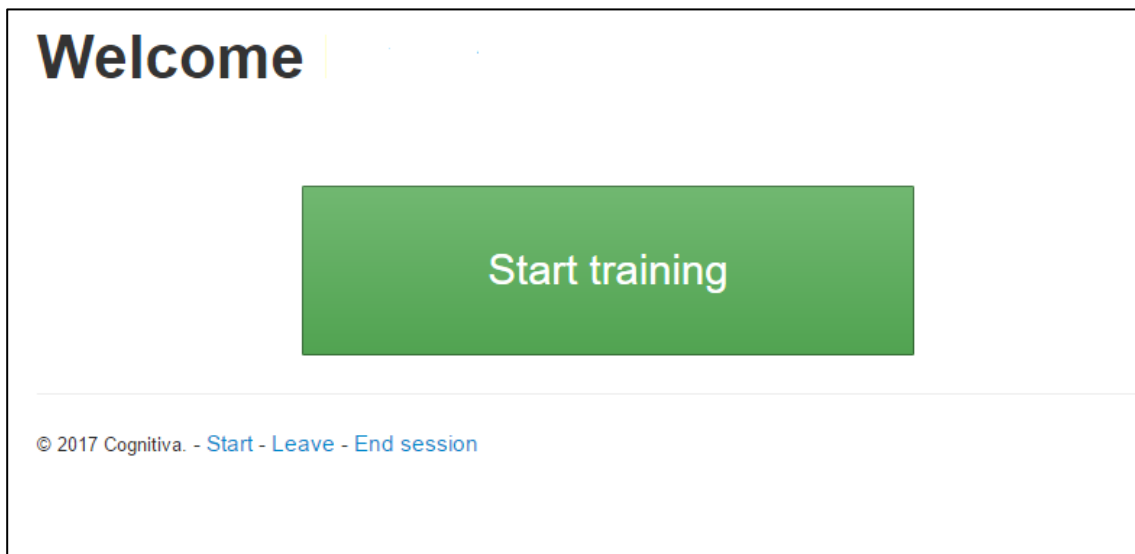

Figure 1: Screen to start the cognitive stimulation

The exercises that "Mementia" contains are categorized based on the cognitive function that is trained: Attention, Memory, Executive Functions, Calculus, Language, and Orientation.
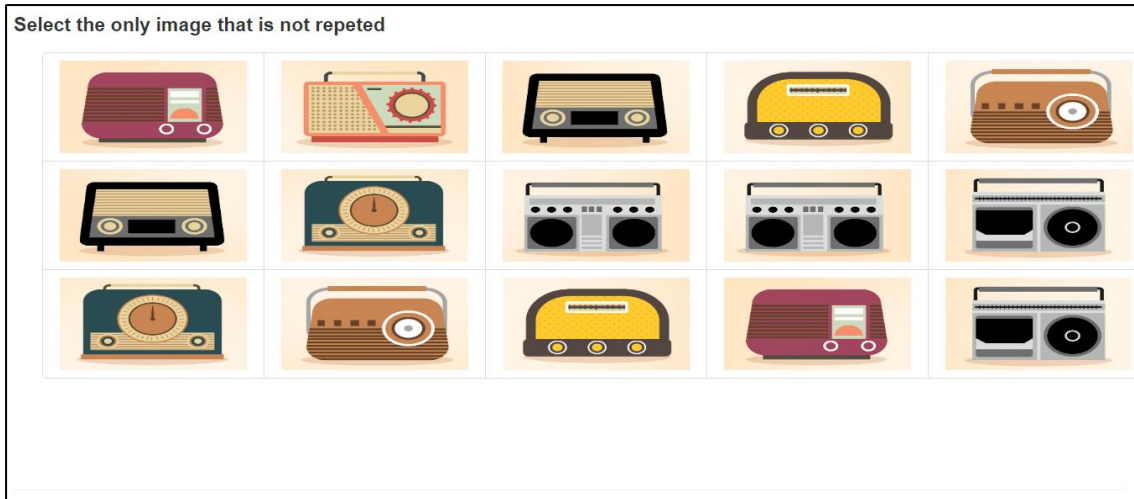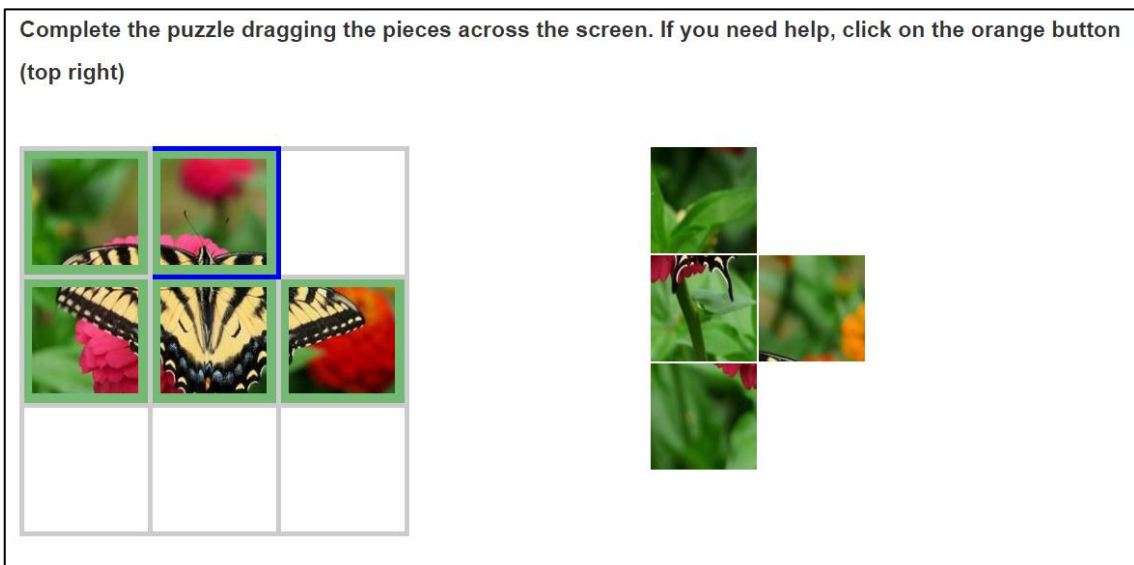

Figure 2: Example of Attention exercise

Figure 3: Example of Executive Function exercise with puzzle format.
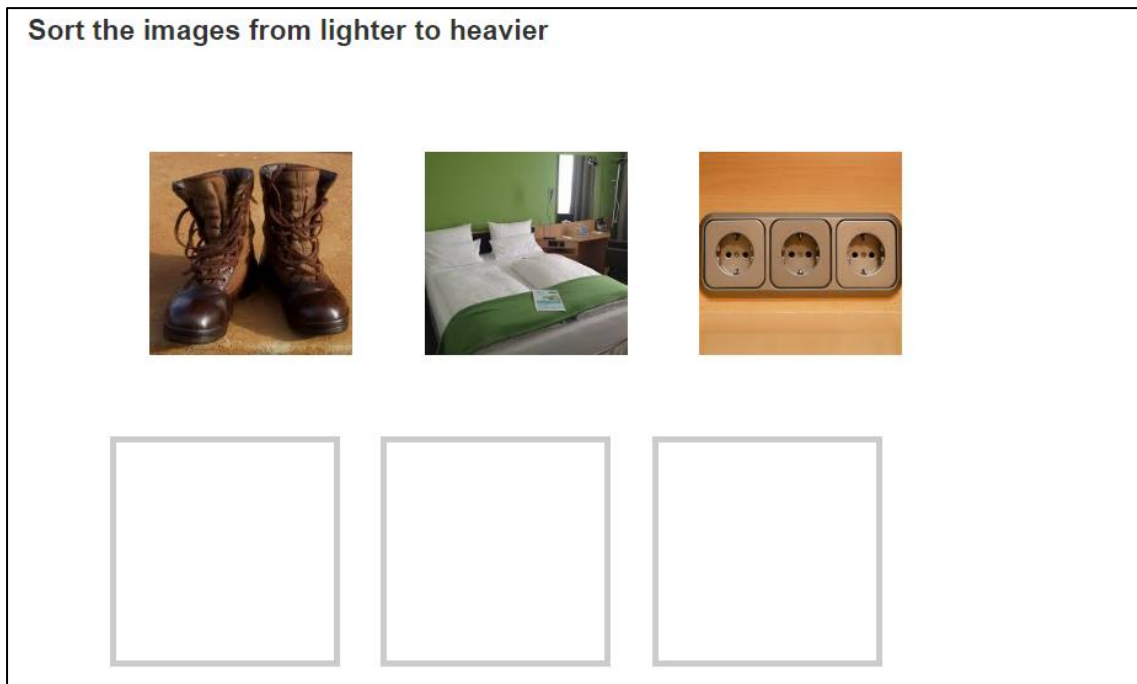
Sort the images from lighter to heavier

Figure 4: Example of Executive Function exercise with drag format

In every cognitive stimulation programme, adapting the level of exercises to the end-user level is very important. In this way what is sought is to achieve a balance, being able to offer activities neither too easy nor too difficult. This ensures a workload appropriate to each person, which is motivating but not frustrating. For this reason the platform includes 4 levels of training:

- Moderate cognitive impairment
- Mild cognitive impairment
- Memory problems associated with age
- Expert: people with a high cognitive level, without cognitive impairment, who use the platform with a preventive character

All Mementia's activities has exercises for each mentioned levels, which adjust the difficulty by varying the number of possible answers and the complexity of them, but having the same common goal of stimulating a certain cognitive function through a specifically designed exercise.

Figure 5: Example of calculus exercise for Moderate Cognitive Impairment

Figure 6: Example of calculus exercise for Expert level

Mementia has a data exploitation section. Each activity will record right answers and mistakes and will automatically calculate the so-called GCI **(General Cognitive Index)**. This index binds together the 6 capacities mentioned above, being able to see the score in detail and also in general.

Within this data exploitation screen, it also offers the possibility of analysing 3 other important dependent variables of each person, which will be updated with each training:

- **Stimulation time.** "Mementia" records training time in total, and also detailed each of the 6 capabilities.

- **Emotional state.** "Mementia" will ask at the end of each session for the emotional state of the end-user, and will calculate an average of all sessions. It is a score of 5, with two decimal places.

Also, "Mementia" has an automatic recognition system of emotions, when answering the question about the emotional state. It recognizes 8 basic universal emotions: happiness, sadness, surprise, anger, fear, contempt, disgust, neutral. Each time they answer the question about emotional state an image is captured with the front camera of the tablet, they are sent to the server and these emotions are detected. If it has been possible to recognize a face in the picture and get a value for the emotions found in the database along with the emotional state history. The 8 emotions are shown in a percentage that adds up among all 100, so that the strongest emotions will have a higher value

- It will also calculate the **self-assessment** that the person has made of each training (performance), asking the "grade" or "mark" that has been putted down on each specific day. This serves to see the level of frustration on the one hand, or to see if the exercises are not being stimulate (for example an end-user who is always assessed with a 10 after all sessions).

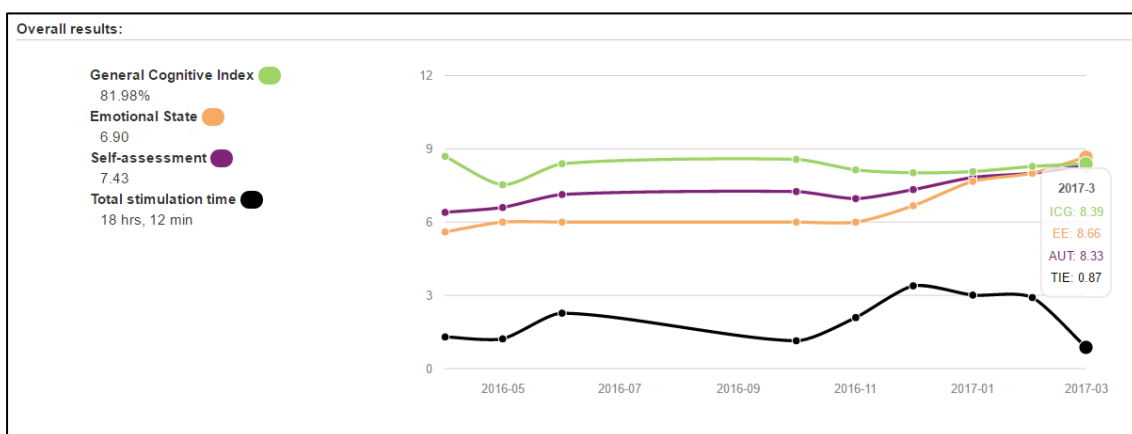Figure 7: Example of self-assesment screen after the training.

Figure 8: Example of a graphic with the four mentioned variables

3 End-users description

"Cognitiva Unidad de Memoria" consists of health centres in which non-pharmacological interventions are carried out with adult users. These interventions can be preventive, can be performed with patients with mild and moderate cognitive impairment, neurodegenerative diseases or other pathologies that affect cognitive performance.

The end-user profile that comes to "Cognitiva Unidad de Memoria" centres consists of men (38%) and women (62%) with a mean age of 78 years, with a level of education that fulfils the following characteristics: without studies or primary studies 10%, average studies not completed 15%, average studies completed 37% and higher studies 37%.

They are users who come to the centres on an outpatient nature, an average of three times a week, to perform interventions of 90 minutes duration. They are usually accompanied by a relative or caregiver.

Among the interventions that are carried out in the centres, one of them is cognitive stimulation, which is done in traditional format through group exercises, as well as cognitive stimulation through the use of new technologies, particularly the use of the platform/application "Mementia", through touch screens.

4 Importart aspect found in the testing

After a first test of the platform with different end-users who come to the "Cognitiva Unidad de Memoria" centres and use it as part of their intervention, the following aspects have been found to be mentioned, which must be taken into account at the time of develop an application for this purpose for elderly users with these features, who often have associated motor or sensory deficits:

- Simple access: profile and "user name" simple and rememberable, or preferably installed by default in the device.

- Low stimulation on the screen:

> - Simple background

> - Warm colours: white background for good contrast

> - Absence of distracting elements

- Large size images

- Simple and understandable wording

- Wording in written format and also in audio format, with the possibility of selecting one or the other, depending on the end-user features.

- All the information on the screen, without having to use scroll

- Need of feedback after performing an exercise. At present in "Mementia", the selected answer is highlighted in green if it is correct, and in red if it is incorrect and accompanied by a different sound also in both cases. It could be positive to incorporate certain messages depending on the execution (of mood or with recommendations).
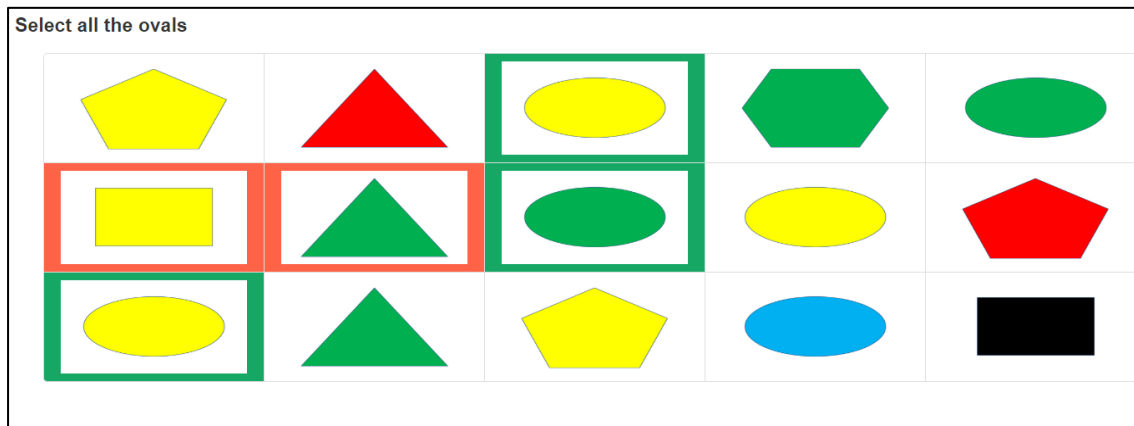

Figure 9: Example of an exercise with the feedback colour features.

Figure 10: Example of an exercise with the feedback colour features.

- Fairly or no existent "temporary" pressure in the exercises.

- Simple contact with the screen: click, drag briefly, etc., where complex finger movements or other used elements are not needed, given the fine motor skills problems that often have the end-user which use the platform.

- In touch screens: sensitivity not too excessive (sometimes they rest the hand on the screen, pushing too long, etc).

- Application specifically designed for use on large screens (in "Cognitiva Unidad de Memoria" centres the touch screens has 20 inches), by the benefits at visual level in comparison with smaller screens or tablets. For all of mentioned above (large size elements, simple contact, etc) the characteristics of a large screen are the ones which best suited to the needs of end-users.