Following the results of the previous experiment, it was decided to step up in complexity the experiment. It was understood that divided attention tasks would have been excessively disruptive with the object recognition and could have altered the results, so instead a new experiment would be designed. This will consist on a dual task experiment rather than divided attention.

The UNRAVEL task is a mechanical task divided in different steps that the participant has to fulfil cyclically, and it has been previously used for cognitive processing research (Altmann, Trafton & Hambrick, 2014; Altmann & Trafton, 2014; Hambrick & Altmann, 2014), as a sequential activity which would then be interrupted by a second activity. Cognitive processing research is focused on procedural errors, aiming to understand why those errors are produced after the interruption of a procedure, and how we then return to the sequence.

However, this experiment will change the roles of the usual procedure. The interruption task, in this case recognizing a series of visual stimuli presented at the beginning of the block, will be the main task and the UNRAVEL, seemingly the main task, would be an interruption for the memorization and recognition of objects. It has been suggested that knowing and remembering are separate processes (Gregg et al., 2006), so by presenting the stimuli in a short time randomly between the steps of the sequential task we should be able to minimize the effect of knowing and limit to the effects of remembering.

It has been suggested before that rotation may not be an important cue on object recognition since monkeys have been able to recognize instantly objects rotated 30 and 60º (Yamashita, Wang & Tanaka, 2010). However, this should be reviewed because the rotation angles have been too small for the recognition to rely on rotation. By increasing significantly the rotation to 90 and 180 degrees on two-dimensional, single colour drawings, it should be enough for rotation to be a determining factor.

**Method**

*Participants*

32 undergraduate students

*Materials*

A programme will be written on Python, presenting the UNRAVEL task and, when appropriate, images obtained from Snodgrass & Vanderwart (1980). These are two dimensional drawings in black over a white canvas of animals, items and body parts that every person should be familiarized with. The programme will be running on a PC. A table identical to Table 1 will be available for reference for the participant, but placed out of his/her reach.

*Design and Procedure*

The programme will show the visual stimuli to the participant while recording the responses. Participants will use the programme to complete the two tasks that they will be asked to do so: the UNRAVEL task and an image recognition task.

The UNRAVEL task consists on a series of small step tasks that the participant will complete in a sequence. They will see a screen with a box, a letter and a digit. One of them will be inside the box and the other one outside. One of them will change also in font style (either underlined or italic), font colour (red or yellow) as well as the value of the letter and digit. The digits used are 1, 2, 8 and 9, and the letters used will be A, B, U and X. The participant will have to press a key depending on the step s/he is doing, which is presented on the following table which will also be provided to the participant for reference, being placed in front of him/her out of reach:

|  |  |
| --- | --- |
| HOTKEYS | STEP |
| **U I** | Either the letter or digit is UNDERLINED or in ITALICS. |
| **N F** | The letter is NEAR the beginning of the alphabet or FAR from it. |
| **R Y** | Either the letter or digit is in RED or YELLOW. |
| **A B** | Either the letter or digit is ABOVE the box or BELOW the box. |
| **V C** | The letter is a VOWEL or a CONSONANT. |
| **E O** | The digit is EVEN or ODD. |
| **L M** | The digit is LESS than five or MORE than five. |

**Table 1.** Steps for the UNRAVEL task and the hotkeys that the participant has to choose from to respond depending on the stimulus presented.

The participant will always follow the sequence on the same order, and once s/he reaches the final step, s/he would begin again on the first step. This would go on for a series of rounds.

The recognition task would consist on presenting to the participant a series of images, each for three seconds. Then the participant would have to recognize them from a second series of stimuli.

The experiment will consist of two trial and four experimental blocks. The first trial test will be the UNRAVEL task, giving feedback when the answer is wrong so that the participant familiarizes with the task. The second trial block will begin showing a list of pictures and then begin with the UNRAVEL task. While doing the UNRAVEL task, it will pop up randomly after one of the steps a screen with a picture that can or cannot be from the list presented at the beginning of the block, and the participant has to press one key or another one to respond if it was on the list. Participants will only have 3 seconds to answer. The image will be randomly rotated 0, 90 or 180 degrees. After responding, the participant will continue with the UNRAVEL task. The interruptions will happen several times per text.

The experimental blocks will be the same as the second experimental block but with the difference that there will be no feedback given, so the participant will not know if s/he was wrong, as well as the images used, which must be different for each block. As well, all images will not be rotated for the first experimental block. For the second one they will be rotated 90 degrees, for the third 180 degrees and on the last one the rotation will be randomized.

Only the experimental blocks will record data. The accuracy and false alarm rates of the recognition tasks will be compared. The data for the UNRAVEL task will not be analysed since it is not the matter of study of this experiment as it is used as a distraction activity, although it could provide data for cognitive processing research.