

SEMANTIC TASK

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In this tutorial, you will learn how to implement the MICA task-based functional MRI battery. This platform has been designed to tap into the different domains of relational memory, namely, episodic memory, semantic memory, and spatial memory. Tasks are python-based, implement a 3-alternative forced choice paradigm, and employ similar visual stimuli across two experimental conditions: easy & difficult. The current tutorial deals with the semantic memory task.

In the semantic task, the participant must make accurate conceptual associations. At each trial, an object appears at the top with three others at the bottom. The participant must choose the option that shares the highest degree of conceptual relation with the item at the top. For example, if a kitten is displayed as the top object, and the items at the bottom are a kettle, a puppy, and a doorknob, then the participant would be choosing the puppy. There are 56 trials in total, 28 easy & 28 difficult. Difficulty is based on how strongly each option (i.e., kettle, puppy, and doorknob) is associated with the target (i.e., kitten). Thus, conceptual relatedness was computed using the UMBC Phrase Similarity Service (Han et al, 2013), which calculates a pairwise semantic relationship index based on the frequency with which two words co-occur within the Refined Stanford WebBase Corpus.

All memory tasks are called from a common graphical user interface titled "Instructions".

Step 1:

From the 'micaopen/task-fMRI' directory, open a terminal and call the "Instructions" GUI by typing 'python instructions.py' and pressing 'enter'.

Step 2:

Choose "English". You will be prompted to a new GUI called "Cognitive task", which encompasses the three memory tests that make up the MICA task battery.

Step 3:

To call the semantic task, click "semantic", which will open a GUI called "semantic task".

Step 4:

Enter the relevant information in the appropriate boxes. For example, for "session", enter "001"; for "subject name", enter "enkidu"; for "symbol list", enter "demo".

Note: For "symbol list", you have the choice between, "A", "B", and "demo". The demo list is an abridged version of the full task.

Click "OK" to continue.

Step 5:

The instructions will now appear on the screen. Read them carefully and when you are ready to proceed, press either '2', '3', or '4' on your keyboard.

Note: Participants inside the scanner are provided with a button box with 4 buttons, numbered '1', '2', '3', and '4'. Only buttons '2', '3', and '4' are used for the purposes of this task. Thus, when prompted to "Press any button to continue...", participants know that it's either '2', '3', or '4' that must be pressed.

Step 6:

You should now see "waiting for scanner..." on the screen. The program is now waiting for the scanner to send a trigger before commencing. To emulate this trigger, press '5' on your keyboard. The task will now begin. At each trial, you must select which of three options is most strongly related to a target item at the top of the screen. To choose the leftmost option, press '2'; to choose the center option, press '3'; to choose the rightmost option, press '4'. Press only one key per trial and simply wait for the next trial to appear.

Note: Should you wish to exit the program before the end of the task, press 'esc' during any fixation screen (i.e., any one of the repeating windows with a '+' in the center).

Step 7:

At the end of the run, you will see the "End of experiment" screen. Press 'space' to exit.

Note: A new folder will have been created in 'micaopen/task-fMRI/tasks/semantic' called 'data'. This folder will contain two corresponding log files for semantic task that was just run: a .log file and a .csv file.

Step 8:

Now that you have successfully completed the semantic task, you can verify how well you performed on it. Open a terminal from the 'micaopen/task-fMRI' directory, type 'python eval.py' and press 'enter'.

Step 9:

Choose "English" and you will be directed to a new GUI titled "Evaluator". Select "semantic".

Step 10:

In the new "Semantic Evaluator" GUI, enter the relevant information. You must ensure that all the information corresponds to what you entered previously at the outset of the semantic task. For this example, for "session", enter "001"; for "subject name", enter "enkidu"; for "symbol list", enter "demo". Click "OK".

Note: A new folder will have been created in 'micaopen/task-fMRI/tasks/semantic' called 'data_score'. This folder will contain a single .csv file, which contains behavioral information, such as performance scores on each condition and various reaction time outputs.