Testing the hypothesis that the default mode network role is to generate representations form memory.

The aim of the current study is to examine whether the DMN activity in the 1-back paradigm developed by Konishi and colleagues is to regenerate representations of information from memory. To test this idea we would like to compare conditions in which participants have to remember the spatial layout of coloured shapes under two conditions. In one condition they will identify which side of a spatial array of shapes is similar to a prior trial, in the second condition they will be asked to remember which side of the display a stimulus was on. These two conditions will thus compare whether two images match a memory of the prior trial, while in the other condition they have to generate the spatial location of a stimulus from memory. This will help us understand if the role of the DMN in states like daydreaming and mind-wandering is to generate a conscious experience from memory, or to simply reflect an experience that has already been generated. The paradigm will look something like this:



The left most column has the condition in which the person must generate the spatial location of the probed object, the centre column is a condition in which the participant must select the stimulus that is in the same place as on the prior trial, and the right most column is the control condition in which the person must simply decide which of the bottom two stimuli the central stimulus is the same as.

In this experiment we could have three shapes (circles, squares and triangles) in three different colours (blue, red and green) so a total of nine items. They will be paired together in each of the possible combinations (e.g. blue square and red circle, red circle and green triangle etc…). Ideally we would have one of each pair for each decision (so each decision will be made 36 times). We should also have a range of encoding periods before the catch trial (2-5 so an average of 3) so that the participant cannot predict when the target will occur. We will also have 12 times when instead of a decision would have occurred a null event. We will use these to control for differences across the blocks that are not related to the decision. This means that the trial loop will repeat 48 times. The encoding stimuli should be on the screen for 2 seconds, the fixation cross is jittered between 1 and 4 second (an average of around 2.5) and the response periods is are screen for 3 seconds. This means we can collect 13 minutes of each task, so the whole experiment will last 40 minutes plus set up time plus time between blocks.

Timeline

May - June. Program behavioural experiment in Psychpy

June – September. Run pilot study on friends and relations. Adjust paradigm as needed

September – October. Run second pilot on participants we have ran in resting state experiments already (n = 50). This will allow us to look at the relationship between these measures and the connectivity of the DMN to see if we can predict performance.

November- December. Run functional experiment, with additional case funded by ERC grant.