Introduction

The hypothesis is that memory activation is modulated by executive control and learning is nonmonotonic.

If a memory is strongly retrieved it gets strengthened.
If a memory does not activate, nothing happens.
If a memory activates to a moderate degree, it gets weakened.

The nonmonotonic pattern has been found at the synaptic level (short-term synaptic potential) and at population level (neural plasticity hypothesis).

We want to see if this pattern occurs at the level of memory representations.

Paradigm and Experimental Logic

To facilitate our classifier analyses, we had subjects learn word pairs instead of word pairs. Pictures were down from four different face categories, faces, cars, shoes, and tools.

Study Phase (day 1, outside of scanner). Learn retention procedure; each pair was tested until subjects correctly recalled it.

Think-No Think Phase (day 2, in scanner). Think items were shown in green and no-think items were shown in red. Think items were presented 6x. No-think items were presented 4x. All items shown in the Think-No Think phase were associated with one of three faces (Square, Shoe, Car).

Analysis Phase: We trained pattern classifiers to track activation relating to the four categories (faces, cars, shoe, tool).

We used these classifiers to covertly measure robust levels of associated items during the Think-No Think phase. For example: Since nickel was paired with a face at study, we would use the face classifier on this trial to measure the rate of which the face associated was coming to mind.

Alternatively, instead of using classifier outputs, we used time courses from the prefrontal cortex (PFC) and visual and sensorimotor (SOM) areas to index face, shoe, and tool recall.

Background: The Think/No Think Paradigm

Anderson & Green (2001) had subjects study novel word pairs like elephant - wrench and pair & told for pairs assigned to the no think condition, subjects are given the first word of the pair, and asked to remember the second word. If subjects are given the first word of the pair and asked to remember the second word, then they activate the other item with it. The other item is the target and the first item is the distractor.

The Think-No Think paradigm is a useful tool for testing the effects of distractors on memory retrieval. In the Think-No Think paradigm, subjects are given the first word of a word pair, and then asked to either think about the second word or not think about it. The second word is then cued, and the subject is asked to recall the first word. The goal of this paradigm is to measure the effects of distractors on memory retrieval.

The Think-No Think paradigm has been used to study a variety of phenomena, including the effects of distractors on memory retrieval, the role of executive control in memory, and the effects of task demand on memory performance.

Preliminary fMRI Curve Fitting Results

The best-fitting curve is theory-consistent (it has a dip and then increases)

How will the curve predict the data?

For this curve, the correlation between predicted and actual recall across trials for no-think items was .27. The probability of getting a correlation this large due to chance (assuming using a non-parametric permutation test) was p < .001.

The above analysis tells us which curve fits best

No Think vs. Baseline

but Think vs. Baseline and No Think vs. Baseline differences were not significant.

Conclusions

The Think-No Think paradigm is a useful tool for testing the effects of distractors on memory retrieval. In the Think-No Think paradigm, subjects are given the first word of a word pair, and then asked to either think about the second word or not think about it. The second word is then cued, and the subject is asked to recall the first word. The goal of this paradigm is to measure the effects of distractors on memory retrieval.

By contrast, hierarchical Bayes also allows us to model inter-subject variability.

References


tained by synaptic depression.


Funding for this research was provided by NHMRC grant R091 M061456 to KAN. This poster can be downloaded from http://compmem.princeton.edu. 1 Department of Psychology and Princeton Neuroscience Institute, Princeton University 2 Memrise, Inc. (www.memrise.com)