Multi-Voxel Pattern Analysis Reveals Increased Memory Targeting and Reduced Use of Retrieved Details During Single-Agenda Source Monitoring

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Background and Research Objectives

Agenda-Dependent Memory

•*Agenda-dependent memory* refers to how an individual's goals at the time of retrieval can influence what information he remembers and/or the extent to which he uses it (Mitchell et al., 2008)

•*Source monitoring* is the act of identifying the origin of a memory. (e.g., Johnson et al., 1993; Marsh & Hicks, 1998)

- •*Single-agenda monitoring:* Did you hear that from your mother?
- •*Multi-agenda monitoring:* Who told you that?

Objectives

•Isolate neural correlates of distinct *encoding states* with fMRI and multi-voxel pattern classification. Track the presence of these states during retrieval.

•Characterize differences between single- and multi-agenda scenarios.

- •Memory cuing (how much do subjects focus on the target source?)
- •Utilization (how much do subjects scrutinize retrieved info?)

Experimental Paradigm

Overview

•Participants completed 6 runs of studying & retrieving words.

Encoding Tasks

•**Artist**: Imagine drawing the object. Was the object easy or hard to draw?

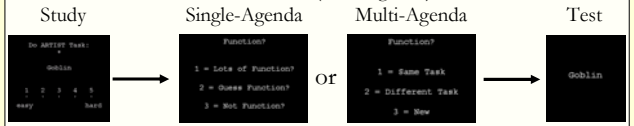
•**Function**: How many ways could you use this object?

•**Read**: Silently read the word backwards. Was that easy or hard?

Retrieval Manipulation

•Experiment 1: subjects judge whether items were studied using the targeted source or not (single-agenda).

•Experiment 2: subjects judge whether items were studied using the targeted source, a different source, or are new (multi-agenda).



•Incongruent trials: when targeted task & actual task don't match (as above)

•Targeted Task (TT) = Function, Actual (AT) = Artist, Other (OT) = Read

•We use classifier activity associated with these different task types to read out memory targeting (TT) and recollection (AT).

Multi-Voxel Pattern Classification

Classification Procedure

•Analyses were conducted using the Princeton Multi-Voxel Pattern Analysis Toolkit (www.csbmb.princeton.edu/mvpa).

•Scan subjects during study and test

•Train a neural network classifier to discriminate between brain volumes corresponding to a subject performing the artist, function, or read tasks at study (Polyn et al., 2005)

•Apply the trained classifier to individual TRs from test phase

- •Get an estimate for how much the subject activates artist, function, and read patterns from the study phase

Differences in Memory Cuing Strategies

Research Question & Prediction

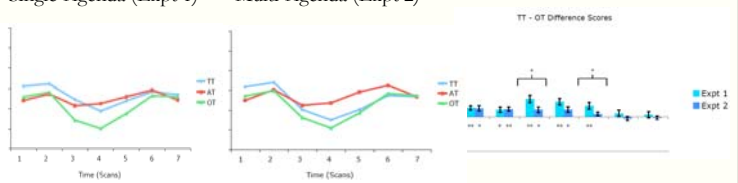
•Do subjects try to target memories from a specific task by performing that task at test during single-agenda more than multi-agenda source monitoring?

- •If so, single-agenda should be associated with higher levels of TT than multi-agenda.

Results

•More TT activation in single-agenda source monitoring

Single-Agenda (Expt 1) Multi-Agenda (Expt 2)



Relationship Between Targeting and Retrieval

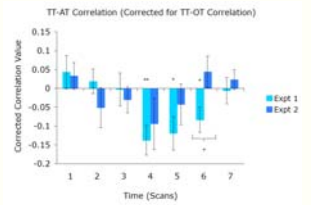
Research Question and Prediction

•Does performing the targeted task during single-agenda tests limit actual task recollection?

- •If so, we should observe a negative correlation between measured TT and AT in Experiment 1 but not Experiment 2.

Results

•TT activity was negatively correlated with AT activity in Experiment 1 at timepoints 4, 5, and 6



Utilization of Retrieved Details

Research Question and Prediction

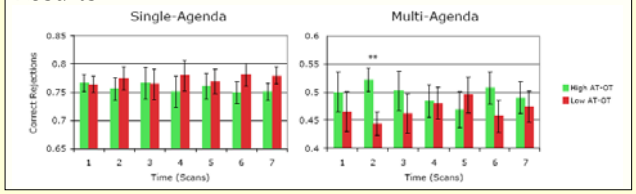
•Do subjects utilize recollected details? If they do:

- •High levels of AT should be associated with increased correct rejections.

•Subjects should scrutinize retrieved info more in multi- than single-agenda.

•To test this question, we plotted correct rejections as a function of whether AT activity was high or low on that trial.

Results



Future Directions

•Would subjects do a better job of utilizing retrieved details during single-agenda scenarios if we don't include new items at test?

•Does activation of source information occur during testing scenarios that do not ask subjects about source information?

References

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