Dissociating the Role of the Dorsolateral Prefrontal and Anterior Cingulate Cortex in Cognitive Control

Donald, Cohen, Stenger, & Carter
Science 2000
working memory control

divided attention

novel tasks

overcoming default responses

often active simultaneously
• fMRI study
• 12 subjects
• performing Stroop task
• contrasting DLPFC and ACC activity
<table>
<thead>
<tr>
<th>Congruent</th>
<th>Incongruent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Blue</td>
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<tr>
<td>Yellow</td>
<td>Green</td>
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<td>Blue</td>
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<tr>
<td>Blue</td>
<td>Red</td>
</tr>
</tbody>
</table>
2500 ms/scan

Instruction (1500 ms): "Word" or "Color"

25 seconds / trial

Colored word (1500 ms): "Red" "Green" "Blue" etc.
Paradigm

Instruction (1500 ms): “Word” or “Color”

Colored word (1500 ms): “Red” “Green” “Blue” etc.

2500 ms/scan

% MR change from baseline (T1)

% MR change from baseline (T10)

L. DLPFC (BA 9)

ACC (BA 24/32)

Instruction-related fMRI Activity

- Color +/- SE
- Word +/- SE

Color-naming response-related fMRI Activity

- Congruent +/- SE
- Incongruent +/- SE

25 seconds / trial
DLPFC - exerting control

% MR change from baseline

2500 ms/scan

Instruction (1500 ms): "Word" or "Color"

25 seconds

Color +/- SE
Word +/- SE
ACC - more active for conflict

% MR change from baseline

Colored word (1500 ms): "Red" "Green" "Blue" etc.
Summary

- DLPFC for attentional demands, maintaining context of a task
- ACC for monitoring conflict
- Double disassociation of frontal lobe areas
Tips

• Don’t need every detail
• Focus on paper over background
• Break down figures
• Explaining tasks & figures take time