Decoding the use of working memory & episodic memory in prospective remembering   *829.04*

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1 "Prospective memory"

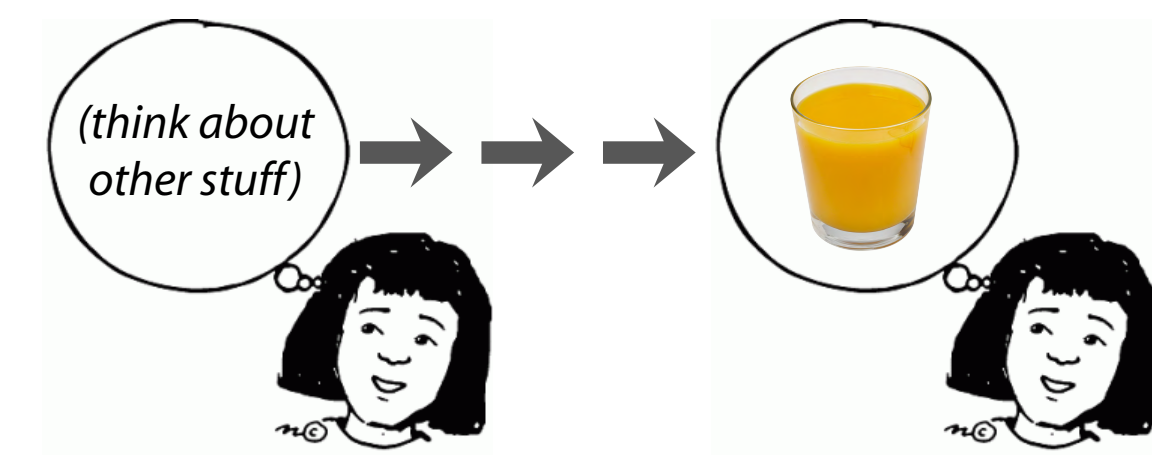*How do we remember to execute our plans at the appropriate time?*

e.g., Think to yourself ...
"I need to buy orange juice"

Working Memory
active maintenance
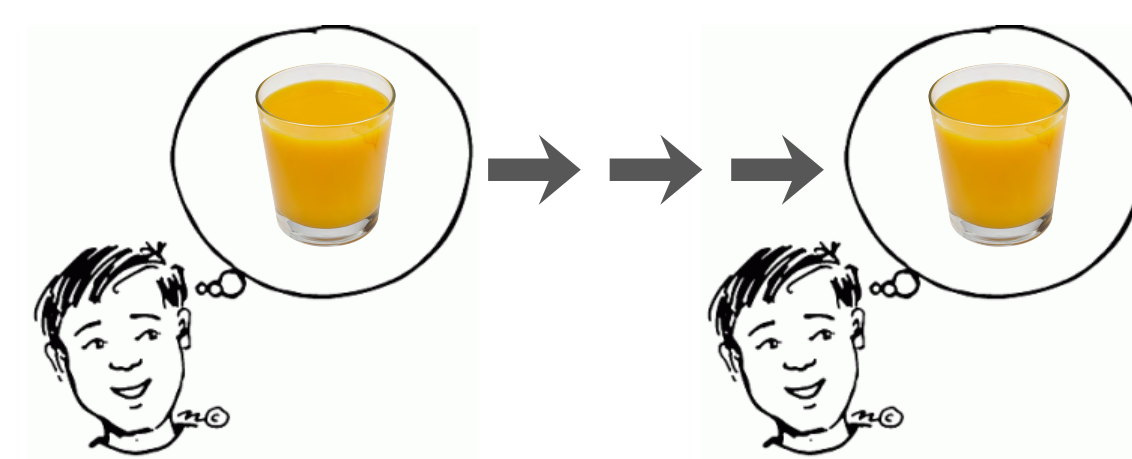
costly but reliable

cheap but unreliable

(think about other stuff)

Episodic Memory
cue-based retrieval

2 Logic of our study

see: McDaniel & Einstein (2007); Reynolds, West, & Braver (2009); Gilbert (2011); Lewis-Peacock, Drysdale, Oberauer, & Postle (in press)

Balance two simultaneous tasks

1. Picture recognition
2. Lexical decision (n-back)

Bias strategy used for picture task

Working Memory **(WMbias)**

→ *high proactive interference & easy lexical decisions (1-back)*

Episodic Memory **(EMbias)**

→ *low proactive interference & hard lexical decisions (2-back)*

Assess fMRI for evidence of strategy

Use multivariate pattern analysis (MVPA) to measure the active, sustained retention of the target stimulus

Predictions:

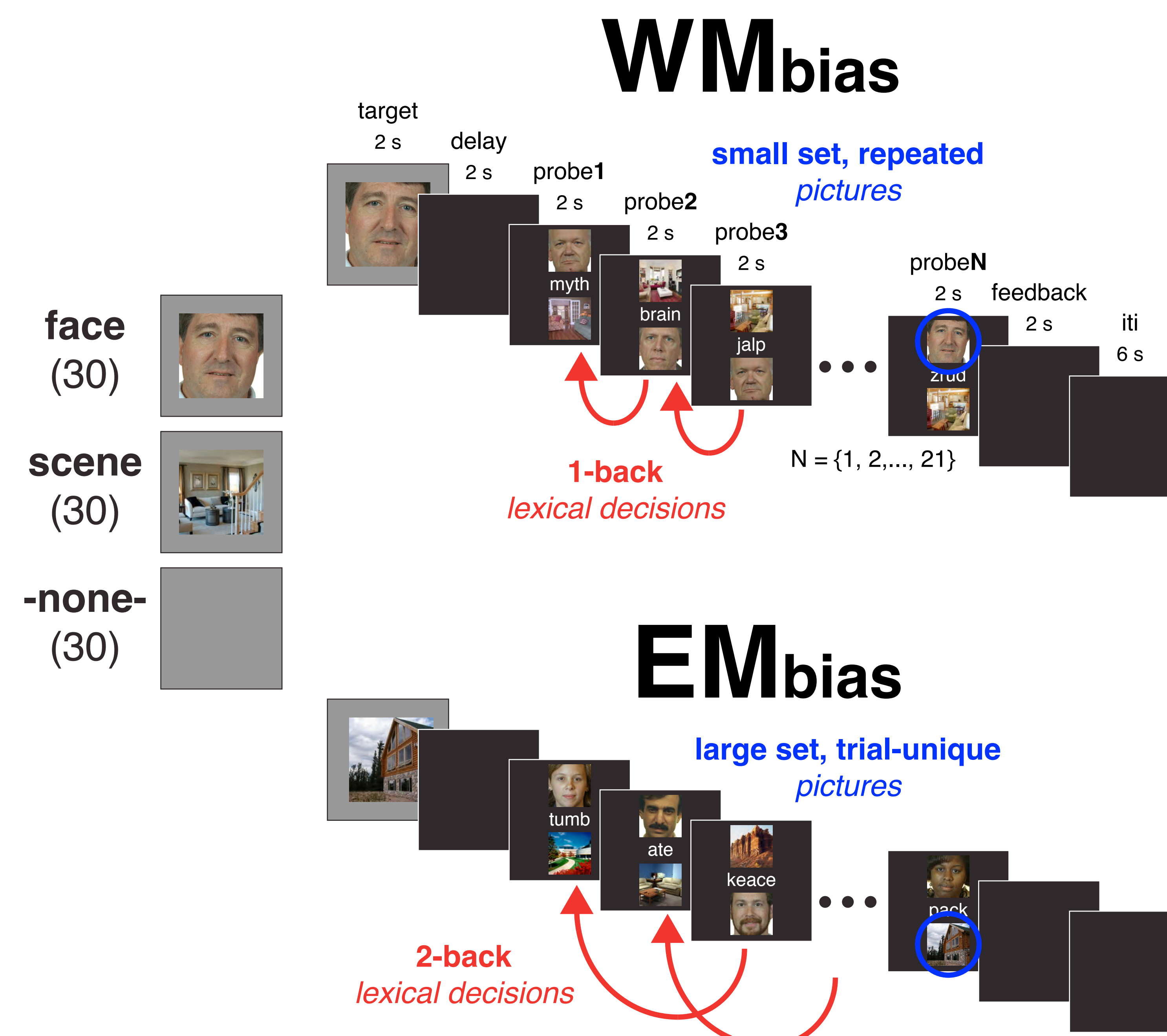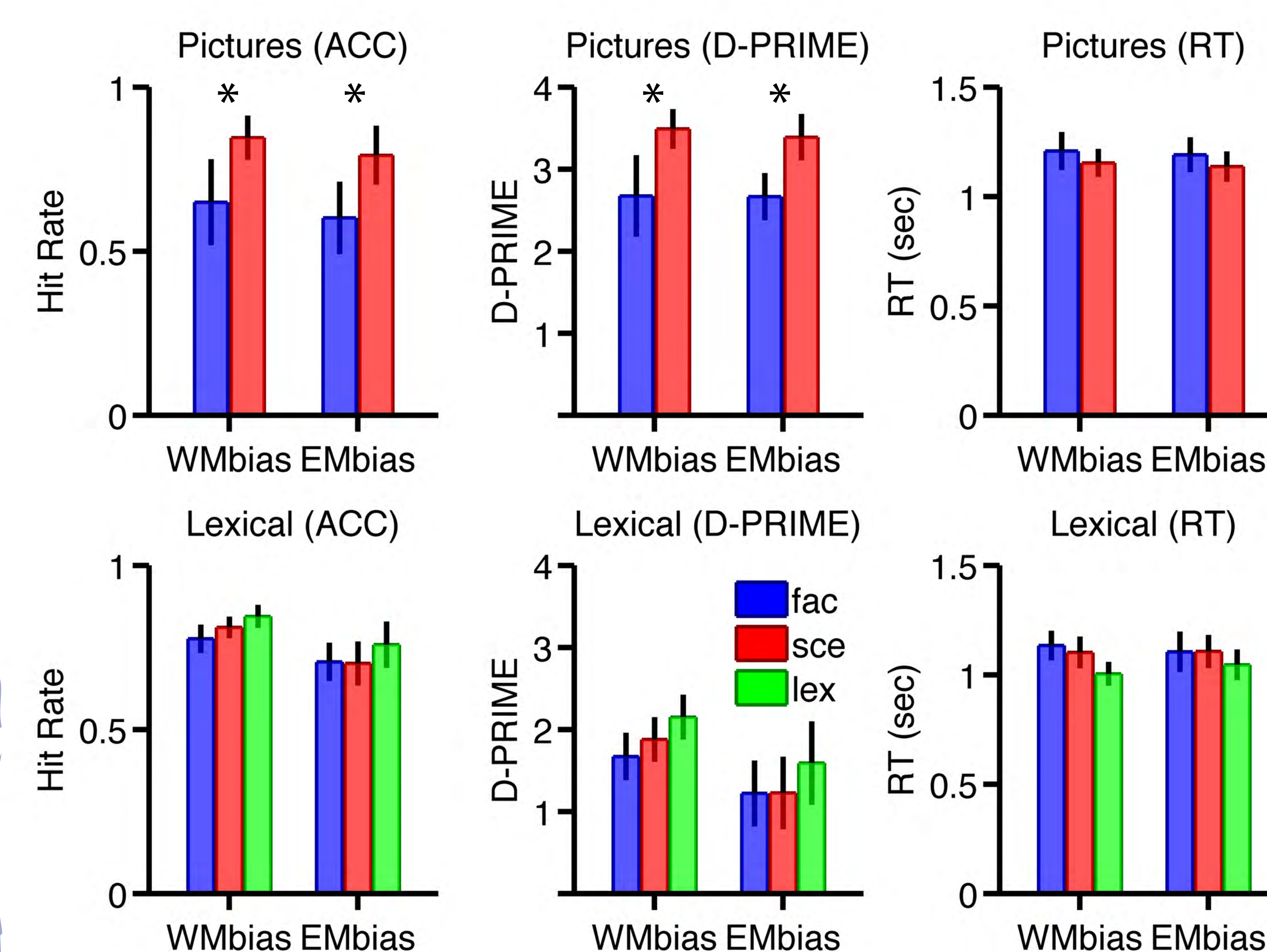MVPA readout should correlate with prospective memory performance more in WMbias trials than in EMbias trials

Episodic retrieval success effects in posterior parietal cortex should be greater in EMbias trials than in WMbias trials

3 Task & procedures

WMbias

target 2 s delay 2 s probe1 2 s probe2 2 s probe3 2 s ... probeN 2 s feedback 2 s iti 6 s

small set, repeated *pictures*

face (30)
scene (30)
-none- (30)

1-back *lexical decisions*

N = {1, 2,..., 21}

EMbias

large set, trial-unique *pictures*

2-back *lexical decisions*

6 blocks (15 trials each), alternate condition (random 1st)

| WMbias | EMbias | WMbias | EMbias | WMbias | EMbias |

4 Behavioral performance

Result - comparable performance in both conditions

Pictures (ACC)   Pictures (D-PRIME)   Pictures (RT)

Lexical (ACC)   Lexical (D-PRIME)   Lexical (RT)

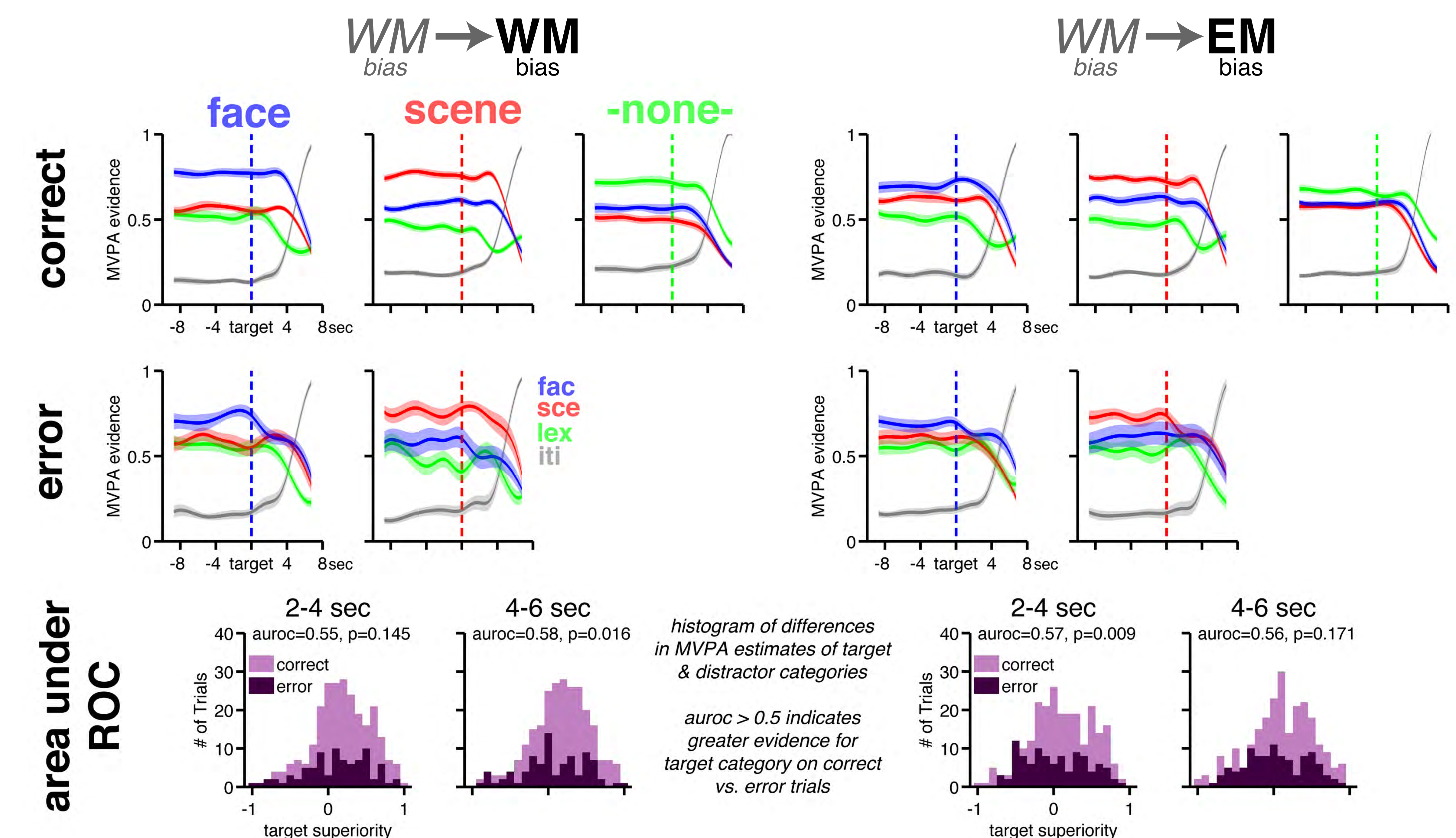fac sce lex

N=14 participants; 18-35 years old, healthy young adults

5 MVPA: cross-validation (*train→test*)

Result - classification is best when training &/or testing on WMbias trials

WM bias → **WM** bias   EM bias → **WM** bias   WM bias → **EM** bias   EM bias → **EM** bias

MVPA accuracy

◆ $p < .001$
◇ $p < .05$

chance

fac sce lex iti

MVPA evidence

fac sce lex iti
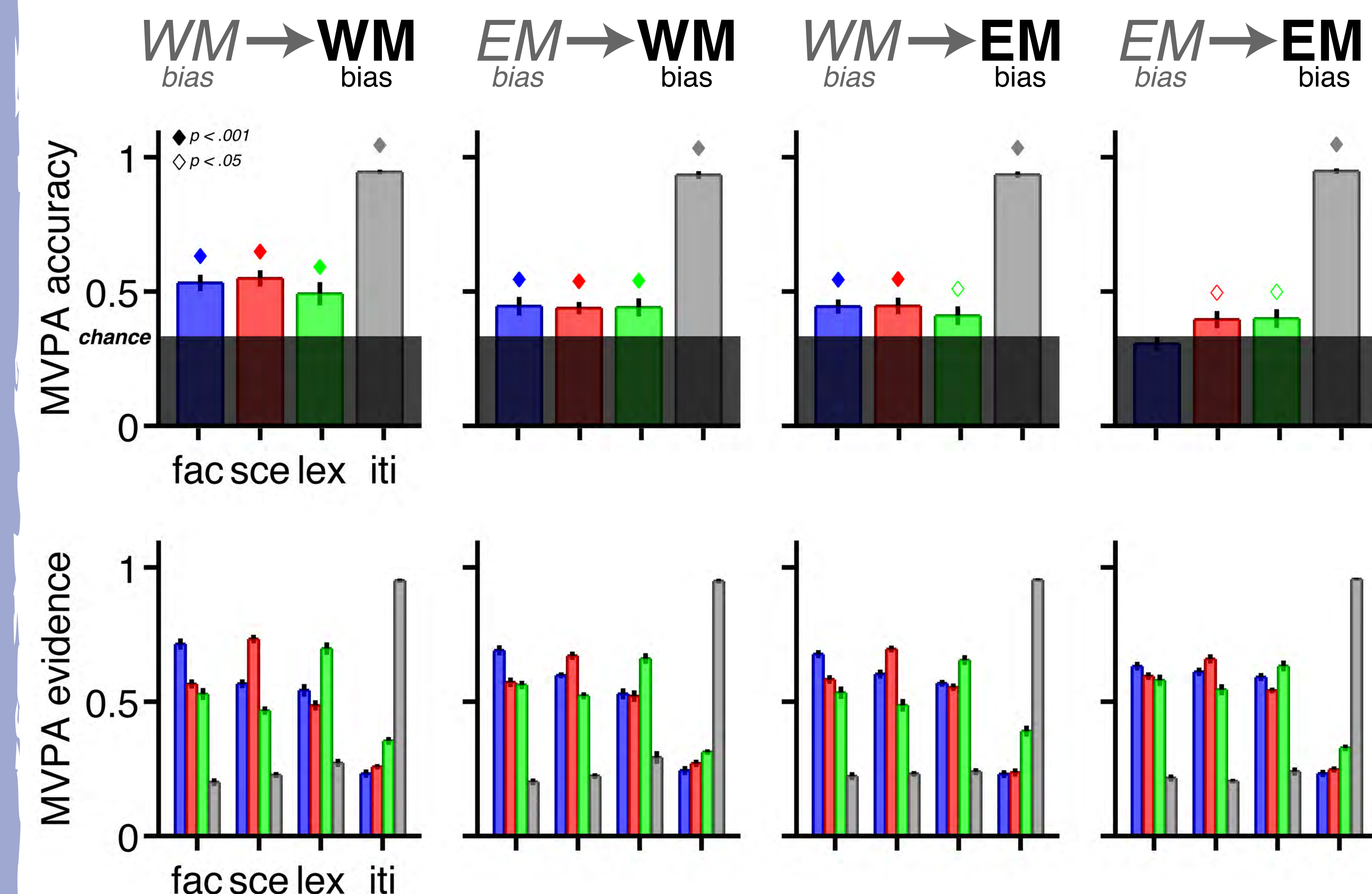
* *Classification done separately for each subject, using L2-penalized logistic regression, in anatomically-derived voxel mask consisting of fusiform & parahippocampal gyri*

6 MVPA: trial-averaged decoding & behavior

WM bias → **WM** bias   WM bias → **EM** bias

correct

face   scene   -none-

MVPA evidence

error

MVPA evidence

fac
sce
lex
iti

area under ROC

2-4 sec   4-6 sec

auroc=0.55, p=0.145   auroc=0.58, p=0.016

2-4 sec   4-6 sec

auroc=0.57, p=0.009   auroc=0.56, p=0.171

correct
error

target superiority

histogram of differences in MVPA estimates of target & distractor categories

auroc > 0.5 indicates greater evidence for target category on correct vs. error trials

7 GLM

Preliminary *results suggest a dissociation of hits/misses in left dlPFC (WMbias) & left Angular Gyrus (EMbias)*

left dlPFC

WMbias

correct
error

BOLD (z)

EMbias

-8 -4 target 4 8

left Ang. Gyrus

WMbias

EMbias

-8 -4 target 4 8