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Reporting Checklist for Nature Neuroscience

This checklist is used to ensure good reporting standards and to improve the reproducibility of published results. For more information, please read Reporting Life Sciences Research.

Please note that in the event of publication, it is mandatory that authors include all relevant methodological and statistical information in the manuscript.

Statistics reporting, by figure

- Please specify the following information for each panel reporting quantitative data, and where each item is reported (section, e.g. Results, & paragraph number).
- Each figure legend should ideally contain an exact sample size (n) for each experimental group/condition, where n is an exact number and not a range, a clear definition of how n is defined (for example x cells from x slices from x animals from x litters, collected over x days), a description of the statistical test used, the results of the tests, any descriptive statistics and clearly defined error bars if applicable.
- For any experiments using custom statistics, please indicate the test used and stats obtained for each experiment.
- Each figure legend should include a statement of how many times the experiment shown was replicated in the lab; the details of sample collection should be sufficiently clear so that the replicability of the experiment is obvious to the reader.
- For experiments reported in the text but not in the figures, please use the paragraph number instead of the figure number.

Note: Mean and standard deviation are not appropriate on small samples, and plotting independent data points is usually more informative. When technical replicates are reported, error and significance measures reflect the experimental variability and not the variability of the biological process; it is misleading not to state this clearly.

		TEST USED		n			DESCRIPTIVE STATS (AVERAGE, VARIANCE)		P VALUE		DEGREES OF FREEDOM & F/t/z/R/ETC VALUE	
	FIGURE NUMBER	WHICH TEST?	SECTION & PARAGRAPH #	EXACT VALUE	DEFINED?	SECTION & PARAGRAPH #	REPORTED?	SECTION & PARAGRAPH #	EXACT VALUE	SECTION & PARAGRAPH #	VALUE	SECTION & PARAGRAPH #
example	1a	one-way ANOVA	Fig. legend	9, 9, 10, 15	mice from at least 3 litters/group	Methods para 8	error bars are mean +/- SEM	Fig. legend	p = 0.044	Fig. legend	F(3, 36) = 2.97	Fig. legend
example	results, para 6	unpaired t-test	Results para 6	15	slices from 10 mice	Results para 6	error bars are mean +/- SEM	Results para 6	p = 0.0006	Results para 6	t(28) = 2.808	Results para 6

		TEST USED		n			DESCRIPTIVE STATS (AVERAGE, VARIANCE)		P VALUE		DEGREES OF FREEDOM & F/t/z/R/ETC VALUE	
	FIGURE NUMBER	WHICH TEST?	SECTION & PARAGRAPH #	EXACT VALUE	DEFINED?	SECTION & PARAGRAPH #	REPORTED?	SECTION & PARAGRAPH #	EXACT VALUE	SECTION & PARAGRAPH #	VALUE	SECTION & PARAGRAPH #
+ -	Fig 3A, left	repeated-measures ANOVA	Results, para 3	22	Human subjects in Exp 1	Methods, para 1	error bars are mean +/- SEM	Fig. legend	main effect of direction: p = 0.003; main effect of museum: p = 0.002; interaction: p = 0.401	Results, para 3	main effect of direction: F(1,21) = 11.631; main effect of museum: F(1,21) = 11.802; interaction: F(1,21) = 0.734	Results, para 3
+ -	Fig 3A, right	paired-samples t-test	Results, para 8	22	Human subjects in Exp 1	Methods, para 1	error bars are mean +/- SEM	Fig. legend	p = 0.214	Results, para 8	t(21) = 1.283	Results, para 8
+ -	Fig 3B, left	repeated-measures ANOVA	Results, para 6	22	Human subjects in Exp 1	Methods, para 1	error bars are mean +/- SEM	Fig. legend	main effect of location: p = 0.026; main effect of museum: p = 0.052; interaction: p = 0.915	Results, para 6	main effect of location: F(1,21) = 5.695; main effect of museum: F(1,21) = 4.227; interaction: F(1,21) = 0.012	Results, para 6
+ -	Fig 3B, right	repeated-measures ANOVA	Results, para 8	22	Human subjects in Exp 1	Methods, para 1	error bars are mean +/- SEM	Fig. legend	p = 0.340	Results, para 8	t(21) = 0.976	Results, para 8
+ -	Fig 4A, left	repeated-measures ANOVA	Results, para 13	24	Human subjects in Exp 2	Methods, para 1	error bars are mean +/- SEM	Fig. legend	main effect of direction: p = 0.00017; main effect of museum: p = 0.131; interaction: p = 0.942	Results, para 13	main effect of direction: F(1,23) = 20.009; main effect of museum: F(1,23) = 2.450; interaction F(1,23) = 0.005	Results, para 13
+ -	Fig 4A, right	paired-samples t-test	Results, para 17	24	Human subjects in Exp 2	Methods, para 1	error bars are mean +/- SEM	Fig. legend	p = 0.476	Results, para 17	t(23) = 0.724	Results, para 17
+ -	Fig 4B, left	repeated-measures ANOVA	Results, para 15	24	Human subjects in Exp 2	Methods, para 1	error bars are mean +/- SEM	Fig legend	main effect of location: p = 0.013; main effect of museum: p = 0.113; interaction: 0.600	Results, para 15	main effect of location: F(1,23) = 7.162; main effect of museum: F(1,23) = 2.719; interaction: F(1,23) = 0.284	Results, para 15
+ -	Fig 4B, right	paired-samples t-test	Results, para 17	24	Human subjects in Exp 2	Methods, para 1	error bars are mean +/- SEM	Fig. legend	p = 0.344	Results, para 17	t(23) = 0.965	Results, para 17
+ -	Fig 6A	non-parametric permutation testing	Methods, para 18	n/a (1)	One grand correlation matrix	Methods, para 18	Distortion index reported in text	Results, para 22	p = 0.00008 (after 100000 iterations)	Results, para 22	n/a	Results, para 22
+ -	Fig 6B	non-parametric permutation testing	Methods, para 18	n/a (1)	One grand correlation matrix	Methods, para 18	Distortion index reported in text	Results, para 23	p = 0.015 (after 100000 iterations)	Results, para 23	n/a	Results, para 23

+ -	Fig 7	Searchlight analysis	Results, para 24; Methods, para 19	24	Searchlight maps for each human subject in Exp 2	Methods, para 1	n/a	n/a	$p < 0.001$ uncorrected - $p < 0.05$ corrected	Fig. 7	critical values: $t(23) = 3.768$ (uncorrected); $t(23) = 4.5055$ (corrected)	Implicit in Fig. 7
+ -	Fig S1A	repeated-measures ANOVA	Caption for Supplementary Fig 1.	22	Human subjects in Exp 1	Methods, para 1	error bars are mean +/- SEM	Fig S1A	$p = 0.0001$	Caption for Supplementary Fig 1.	$F(3,63) = 8.221$	Caption for Supplementary Fig 1.
+ -	Fig S1A	linear contrast	Caption for Supplementary Fig 1.	22	Human subjects in Exp 1	Methods, para 1	Descriptive statistics are not presented as this is a secondary analysis of the data in Supp. Fig 1A	n/a	$p = 0.000008$	Caption for Supplementary Fig 1.	$F(1,21) = 23.196$	Caption for Supplementary Fig 1.
+ -	Fig S1B	repeated-measures ANOVA	Caption for Supplementary Fig 1.	24	Human subjects in Exp 2	Methods, para 1	error bars are mean +/- SEM	Fig S1B	$p = 0.000002$	Caption for Supplementary Fig 1.	$F(3,69) = 11.865$	Caption for Supplementary Fig 1.
+ -	Fig S1B	linear contrast	Caption for Supplementary Fig 1.	24	Human subjects in Exp 2	Methods, para 1	Descriptive statistics are not presented as this is a secondary analysis of the data in Supp. Fig 1B	n/a	$p = 0.004$	Caption for Supplementary Fig 1.	$F(1,23) = 14.077$	Caption for Supplementary Fig 1.
+ -	Fig S2A, left	repeated-measures ANOVA	Caption for Supplementary Fig 2.	24	Human subjects in Exp 2	Methods, para 1	error bars are mean +/- SEM	Caption for Supplementary Fig 2.	main effect of direction: $p = 0.00002$; main effect of museum: $p = 0.302$; interaction: $p = 0.135$	Caption for Supplementary Fig 2.	main effect of direction: $F(1,23) = 27.881$; main effect of museum: $F(1,23) = 1.114$; interaction: $F(1,23) = 2.359$	Caption for Supplementary Fig 2.
+ -	Fig S2A, right	paired-samples t-test	Caption for Supplementary Fig 2.	24	Human subjects in Exp 2	Methods, para 1	error bars are mean +/- SEM	Caption for Supplementary Fig 2.	$p = 0.028$	Caption for Supplementary Fig 2.	$t(23) = 2.349$	Caption for Supplementary Fig 2.
+ -	Fig S2B, left	repeated-measures ANOVA	Caption for Supplementary Fig 2.	24	Human subjects in Exp 2	Methods, para 1	error bars are mean +/- SEM	Caption for Supplementary Fig 2.	main effect of location: $p = 0.008$; main effect of museum: $p = 0.230$ interaction: $p = 0.188$	Caption for Supplementary Fig 2.	main effect of location: $F(1,23) = 8.429$; main effect of museum: $F(1,23) = 1.524$; interaction: $F(1,23) = 1.840$	Caption for Supplementary Fig 2.
+ -	Fig S2B, right	paired-samples t-test	Caption for Supplementary Fig 2.	24	Human subjects in Exp 2	Methods, para 1	error bars are mean +/- SEM	Caption for Supplementary Fig 2.	$p = 0.245$	Caption for Supplementary Fig 2.	$t(23) = 1.191$	Caption for Supplementary Fig 2.

+ -	Fig S3	repeated-measures ANOVA	Caption for Supplementary Fig 3.	24	Human subjects in Exp 2	Methods, para 1	error bars are mean +/- SEM	Caption for Supplementary Fig 3.	PPA: direction: p = 0.051 museum: p = 0.16 interaction: p = 0.47 OPA: direction: p = 0.076 museum: p = 0.033 interaction: p = 0.74 EVC: direction: p = 0.38 museum: p = 0.018 interaction: p = 0.20 Hippocampus: direction: p = 0.91 museum: p = 0.61 interaction: p = 0.69 Presubiculum: direction: p = 0.68 museum: p = 0.21 interaction: p = 0.14	Caption for Supplementary Fig 3.	Only marginal or significant Fs were reported: PPA direction: F(1,23) = 4.247 OPA direction: F(1,23) = 3.463 OPA museum: F(1,23) = 5.175 EVC museum: F(1,23) = 6.481	Caption for Supplementary Fig 3.
+ -	Fig S4	repeated-measures ANOVA	Caption for Supplementary Fig 4.	24	Human subjects in Exp 2	Methods, para 1	error bars are mean +/- SEM	Caption for Supplementary Fig 4.	PPA: location: p = 0.39 museum: p = 0.71 interaction: p = 0.19 OPA: location: p = 0.47 museum: p = 0.033 interaction: p = 0.63 EVC: location: p = 0.22 museum: p = 0.013 interaction: p = 0.84 Hippocampus: location: p = 0.81 museum: p = 0.74 interaction: p = 0.45 Presubiculum: location: p = 0.97 museum: p = 0.71 interaction: p = 0.94	Caption for Supplementary Fig 4.	Only marginal or significant Fs were reported: museum OPA: F(1,23) = 5.151 museum EVC: F(1,23) = 7.311	Caption for Supplementary Fig 4.

+ -	Results, para 9	paired-samples t-test	Results, para 9	22	Human subjects in Exp 1	Methods, para 1	Descriptive statistics are not presented, as this is a secondary analysis of the data in Fig. 3	N/A	p = 0.00036	Results, para 9	t(21) = 4.242	Results, para 9
+ -	Results, para 11	unequal-ns t-test, with unequal variances	Results, para 11	46	Human subjects in Exp 1 and Exp 2	Methods, para 1	Means presented in text	Results, para 11	p = 0.00008	Results, para 11	t(44) = 4.599	Results, para 11
+ -	Results, para 11	repeated-measures ANOVA	Results, para 11	24	Human subjects in Exp 2	Methods, para 1	Null effect presented for thoroughness so descriptives were not reported	N/A	main effect of direction: p = 0.233	Results, para 11	main effect of direction: F(1,23) = 1.501	Results, para 11
+ -	Results, para 11	repeated-measures ANOVA	Results, para 11	24	Human subjects in Exp 2	Methods, para 1	Null effect presented for thoroughness so descriptives were not reported	N/A	main effect of location: p = 0.287	Results, para 11	main effect of location: F(1,23) = 1.190	Results, para 11
+ -	Results, para 14	repeated-measures ANOVA	Results, para 14	24	Human subjects in Exp 2	Methods, para 1	Descriptive statistics are not presented as this is a secondary analysis of the data in Fig. 4	N/A	main effect of direction: p = 0.008; main effect of museum: p = 0.366; interaction: p = 0.318	Results, para 14	main effect of direction: F(1,23) = 8.279; main effect of museum: F(1,23) = 0.850; interaction: F(1,23) = 1.043	Results, para 14
+ -	Results, para 16	repeated-measures ANOVA	Results, para 16	24	Human subjects in Exp 2	Methods, para 1	Descriptive statistics are not presented as this is a secondary analysis of the data in Fig. 4	N/A	main effect of location: p = 0.043; main effect of museum: p = 0.189; interaction: p = 0.390	Results, para 16	main effect of location: F(1,23) = 4.581; main effect of museum: F(1,23) = 1.834; interaction: F(1,23) = 0.786	Results, para 16
+ -	Results, para 18	paired-samples t-test	Results, para 18	24	Human subjects in Exp 2	Methods, para 1	Descriptive statistics are not presented as this is a secondary analysis of the data in Fig. 4	N/A	p = 0.002	Results, para 18	t(23) = 3.495	Results, para 18
+ -	Results, para 21	repeated-measures ANOVA	Results, para 21	24	Human subjects in Exp 2	Methods, para 1	Descriptive statistics are not presented as this is a secondary analysis of the data in Fig. 4	N/A	main effect of shared boundaries: p = 0.003; main effect of museum: p = 0.087; interaction: p = 0.730	Results, para 21	main effect of shared boundaries: F(2,46) = 6.675; main effect of museum: F(1,23) = 3.200; interaction: F(2,46) = 0.316	Results, para 21
+ -	Results, para 21	linear contrast	Results, para 21	24	Human subjects in Exp 2	Methods, para 1	Descriptive statistics are not presented as this is a secondary analysis of the data in Fig. 4	N/A	Linear fit: p = 0.007	Results, para 21	Linear fit: F(1,23) = 8.615	Results, para 21
+ -	Results, para 21	paired-samples t-test	Results, para 21	24	Human subjects in Exp 2	Methods, para 1	Descriptive statistics are not presented as this is a secondary analysis of the data in Fig. 4	N/A	advantage of direction over location coding: p = 0.014	Results, para 21	advantage of direction over location coding: p = 2.652	Results, para 21
+ -	Results, para 22	non-parametric permutation testing	Results, para 22	N/A (1)	One grand correlation matrix	Methods, para 18	Distortion index reported in text	Results, para 22	ps > 0.1 (after 100000 iterations)	Results, para 22	N/A	Results, para 22

+ -	Results, para 23	non-parametric permutation testing	Results, para 23	N/A (1)	Difference in grand correlation matricies	Methods, para 18	Difference in distortion indicies reported in text	Results, para 23	p = 0.009 (after 100000 iterations)	Results, para 24	N/A	Results, para 23

Representative figures

1. Are any representative images shown (including Western blots and immunohistochemistry/staining) in the paper?

   If so, what figure(s)?

No.

2. For each representative image, is there a clear statement of how many times this experiment was successfully repeated and a discussion of any limitations in repeatability?

   If so, where is this reported (section, paragraph #)?

N/A.

Statistics and general methods

1. Is there a justification of the sample size?

   If so, how was it justified?

   Where (section, paragraph #)?

   Even if no sample size calculation was performed, authors should report why the sample size is adequate to measure their effect size.

Yes, this is found within the Participants subsection of Methods (para 1). The number of behavioral subjects (22) was chosen based on a pilot experiment. The number of fMRI subjects (24) was selected in advance as a round number at which the behavioral effects would be stable; our N is average to above-average for MVPA studies, and the true effect size for our novel phenomenon was unknown.

2. Are statistical tests justified as appropriate for every figure?

   Where (section, paragraph #)?

Yes, every figure displaying results from which inferences are made is connected to an explicit statistical test supporting these inferences:

Figure 3: Results, paras 3, 6, & 8
Figure 4: Results, paras 13, 15, & 17
Figure 6: Results, paras 22 & 23
Figure 7: Results, paras 24; Methods, para 19

   a. If there is a section summarizing the statistical methods in the methods, is the statistical test for each experiment clearly defined?

The statistical methods are defined in the results section immediately prior to the result it pertains to. In addition, Methods section contains a subsection on Statistics (Methods para 20).

   b. Do the data meet the assumptions of the specific statistical test you chose (e.g. normality for a parametric test)?

      Where is this described (section, paragraph #)?

We do not run or explicitly describe tests for normality; this is reported in the Methods subsection on Statistics (para 20). However, based on standard practices in psychology and cognitive neuroscience, supported by decades of research in these areas, we assumed the data to be normally distributed. In addition, we avoided the use of small sample sizes (our ns are 22, 24), where departure from normality is particularly problematic.

Reaction times, as used in Exp 1, can have an asymmetric distribution. To correct for this, we calculated median, rather than mean, reaction times for each condition for each subject (Methods, para 9).

c. Is there any estimate of variance within each group of data?

Is the variance similar between groups that are being statistically compared?

Where is this described (section, paragraph #)?

Estimates of variance are presented along with other descriptive statistics as standard error of the mean in the error bars in our figures and their legends (as all comparisons involve the same N, total number of participants in that experiment, this allows for comparisons of variance across conditions).

All comparisons are within-subject, and thus avoid differences in variance that arise due to assignment of subjects to experimental groups. Based on the traditions of research in psychology and cognitive neuroscience, our sample sizes, and the exposure of each participant to many independent experimental trials, are assumed to produce comparable variances in different experimental conditions.

The one exception to this is that the comparisons between reaction times for participants in Experiment 1 and Experiment 2 is a between-subjects tests (Results, para 11); to calculate this statistic, we used an unequal-ns t-test, calculated without an assumption of equal variance.

d. Are tests specified as one- or two-sided?

All tests are two-sided, but are not explicitly labeled as such in the text.

e. Are there adjustments for multiple comparisons?

We correct for multiple comparisons in the searchlight analyses. MVPA results are not corrected for multiple comparisons (i.e. separate ANOVAs for direction and location); nor are explicit corrections for multiple comparisons performed for the multiple independent ROIs.

3. Are criteria for excluding data points reported?

Was this criterion established prior to data collection?

Where is this described (section, paragraph #)?

For the behavioral analyses, reaction times that were 2.5 standard deviations above the mean were excluded from analysis, resulting in 5% of the data excluded in Experiment 1 and 1% excluded in Experiment 2 (Methods para 9). This criterion was established

4. Define the method of randomization used to assign subjects (or samples) to the experimental groups and to collect and process data.

If no randomization was used, state so.

Where does this appear (section, paragraph #)?

All of our effects are within-subject, and thus there is no random assignment to group or condition.

5. Is a statement of the extent to which investigator knew the group allocation during the experiment and in assessing outcome included?

If no blinding was done, state so.

Where (section, paragraph #)?

N/A

6. For experiments in live vertebrates, is a statement of compliance with ethical guidelines/regulations included?

Where (section, paragraph #)?

Yes (Methods, para 1)

7. Is the species of the animals used reported?

Where (section, paragraph #)?

All our subjects were human subjects from the University of Pennsylvania community. (Methods, para 1)

8. Is the strain of the animals (including background strains of KO/ transgenic animals used) reported? Where (section, paragraph #)?	N/A
9. Is the sex of the animals/subjects used reported? Where (section, paragraph #)?	Yes (Methods, para 1)
10. Is the age of the animals/subjects reported? Where (section, paragraph #)?	Yes (Methods, para 1)
11. For animals housed in a vivarium, is the light/dark cycle reported? Where (section, paragraph #)?	N/A.
12. For animals housed in a vivarium, is the housing group (i.e. number of animals per cage) reported? Where (section, paragraph #)?	N/A.
13. For behavioral experiments, is the time of day reported (e.g. light or dark cycle)? Where (section, paragraph #)?	No. Our participants were scanned during the day, typically during the early afternoon and evening.
14. Is the previous history of the animals/subjects (e.g. prior drug administration, surgery, behavioral testing) reported? Where (section, paragraph #)?	N/A. All of our subjects were naive to the experiment and had not participated previously.
a. If multiple behavioral tests were conducted in the same group of animals, is this reported? Where (section, paragraph #)?	N/A.
15. If any animals/subjects were excluded from analysis, is this reported? Where (section, paragraph #)?	Yes (Methods, para 1)
a. How were the criteria for exclusion defined? Where is this described (section, paragraph #)?	One subject was excluded for technical difficulties in fMRI acquisition, one requested to terminate the scan session, and one was excluded for sleeping during the course of the scan. Data from these subjects were discarded without analysis. (Methods, para 1).
b. Specify reasons for any discrepancy between the number of animals at the beginning and end of the study. Where is this described (section, paragraph #)?	N/A

Reagents

1. Have antibodies been validated for use in the system under study (assay and species)?

   N/A

   a. Is antibody catalog number given?

      Where does this appear (section, paragraph #)?

      N/A

   b. Where were the validation data reported (citation, supplementary information, Antibodypedia)?

      Where does this appear (section, paragraph #)?

      N/A

2. If cell lines were used to reflect the properties of a particular tissue or disease state, is their source identified?

   Where (section, paragraph #)?

   N/A

   a. Were they recently authenticated?

      Where is this information reported (section, paragraph #)?

      N/A

Data deposition

Data deposition in a public repository is mandatory for:

a. Protein, DNA and RNA sequences
b. Macromolecular structures
c. Crystallographic data for small molecules
d. Microarray data

Deposition is strongly recommended for many other datasets for which structured public repositories exist; more details on our data policy are available here. We encourage the provision of other source data in supplementary information or in unstructured repositories such as Figshare and Dryad.

1. Are accession codes for deposit dates provided?

   Where (section, paragraph #)?

   No.

Computer code/software

Any custom algorithm/software that is central to the methods must be supplied by the authors in a usable and readable form for readers at the time of publication. However, referees may ask for this information at any time during the review process.

1. Identify all custom software or scripts that were required to conduct the study and where in the procedures each was used.

   Custom Matlab scripts were used to run the behavioral and fMRI experiment (Methods: Stimuli and Procedure) and addition Matlab scripts were used perform the multivariate analyses (Methods/MRI Data Analysis/Multivoxel Pattern Analysis) including the spatial reconstruction and searchlight analyses. In addition, custom maps were created using commercial video game software (Methods/ Stimuli & Procedure/Virtual Environment)

2. Is computer source code/software provided with the paper or deposited in a public repository? Indicate in what form this is provided or how it can be obtained.	No- the code and map can be obtained through contacting the corresponding author.

Human subjects

1. Which IRB approved the protocol? Where is this stated (section, paragraph #)?	The University of Pennsylvania Institutional Review Board. (Methods, para 1)
2. Is demographic information on all subjects provided? Where (section, paragraph #)?	Yes (Methods, para 1)
3. Is the number of human subjects, their age and sex clearly defined? Where (section, paragraph #)?	Yes (Methods, para 1)
4. Are the inclusion and exclusion criteria (if any) clearly specified? Where (section, paragraph #)?	Yes (Methods, para 1)
5. How well were the groups matched? Where is this information described (section, paragraph #)?	Our study uses a within-subjects design.
6. Is a statement included confirming that informed consent was obtained from all subjects? Where (section, paragraph #)?	Yes (Methods, para 1).
7. For publication of patient photos, is a statement included confirming that consent to publish was obtained? Where (section, paragraph #)?	N/A

fMRI studies

For papers reporting functional imaging (fMRI) results please ensure that these minimal reporting guidelines are met and that all this information is clearly provided in the methods:

1. Were any subjects scanned but then rejected for the analysis after the data was collected?	Yes.
a. If yes, is the number rejected and reasons for rejection described? Where (section, paragraph #)?	One subject was excluded for technical difficulties in fMRI acquisition, one requested to terminate the scan session, and one was excluded for sleeping during the course of the scan. Data from these subjects were discarded without analysis. (Methods, para 1).
2. Is the number of blocks, trials or experimental units per session and/or subjects specified? Where (section, paragraph #)?	Yes (Methods- para 9 & 10).

3. Is the length of each trial and interval between trials specified?	Yes
4. Is a blocked, event-related, or mixed design being used? If applicable, please specify the block length or how the event-related or mixed design was optimized.	Event-related; the timing and sequence is described in Methods paras 9,10 & 11 .
5. Is the task design clearly described? Where (section, paragraph #)?	Yes (Methods, paras 9 & 10)
6. How was behavioral performance measured?	Spatial judgments (Left/Right) collected via a button box.
7. Is an ANOVA or factorial design being used?	Yes
8. For data acquisition, is a whole brain scan used? If not, state area of acquisition.	Yes
a. How was this region determined?	N/A
9. Is the field strength (in Tesla) of the MRI system stated?	Yes
a. Is the pulse sequence type (gradient/spin echo, EPI/spiral) stated?	Yes
b. Are the field-of-view, matrix size, slice thickness, and TE/TR/ flip angle clearly stated?	Yes.
10. Are the software and specific parameters (model/functions, smoothing kernel size if applicable, etc.) used for data processing and pre-processing clearly stated?	Yes.
11. Is the coordinate space for the anatomical/functional imaging data clearly defined as subject/native space or standardized stereotaxic space, e.g., original Talairach, MNI305, ICBM152, etc? Where (section, paragraph #)?	Yes, all analyses were performed in the subject's native space (Methods para 13), with the exception of the searchlight analyses which were normalized to the MNI template (Methods para 19). In addition, our procedure for defining functional regions of interest involved group-defined parcels that were in the standard MNI space, but these parcels were warped to each subject's native space, and the ROIs were defined in native space (Methods- para 14).
12. If there was data normalization/standardization to a specific space template, are the type of transformation (linear vs. nonlinear) used and image types being transformed clearly described? Where (section, paragraph #)?	The searchlight maps were normalized to the MNI template (Methods pata 19). Further, our ROI procedure involved warping parcels defined in the MNI space back into each subjects' native space (Methods- para 14). Linear transformation were used in all cases.
13. How were anatomical locations determined, e.g., via an automated labeling algorithm (AAL), standardized coordinate database (Talairach daemon), probabilistic atlases, etc.?	Anatomical locations were determined using MNI coordinates and the software MRIcron; masks for medial temporal ROIs were reconstructed through automatic labeling algorithms in Freesurfer.
14. Were any additional regressors (behavioral covariates, motion etc) used?	Yes, confound regressors for motion were added to the model, as well as spike regressors to remove artifacts discovered by the Artifact Detection Toolbox.

15. Is the contrast construction clearly defined?	Yes.
16. Is a mixed/random effects or fixed inference used?	Random effects analyses are used.
a. If fixed effects inference used, is this justified?	N/A
17. Were repeated measures used (multiple measurements per subject)?	No. We used repeated-measures ANOVAs as our primary analysis; however, no subject was scanned multiple times. Thus, in each analysis, each subject represents only a single row of observations for the within-subjects comparisons of interest in the analysis and all subjects contribute equally to the variance (and degrees of freedom) of the experiment.
a. If so, are the method to account for within subject correlation and the assumptions made about variance clearly stated?	We use standard statistical approaches for evaluating within-subjects effects with multiple levels (ANOVA). These approaches commonly assumes that the variances among different levels are equal with the sample sizes used in our experiments. Importantly, this means that the variance in our experiment reflects the random-effects (or population) variability, rather than the variability of repeated measurement of the same quantity in the same subject (representing idiosyncratic, or fixed effects). As a result, our analysis does not make the mistake of assuming that observations from the same subject (and subject to within-subject correlation) constitute independent events.
18. If the threshold used for inference and visualization in figures varies, is this clearly stated?	Only one whole-brain figure is presented, and information on the threshold for presentation is given in the colorbar, figure legend, and results text.
19. Are statistical inferences corrected for multiple comparisons?	Yes. Voxel-wise permutation testing is used to correct for multiple comparisons.
a. If not, is this labeled as uncorrected?	Where lower thresholds are used, this is made clear in the text.
20. Are the results based on an ROI (region of interest) analysis?	Yes.
a. If so, is the rationale clearly described?	Yes.
b. How were the ROI's defined (functional vs anatomical localization)?	Scene-selective ROIs (RSC, PPA, TOS/OPA) and early visual cortex (EVC) were defined using contrasts from independent localizers.
21. Is there correction for multiple comparisons within each voxel?	Voxel-wise permutation testing is used to correct for multiple comparisons. We do not do explicit analyses of individual voxels; our analyses primarily concern multi-voxel patterns within one ROI. We do not correct for our two tests of direction and location within this ROI (the remainder are control analyses to rule out other accounts or subsequent analyses to provide further description of the data).
22. For cluster-wise significance, is the cluster-defining threshold and the corrected significance level defined?	N/A

Additional comments

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