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Supplementary Videos: 0

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 #
+ -	2a	2-way AnCOVA	Statistical analysis, para 1	26	yes	Methods, para 1	No; interaction term		0.032	beta-amyloid and NREM SWA, para 1	F(1) = 5.191	
+ -	2b	regression	Statistical analysis, para 1	26	yes	Methods, para 1	No; regression		0.020	beta-amyloid and NREM SWA, para 1	F(24) = 6.192 (model) t = -2.488 for PIB regressor	
+ -	2c	2-way AnCOVA	Statistical analysis, para 1	26	yes	Methods, para 1	No; interaction term		0.020	beta-amyloid and NREM SWA, para 4	F(1) = 6.256	
+ -	2d	regression	Statistical analysis, para 1	22	yes	Episodic Memory Task, para 2	No; regression		0.019	NREM SWA and hippocampus-dependent memory, para 1	F(20) = 6.500 (model) t = 2.549 for SWA regressor	
+ -	3a	fMRI 2nd level regression model	fMRI analysis, para 2	22	yes	Episodic Memory Task, para 2	No; regression		<0.05 FWE corrected; cluster average p=0.004	NREM SWA and hippocampus-dependent memory, para 2	F(20) = 10.865 (model) t = -3.296 for HC regressor	
+ -	3b	regression	Statistical analysis, para 1	22	yes	Episodic Memory Task, para 2	No; regression		0.017	NREM SWA and hippocampus-dependent memory, para 2	F(20) = 6.807 (model) t = -2.609 for SWA regressor	
+ -	4A-C	Structural equation model	Statistical analysis, para 2	22	yes	Episodic Memory Task, para 2	No; SEM		Each p value reported in Figure 4; each SEM fit metric reported in Figure legend 4 and in main text			
+ -												
+ -												
+ -												

Representative figures

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

   If so, what figure(s)?

   Yes, Figure 1 shows three representative plots of voxelwise PIB scans, NREM SWA topoplots, individual slow wave source maps, and memory performance for three separate participants.

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. This figure was descriptive only, to define the ROIs and measures examined in the study.

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.

   There is no justification of sample size, but the sample size is typical of these types of studies. And power analyses do indicate that the current study was adequately powered to detect typically reported effect sizes related to associations between sleep and memory.

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

   Where (section, paragraph #)?

   Yes, Page 31, Para 1, 'Statistical Analysis' justifies each of the tests employed. Further justification is also offered on page 27, para 2, 'fMRI analsyis', and page 25, para 2, 'episodic memory task'

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

      Yes, page 31, para 1

   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 #)?

      Yes, after logarithmic transformation, but even so, we conservatively employ a nonparametric follow up test, given the commonly reported non-normality of PIB-PET DVR measures. This is described on page 31, para 1 and on page 26, para 1.

   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 #)?

      One group is reported, and all stats are continues variables. Still, variance measures are presented as S.E.M. or S.D. as described in each section where data is presented, e.g. Table 1 header.

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

      Yes, specified as two sided, Page 31, para 1, 'statistical analysis'

   e. Are there adjustments for multiple comparisons?

      Yes, where appropriate; e.g. FWE correction was applied to fMRI data.

3. Are criteria for excluding data points reported?

   Was this criterion established prior to data collection?

   Where is this described (section, paragraph #)?

   Yes and yes. Reported as >2 S.D. from mean, on page 25, para 3, 'episodic memory task'. This exclusion criteria was not applied to PET data known to be non-normally distributed. This distinction is further described on page 23, para 1, 'Methods'.

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 #)?	N/A. No randomization was employed, as this study was not a 2+ group study, but examined associations between a number of continuous variables in one group.
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, though experimenters analyzing sleep, memory, and fMRI data where blind to the level of PIB deposition, and experimenters analyzing PIB deposition were blind to sleep, memory, and fMRI data.
6. For experiments in live vertebrates, is a statement of compliance with ethical guidelines/regulations included? Where (section, paragraph #)?	N/A
7. Is the species of the animals used reported? Where (section, paragraph #)?	Yes, Page 24, para 2, 'General experimental design', and on page 5, para 2, and also the title.
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 #)?	N/A
10. Is the age of the animals/subjects reported? Where (section, paragraph #)?	N/A
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 #)?	Yes. Page 24, para 2, 'General experimental design', and on page 5, para 2
14. Is the previous history of the animals/subjects (e.g. prior drug administration, surgery, behavioral testing) reported? Where (section, paragraph #)?	Yes. Page 23, para 1, 'Methods'

a. If multiple behavioral tests were conducted in the same group of animals, is this reported?

Where (section, paragraph #)?

Yes, Page 24, para 2, 'General experimental design', and on page 5, para 2

15. If any animals/subjects were excluded from analysis, is this reported?

Where (section, paragraph #)?

Yes, page 25, para 3, 'episodic memory task'.

a. How were the criteria for exclusion defined?

Where is this described (section, paragraph #)?

No subjects were excluded from all analysis. 2 subjects were excluded due to data loss caused by computer theft (behavioral and fMRI data). 2 subjects were excluded from memory correlations due to performing >2 S.D. from the mean; one performing at chance levels. Reported on page 25, para 3, 'episodic memory task'.

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 #)?

Sleep and PIB analysis n=26. due to computer theft and 2 subjects performing >2SD from mean, one at floor, n=22 for sleep, memory, and fmri analysis.
Described on page 25, para 3, 'episodic memory task'.

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 #)?

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

Where does this appear (section, paragraph #)?

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 #)?

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 #)?	N/A

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.	Scripts were written in Matlab for EEGlab sleep analysis, reported on page 26, para 1. No other custom scripts were used. All other programs/scripts used were referenced, e.g. SPM and SPSS.
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.	N/A

Human subjects

1. Which IRB approved the protocol? Where is this stated (section, paragraph #)?	UC Berkeley Yes, page 23, para 1
2. Is demographic information on all subjects provided? Where (section, paragraph #)?	Yes, Table 1
3. Is the number of human subjects, their age and sex clearly defined? Where (section, paragraph #)?	Yes, Table 1, and page 23, para 1
4. Are the inclusion and exclusion criteria (if any) clearly specified? Where (section, paragraph #)?	yes, page 23, para 1
5. How well were the groups matched? Where is this information described (section, paragraph #)?	N/A, This was a one group study.

6. Is a statement included confirming that informed consent was obtained from all subjects?

   Where (section, paragraph #)?

   Yes, Page 23, 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 #)?

      Yes, and it is not related to the fMRI data, but the behavioral performance. 2 performed >2SD from mean, and 2 had behavioral data necessary to define fMRI events lost due to computer theft. Reported on page 25, para 3, 'episodic memory task'.

2. Is the number of blocks, trials or experimental units per session and/or subjects specified?

   Where (section, paragraph #)?

   Yes
   Trials described: Page 25, para 2, 'episodic memory task'
   Scans acquired described: Page 27, para 1, 'MRI scanning'

3. Is the length of each trial and interval between trials specified?

   No, though this task is the same as one previously published, with that paper containing this information cited.

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.

5. Is the task design clearly described?

   Where (section, paragraph #)?

   Yes. Page 25, para 2, 'episodic memory task'

6. How was behavioral performance measured?

   This is described on Page 25, para 3, 'episodic memory task'

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?

9. Is the field strength (in Tesla) of the MRI system stated?	Yes, 3T
a. Is the pulse sequence type (gradient/spin echo, EPI/spiral) stated?	Yes, Page 27, para 1
b. Are the field-of-view, matrix size, slice thickness, and TE/TR/ flip angle clearly stated?	Yes, Page 27, para 1
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, Page 27, para 2, 'fMRI analysis'
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, Page 27, para 2, 'fMRI analysis'
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 #)?	Yes, Page 24, para 2, 'fMRI analysis'
13. How were anatomical locations determined, e.g., via an automated labeling algorithm (AAL), standardized coordinate database (Talairach daemon), probabilistic atlases, etc.?	Hippocampal ROI was defined from a meta-analysis of memory studies, using a standardized coordinate database. PET ROIs were defined using the Desikan-Killiany atlas.
14. Were any additional regressors (behavioral covariates, motion etc) used?	Yes, Page 27, para 4, 'fMRI analysis'
15. Is the contrast construction clearly defined?	Yes, Page 28, para 1, 'fMRI analysis'
16. Is a mixed/random effects or fixed inference used?	random effects, Page 28, para 1, 'fMRI analysis'
a. If fixed effects inference used, is this justified?	
17. Were repeated measures used (multiple measurements per subject)?	No, one scan session was used.
a. If so, are the method to account for within subject correlation and the assumptions made about variance clearly stated?	
18. If the threshold used for inference and visualization in figures varies, is this clearly stated?	No variation used. Inference and visualization were done using the same threshold. Figure S2 uses a different threshold for both, and this is described clearly in the text and accompanying figure legend.
19. Are statistical inferences corrected for multiple comparisons?	Yes. FWE corrected within a priori ROI.
a. If not, is this labeled as uncorrected?	Figure S2 is labeled as uncorrected.

20. Are the results based on an ROI (region of interest) analysis?	Yes
a. If so, is the rationale clearly described?	Yes, Page 24, para 3, 'fMRI analysis'
b. How were the ROI's defined (functional vs anatomical localization)?	Functionally defined, anatomically constrained. Page 28, para 1, 'fMRI analysis'
21. Is there correction for multiple comparisons within each voxel?	Yes.
22. For cluster-wise significance, is the cluster-defining threshold and the corrected significance level defined?	N/A. voxelwise threshold was used.

Additional comments

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