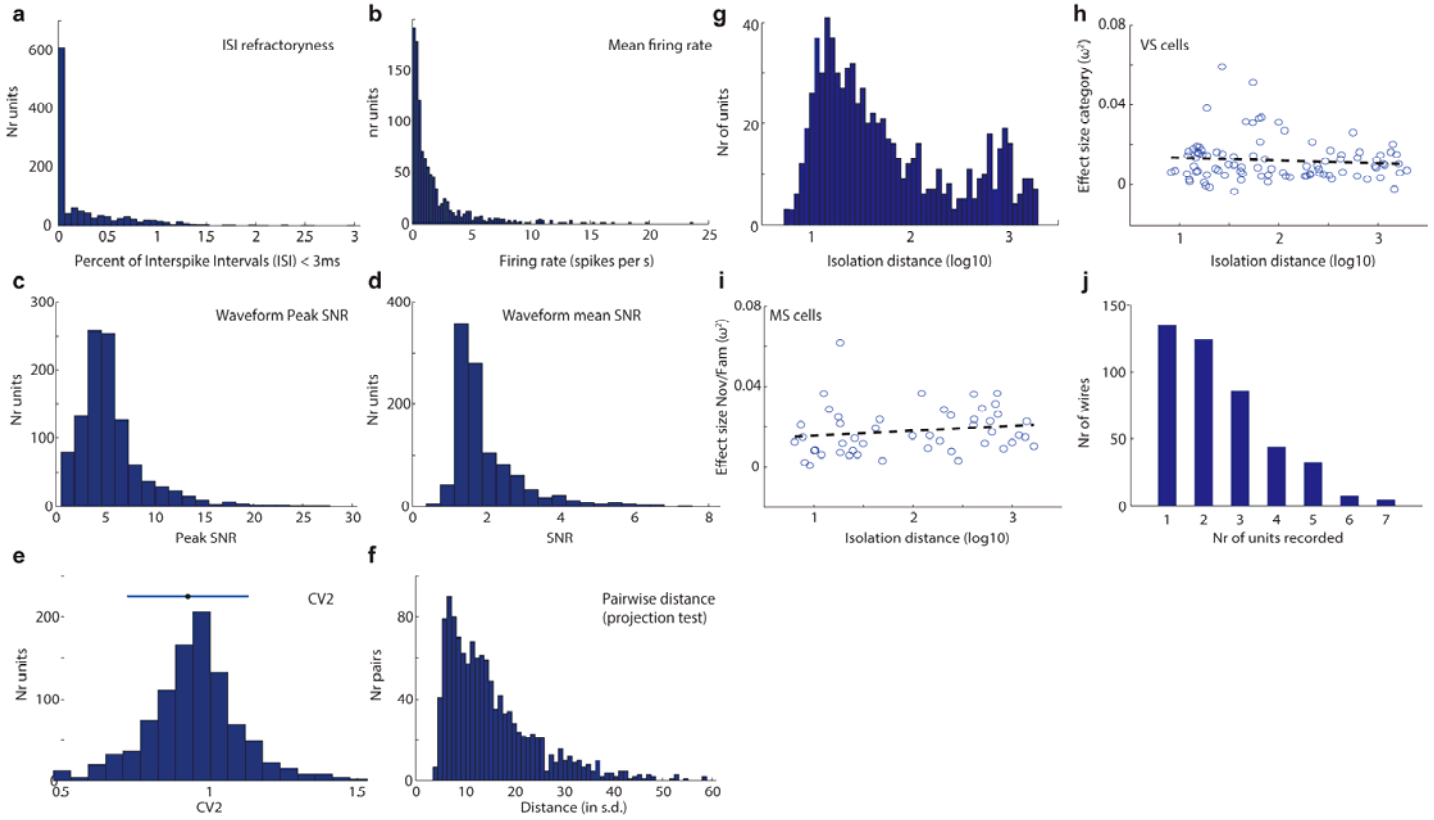
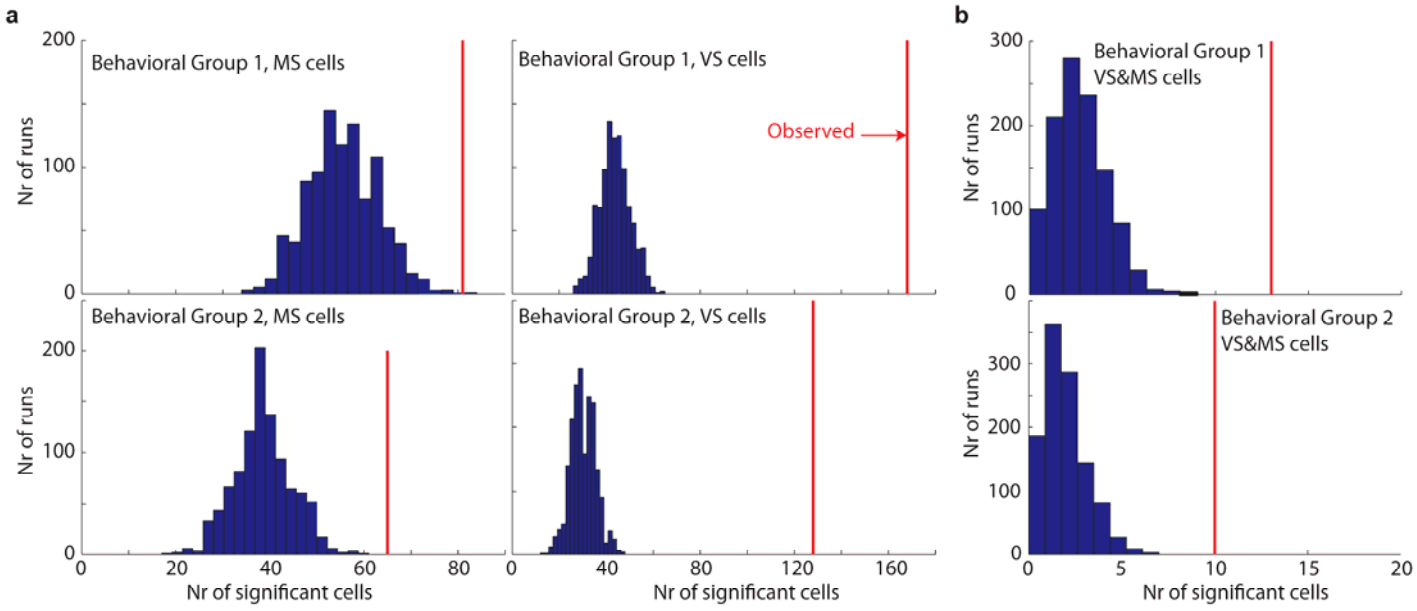


Supplementary Figure 1

Spike sorting and recording quality assessment.

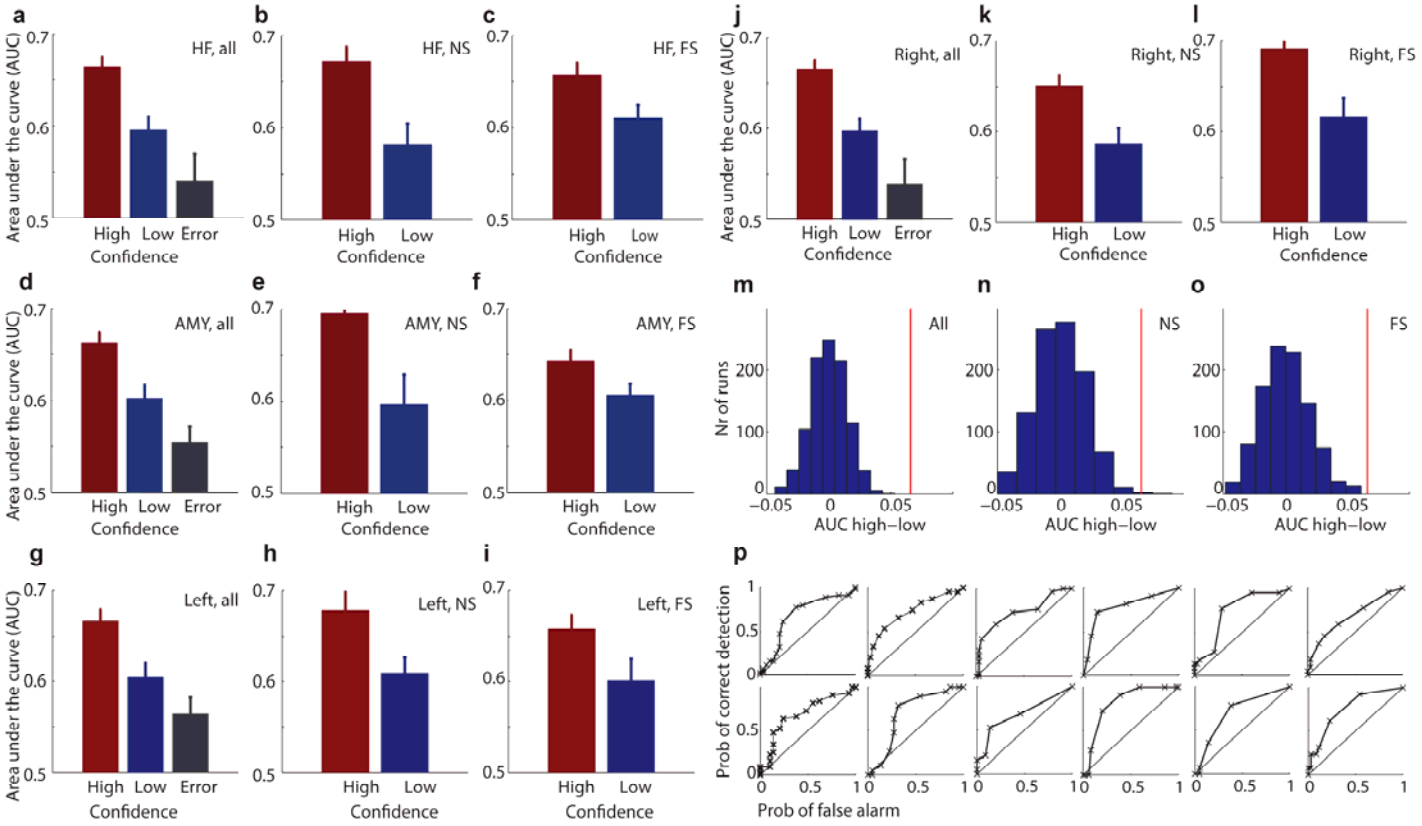
(a-e) Metrics quantifying individual clusters. (a) Histogram of proportion of inter-spike intervals (ISIs) which are shorter than 3ms. The large majority of clusters had less than 0.5% of such short ISIs. (b) Histogram of mean firing rates. (c) Histogram of the SNR of the mean waveform peak of each unit. (d) Histogram of the SNR of the entire waveform of all units. (e) Histogram of CV2 values of all units. (f) Pairwise distance between all possible pairs of units on all wires where more than 1 cluster was isolated. Distances are expressed in units of s.d. after normalizing the data such that the distribution of waveforms around their mean is equal to 1. (g) Isolation distance of all units for which this metric was defined (n=746, median 35.0). There was no significant difference in isolation distance between VS and MS cells (p=0.59, two-sample Kolmogorov-Smirnov test). (h) Absence of correlation between isolation distance and response strength, as quantified by ω^2 for visual category regressor, for all VS cells. R^2=0.009, p=0.37. (I) Absence of correlation between isolation distance and response strength, as quantified by ω^2 for novel/familiar regressor, for all MS cells. R^2=0.03, p=0.25. (j) Histogram of how many units were identified on each active wire (only wires with at least one unit identified are counted). The average yield per wire with at least one unit was 2.4 (range 1-7).



Supplementary Figure 2

Bootstrap statistics for number of cells selected.

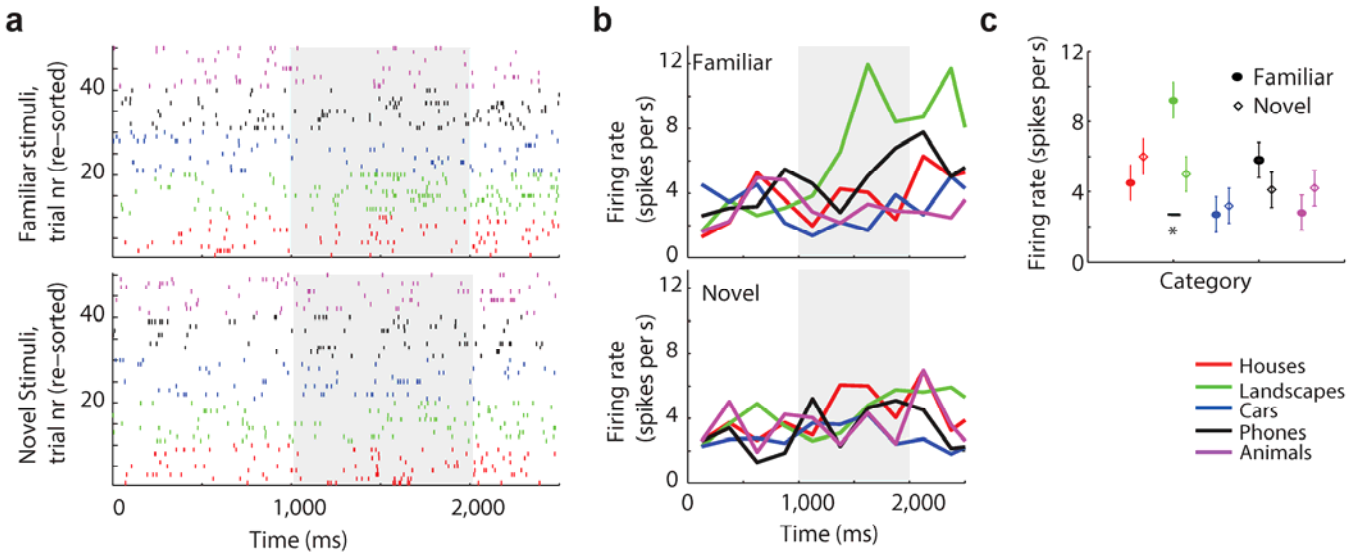
Estimate of chance values (null distribution) of number of cells observed compared to the actual number of cells found. The red line indicates the actual number of cells observed. The null distribution (blue) was estimated by re-running the identical selection procedure after first randomly permuting the order of the labels assigned to each trial. This permutation procedure destroys to association between the spiking response and trial identity, but keeps everything else intact (number of behavioral choices, number of times a stimulus was seen). The p-value is equal to the number of chance observations (blue) which are larger than that observed (red). In cases where no chance values exceeded those observed, we set p-values to 1/B with B the number of bootstrap runs (B=1000). (a) Significance of the number of MS and VS cells we identified for behavioral group 1 (top, p=0.001 and p=0.001, respectively) and group 2 (bottom, p=0.001 and p=0.001, respectively). (b) Significance of the number of cells that qualified as both MS and VS cells in behavioral group 1 (top, p=0.001) and group 2 (bottom, p=0.001). While rare, the number of cells observed was well above chance.



Supplementary Figure 3

Confidence encoding by NS and MS neurons, shown separately for different brain areas and hemispheres.

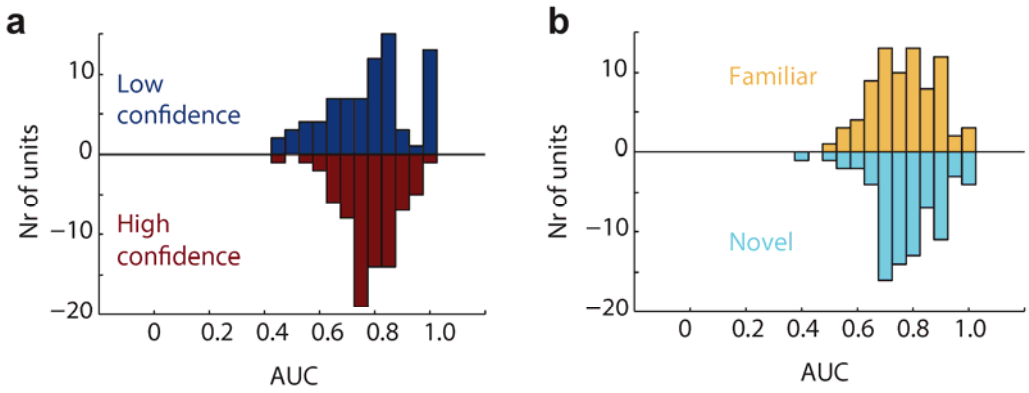
Confidence encoding by NS and MS neurons in the hippocampus (HF, panels a-c), amygdala (AMY, d-f), left side (panels g-i), and right side (j-l). The result shown in Fig 3 held when considering MS neurons separately in the hippocampus (d-f; n=34, p=0.00015, p=0.0014, and p=0.024 for all, NS, and FS neurons, respectively), amygdala (a-c; n=31, p=0.0024, p=0.024, p=0.017 for all, NS, and FS neurons, respectively), left side (g-i, n=26, p=0.0032, p=0.0033, and p=0.056 for all, NS, and FS neurons, respectively), and right side (j-l, n=39, p=0.000069, p=0.0015, and p=0.011 for all, NS, and FS neurons, respectively). (m-o) Bootstrap estimate of the null distribution and significance of difference between AUC for high and low confidence trials. Observed values (red line) are identical to those shown in Fig 3c-e. The null distribution was estimated by randomly scrambling the trials between high and low confidence. We ran 1000 runs, for each of which the average difference in AUC across all cells was calculated in the same manner as in Fig 3. (p) Further example neuronal ROCs for MS neurons, shown for high-confidence trials only, compare to Fig 2. All errorbars are ±s.e. across neurons. All p-values are one-tailed paired t-tests comparing the AUC of high and low confidence trials.



Supplementary Figure 4

Example cell that qualifies as both a VS and MS cell.

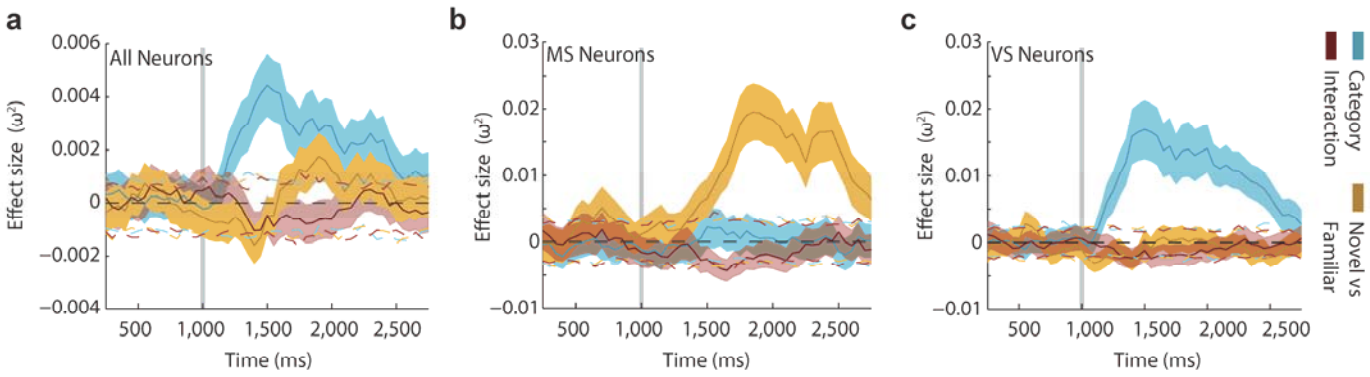
(a) Raster of all trials, grouped into familiar (top) and novel (bottom) trials. Color indicates visual category. (b) PSTH of familiar (top) and novel (bottom) trials. (c) Mean response as a function of visual category (color) and familiarity and novelty. This cell increased its firing rate significantly only for familiar landscapes (pairwise tests novel vs familiar for each category, not corrected for multiple comparisons). Note that these cells were selected independently as MS and VS cells. The contrasts shown in this panel were not used to select cells.



Supplementary Figure 5

Comparison of ability of VS cells to distinguish between visual categories as a function of confidence and familiarity.

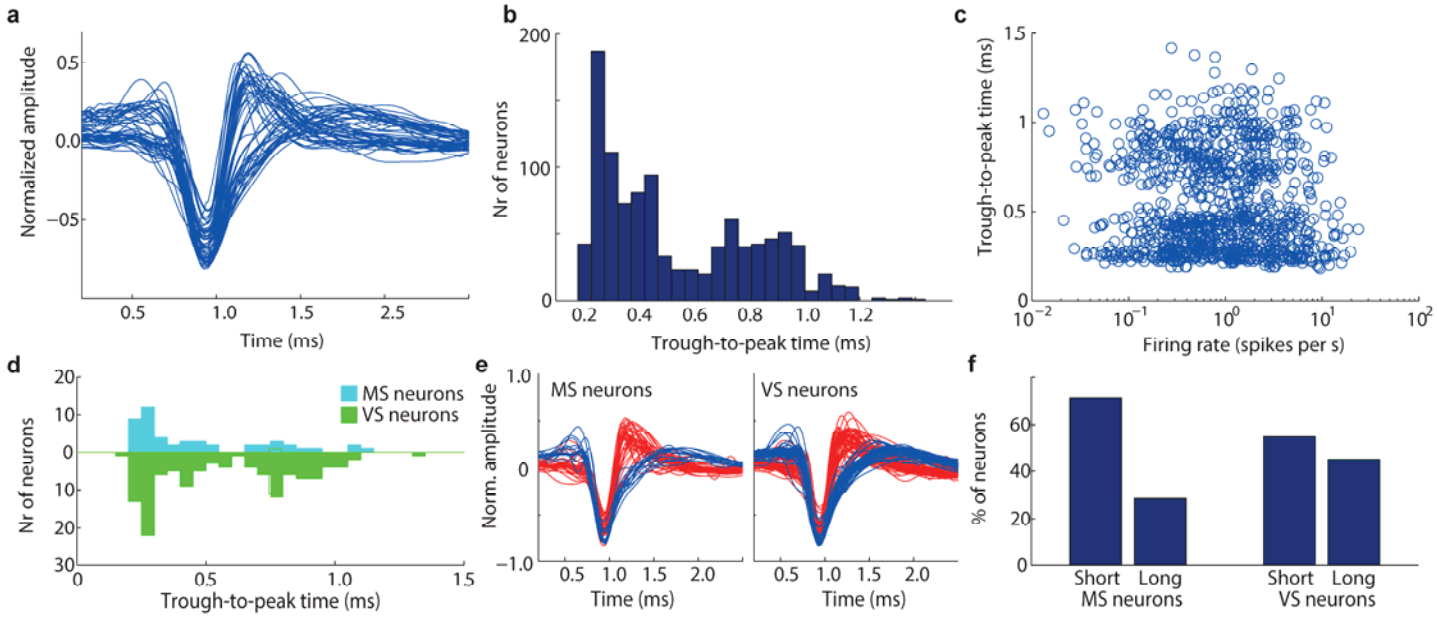
(a,b) Show identical analysis to Fig 5a,b, but only including neurons VS neurons with baseline firing rate >1Hz (n=78). There was no significant difference ($p=0.91$ and $p=0.43$ using paired sign-test and $p=0.75$ and $p=0.48$ using bootstrap test for confidence and familiarity, respectively).



Supplementary Figure 6

Population effect size estimation using a 2-way model with interaction term.

No interaction between the two main factors category and familiarity was found. (a-c) shows effect size for both main factors (category, familiarity) as well as their interaction for all neurons (a), only MS neurons (b) and only VS neurons (c). Dashed horizontal lines indicate the 99% confidence intervals of the null distribution (200 bootstrap runs each) for each factor (color). Note that the interaction term (red) never becomes significantly positive.



Supplementary Figure 7

Properties of extracellular waveforms (EWs).

(a) Normalized EWs of a random subset of all recorded neurons (50 waveforms are shown). (b) Histogram of the trough-to-peak time d of all units (n=1065). The distribution was significantly bimodal (Hartigan's dip test, p<1e-5). (c) Scatter plot of firing rate vs trough-to-peak time. Notice how, at all firing rates, there appear at least two clusters with different trough-to-peak time. (d-f) Comparison of waveforms between MS neurons and VS neurons. (d) Histogram of trough-to-peak time for MS units only (top) and VS units only (bottom). Only the distribution for VS neurons was significantly bimodal (Hartigan's dip test, p=0.004 vs p=0.34 for MS neurons). (e) Waveforms of all MS (left) and VS (right) units. Colors mark short (red) and long (blue) waveforms. (f) Quantification of proportion of short and long waveforms for MS and VS neurons, respectively. The proportion of short and long waveforms was significantly different only for MS neurons ($\chi 2$ comparison of proportions, p=2.2e-5 vs p=0.12 for MS and VS neurons, respectively).

Supplementary Tables

Supplementary Table 1: Patients. Demographics, pathology and neuropsychological evaluation. Abbreviations: Hand: Dominant handedness. Tests indicated with n/a were not performed for clinical reasons. WAIS-III: IQ scores from the Wechsler Adult Intelligence Scale: performance IQ (PIQ), verbal IQ (VIQ), full scale IQ (FSIQ), verbal comprehension index (VCI), perceptual organization index (POI). All WAIS-III scores are on average 100 with a s.d. of 15 in the normal population (69 and less falls in the clinically abnormal range, 70-79 borderline, 80-89 low average, 90-109 average, 110-119 high average, 120-129 superior, 130+ very superior). WMS-R and WMS-III are the Wechsler memory scale revised and version 3, respectively. Subtests are verbal paired associates (VPA), logical memory (LM) and visual reproduction (Vis). 1 and 2 are immediate and delayed, respectively. Scores are raw scores.

ID	Age	Sex	Hand Dom	Epilepsy Diagnosis	WAIS-III / WAIS-IV (*)					WMS-R / WMS-III (*)					
					PIQ	VIQ	VCI	POI	FSIQ	VPA1	VPA2	LM1	LM2	Vis1	Vis2
H09	55	M	R	right temporal	97	98	100	103	98	18	7	22	14	31	25
H10	37	M	R	Left frontal	79	64	n/a	n/a	68	n/a	n/a	n/a	n/a	n/a	n/a
H11	16	M	L	right lateral frontal	84	91	88	84	88	17	8	n/a	n/a	31	29
H14	31	M	L	Bilateral indep. temporal	n/a	n/a	112	111	n/a	11	6	18	11	40	16
H15	45	M	R	Right mesial temporal	64	59	59	69	58	n/a	n/a	n/a	n/a	30	13
H16	34	F	R	right frontal	84	68	68	89	74	8	5	16	10	n/a	n/a
H17	19	M	R	left inferior frontal	128	131	122	133	134	24	6	34	37	40	39
H18	40	M	R	Right temporal	69	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	25	8
H19	34	M	R	Left frontal	81	74	76	80	86	n/a	n/a	20	19	35	32
H21	20	M	R	Not localized	n/a	n/a	93	89	n/a	23	8	34	33	34	32
H23	35	M	R	Left temporal	n/a	n/a	74	86	n/a	11	3	13	4	34	32
H27	41	M	R	Bilateral indep. temporal	86	91	86	88	89	n/a	n/a	n/a	n/a	n/a	n/a
H28	23	M	R	Right mesial temporal	79	77	78	80	76	n/a	n/a	n/a	n/a	n/a	n/a
H29	18	F	L	Left deep insula	104	110	107	101	107	n/a	n/a	n/a	n/a	n/a	n/a
H31	30	M	R	Right temporal	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H33	29	M	R	Left temporal	113	104	101	123	108	11	5	21	15	41	41
H41	19	M	R	Right posterior temporal	92	100	107	95	97	22	6	31	27	36	37
H42	29	M	R	Not localized	87	75	78	91	79	16	6	22	14	37	36
H43	27	F	L	Left temporal	n/a	n/a	84	86	n/a	19	8	18	17	30	24
H44	58	F	L	Right temporal	74	77	72	78	74	12	5	10	3	34	28
C24	47	F	n/a	Not localized	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
C25	36	F	R	Bilateral indep. temporal	107	105	107	105	107	19*	8*	29*	30*	38*	38*
C26	56	F	L	Right temporal	107	92	96	109	99	15*	6*	26*	17*	35*	33*
C27	45	M	R	Left temporal	79	61	57	80	66	n/a	n/a	n/a	1*	17*	11*
C29	19	M	R	Left temporal neocortical	113	95	89	121	103	20*	8*	19*	19*	37*	38*

C31	31	M	R	Left temporal neocortical	n/a	n/a	72*	79*	69*	21*	10*	n/a	n/a	n/a	n/a
C32	19	M	R	Not localized (generalized)	n/a	n/a	83*	n/a	80*	22*	18*	n/a	n/a	n/a	n/a
C33	44	F	R	Right temporal	99	76	80	103	85	19*	5*	20*	24*	35*	28*

Supplementary Table 2: Electrophysiological properties of neurons. Abbreviations are: visually selective (VS), memory selective (MS). Firing rates are over the duration of the experiment (overall) or mean rates across all correct trials of a neuron (baseline period is 1s before stimulus onset, stimulus period is 1.5s long starting 200ms after stimulus onset). P-values (right column) specify the likelihood of observing this many selective cells by chance by repeating the same selection procedure after randomly permuting the order of trials (1000 runs). * = Bootstrap p-values are set to 1/N where N=number of runs if none of the bootstrap samples contained more cells that observed.

	Nr of neurons	**Overall firing rate ±sd (Range) [Hz]**	**Baseline rate ±sd (Range) [Hz]**	**Post-Stimulus rate ±sd (Range) [Hz]**	**p-value bootstrap, nr significant cells**
All sessions (Group 0)	1065	1.84±2.66 (0.01-23.68)	1.79±2.66 (0-26.19)	1.93±2.80 (0-22.20)	-
Behavioral Group 1	954	1.72±2.40 (0.01-19.71)	1.68±2.39 (0-20.38)	1.81±2.57 (0-22.20)	-
Behavioral Group 2	664	1.69±2.47 (0.02-19.7)	1.65±2.48 (0-20.38)	1.76±2.63 (0-22.20)	-
VS Neurons in Group 0	186	2.28±2.90 (0.05-23.68)	2.22±2.94 (0.01-26.19)	2.40±3.00 (0.02-21.63)	0.001
MS Neurons in Group 0	87	2.35±3.09 (0.03-19.71)	2.35±3.15 (0.03-20.38)	2.40±3.14 (0.03-18.81)	0.003
VS Neurons in Group 1	168	2.14±2.28 (0.05-11.80)	2.07±2.20 (0.01-12.04)	2.26±2.53 (0.02-13.90)	0.001*
MS Neurons in Group 1	81	2.44±3.18 (0.03-19.71)	2.44±3.24 (0.03-20.38)	2.48±3.24 (0.03-18.81)	0.001
VS Neurons in Group 2	128	1.95±2.09 (0.05-10.66)	1.90±2.00 (0.01-10.46)	2.06±2.35 (0.03-13.90)	0.001*
MS Neurons in Group 2	65	2.36±3.30 (0.10-19.71)	2.37±3.36 (0.06-20.38)	2.38±3.31 (0.08-18.81)	0.001*

Supplementary Table 3: Total number of neurons recorded in each area and hemisphere. Numbers show total number recorded in all sessions (Group 0). Numbers in brackets are those recorded from pathological tissue. Neurons were counted if the patient was diagnosed with uni-or bilateral temporal seizure onset, regardless of whether the focus was medial or lateral.

	Hippocampus	**Amygdala**
Left	207 (62)	304 (94)
Right	212 (124)	342 (121)
Total	419	646

Supplementary Table 4: Comparison of VS and MS neurons. Here, only the subgroup of MS and VS neurons used for the comparison of extracellular waveforms are used (see results). All errors are ±s.d.

	MS neurons	VS neurons	p-value
Mean firing rate	2.00±2.51 Hz	1.87±2.09 Hz	ns
Proportion of small ISIs	0.25±0.37	0.20±0.35	ns
CV2	0.95±0.13	vs 0.93±0.17	ns
Peak SNR	5.80±4.46	6.90±5.43	ns
Burst index	0.02±0.02	0.03±0.05	ns