Supplementary information for

Persistent activity during working memory maintenance predicts long-term memory formation in the human hippocampus

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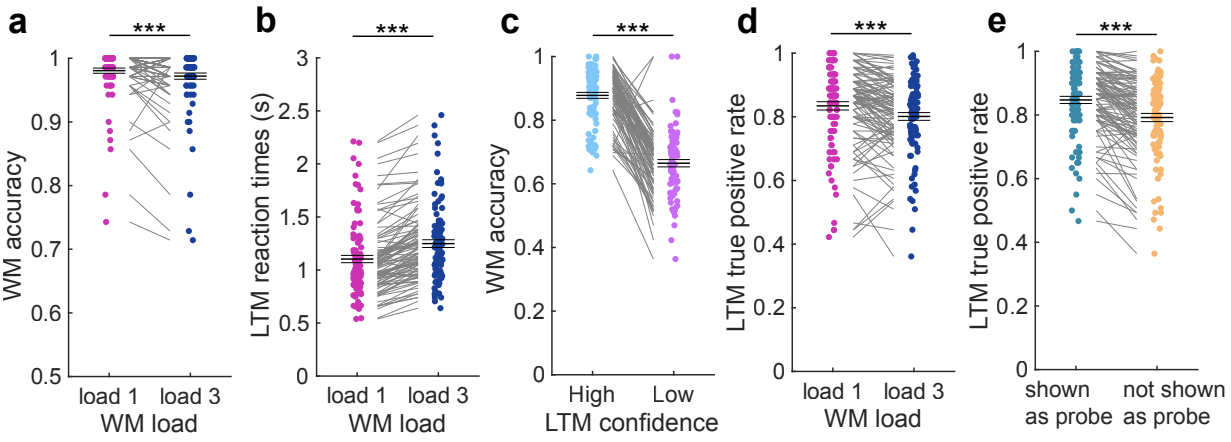

Figure S1. Behavior results of 100 healthy control participants. We conducted an online study collecting behavioral data from 100 healthy control participants (age: 32.9 ± 10.4 years; gender (self-reported): 54 females, 46 males). Participants were recruited on the online platform Prolific (www.prolific.co), gave informed consent, and were compensated monetarily for their participation ($4.50 base pay, bonus pay of $9.50 if performance above 75% in the WM task and 60% in the LTM task; total of $15 for approx. 1 hour experiment time; all but one participant received the bonus payment). We pre-selected participants based on age (18-80 years), location (USA), language (fluent English), and a minimum approval rate in previous studies (99%). The experiment was made accessible to participants through the online platform cognition.run (www.cognition.run) and programmed in JsPsych (version: 6.3.1). **(a,b)** In the WM task, participants responded **(a)** with higher accuracy ($t(99) = 3.54$; $p < 0.0001$) and **(b)** faster ($t(99) = -12.16$; $p < 0.0001$) in load 1 as compared to load 3 trials. **(c)** In the LTM task, participants remembered items better when they reported with high than low confidence. ($t(85) = 18.11$, $p < 0.0001$; 14 participants were not using the confidence rating and were therefore excluded from this analysis). **(d)** Pictures presented in load 1 trials in the WM task were better remembered in the subsequent LTM task than pictures presented in load 3 trials ($t(99) = 5.05$; $p < 0.0001$). **(e)** Pictures that were presented as probe images in the WM task were better remembered in the LTM task than pictures that were not used as probe images ($t(99) = 8.66$; $p < 0.0001$).

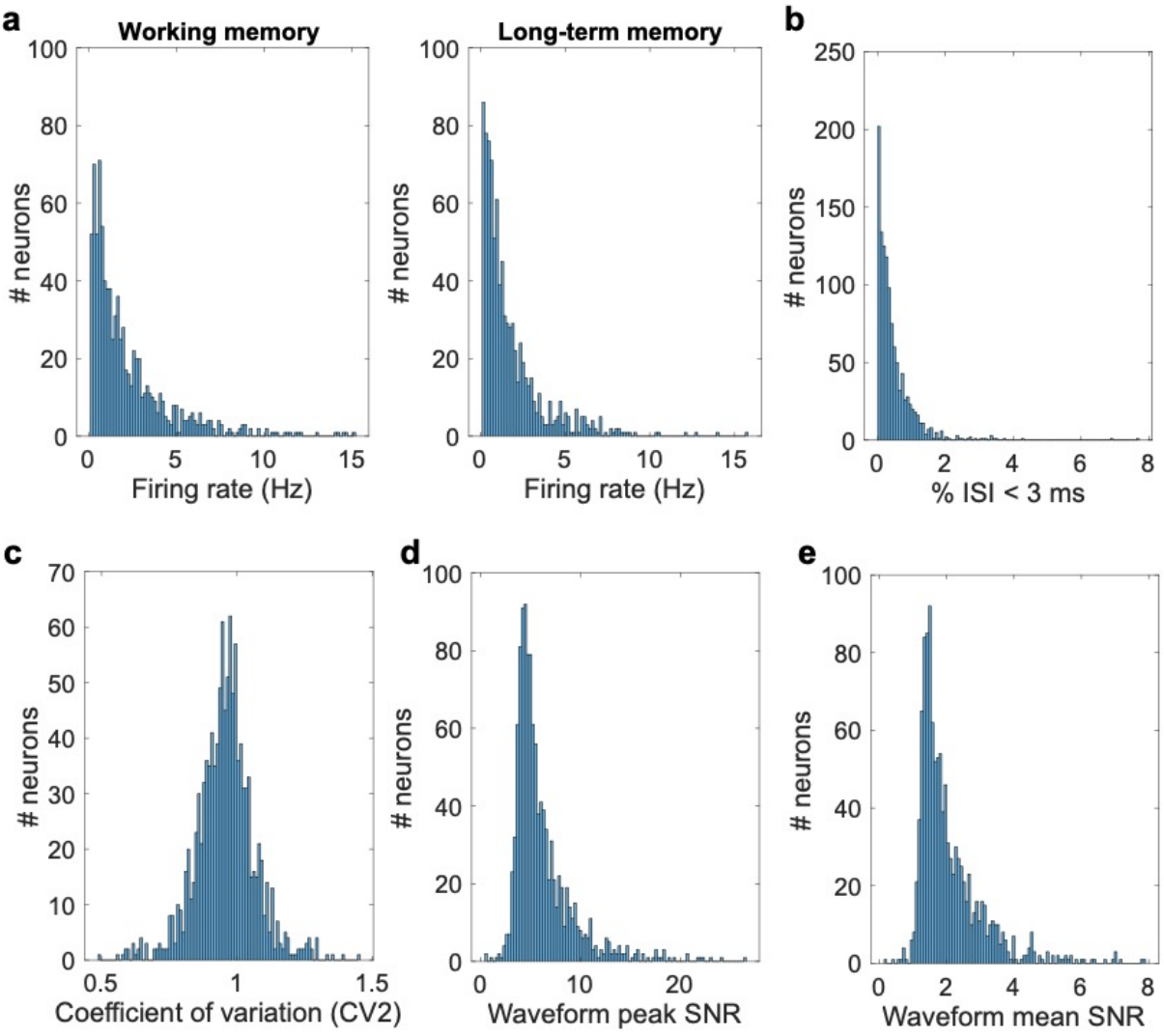

Figure S2. Spike-sorting quality metrics for all identified putative single units. (a) Average firing rate separately for the working memory (left) and the long-term memory part (right). **(b)** Proportion of inter-spike intervals (ISI) below 3 ms. **(c)** Coefficient-of-variation. **(d)** Signal-to-noise ratio (SNR) for the peak of the mean waveform across all spikes as compared to the standard deviation of the background noise. **(e)** Mean SNR of the waveform.

Session	Gender	Age	Acc (%) (WM / LTM)	Seizure onset zone	Hippocampus	Amygdala
P54cs_2	f	59	93.6 / 76.8	Right mesial temporal	3/0/7	5/2/17
P55cs	f	43	97.1 / 72.8	Right mesial temporal	0/0/1	7/3/21
P55cs_2	-	-	97.1 / 74.8	-	2/2/8	13/1/25
P57cs_2	m	46	91.4 / 67.5	Left neocortical parietal	1/0/4	14/5/24
P58cs	f	32	97.9 / 86.3	Right frontal neocortical	0/1/2	9/4/27
P61cs	f	52	87.1 / 68.8	Left mesial temporal	6/2/12	6/2/11
P61cs_2	-	-	97.9 / 72.3	-	0/0/2	7/3/8
P62cs	f	25	97.1 / 80.8	Left mesial temporal	0/2/3	5/0/19
P64cs	f	63	78.6 / 56.8	Right lateral temporal neocortical	0/0/0	3/0/17
P65cs	f	55	94.3 / 72	Bilateral independent temporal	5/0/9	7/3/18
P67cs	f	38	97.9 / 80.8	Bilateral mesial temporal	0/0/0	5/1/12
P68cs	m	54	92.1 / 58	Bilateral mesial temporal	3/3/16	1/0/17
P69cs	f	41	75 / 64.8	Not localized	3/2/8	4/0/7
P70cs	f	30	98.6 / 68.3	Right temporal	0/0/1	5/7/14
P70cs_2	-	-	96.4 / 73.9	-	0/0/1	0/0/5
P71cs	m	40	96.4 / 69	Not localized	0/0/0	0/0/3
P73cs	f	58	92.1 / 60.5	Left mesial temporal	0/1/5	7/1/17
P74cs	m	23	97.9 / 73	Left neocortical temporal	0/0/0	6/0/9
P76cs	f	24	99.3 / 78.5	Not localized	4/0/6	12/1/25
P76cs_2	-	-	100 / 90	-	0/0/0	0/0/4
P77cs	f	46	94.3 / 73	Right auditory cortex	2/2/4	12/12/41
P78cs	f	54	97.1 / 59.8	Right anterior temporal	0/1/13	0/1/14
P79cs	f	42	97.9 / 68.8	Right anterior lateral temporal neocortex	6/2/17	14/4/28
P79cs_2	-	-	97.1 / 80.5	-	4/0/13	9/3/19
P80cs	o	24	100 / 82.3	Not localized	4/7/13	20/9/49
P82cs	m	42	98.6 / 69.5	Bitemporal	11/2/17	12/1/24
P87cs*	f	26	74.3 / 54	Not localized	0/0/0	0/0/0
P88T	m	26	99.3 / 76.3	Right mesial temporal	3/1/22	0/0/6
P89T	f	45	97.1 / 57	Right frontal	7/3/22	11/0/18
P90T_2	m	20	91.4 / 57.8	Occipital cortex	0/0/11	0/0/2
P90T_3	-	-	90.7 / 55.8	-	0/1/13	0/0/0
P93T	m	23	83.6 / 62.7	Left mesial temporal	0/0/4	0/0/3
P96T	f	58	90 / 65	Bilateral mesial temporal	4/0/6	0/0/5
P101T	f	25	100 / 87	Left neocortical temporal	6/3/16	5/0/5

P101T_2	-	-	100 / 90	-	5/3/8	5/3/6
P103T	m	49	96.4 / 61.5	Right mesial temporal	4/2/20	3/0/11
P106T	m	26	84.3 / 58.3	Multifocal	1/0/7	6/1/14
P109T	m	28	100 / 85.8	Multifocal	1/2/15	0/0/7
P110T	m	38	99.3 / 64.3	Right fusiform cortex	0/0/6	1/0/10
P113T_2	m	36	97.1 / 60.8	Right mesial temporal	2/2/11	1/1/7
P116T	m	28	97.9 / 65	Left amygdala	4/1/9	5/0/18
P1802jh	m	62	90.7 / 70.3	Right mesial temporal	5/1/12	0/0/0
P1809jh	m	45	75.7 / 57	Left inferior + middle frontal gyrus	0/1/6	0/0/0
P1811jh	f	27	76.4 / 61	Bilateral mesial temporal	1/0/10	0/0/0
P1814jh	m	48	90.7 / 76.8	Left inferior orbitofrontal cortex and mesial temporal	1/3/8	0/0/0
P1901jh*	m	55	45 / 74.8	Left mesial temporal	0/0/0	0/0/0
P1903jh	m	30	99.3 / 82	Right mesial temporal	0/0/2	0/0/0
P1912jh	m	49	70.7 / 60.5	Left insula and left mesial temporal	6/3/16	0/0/0

Table S1. Patient demographics and neuron count per area. For each area, the first number represents the category-selective neuron count, the second the memory-selective neuron count, and the third all recorded neurons. For sessions in which a patient performed lower than 55% in either of the two tasks, the neurons counts were set to zero (marked with *). These sessions were excluded from all analyses.