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Supplemental Information

Integration of Parallel Opposing

Memories Underlies Memory Extinction

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Table 1. Statistical details related to Figure 1-6 and S1-S7

Experiment / Figure	group/treatment	n	normally distributed	statistical test	p value
Figure 1A	a) No extinction	6	na	ANOVA with Tukey's multiple comparisons test	ANOVA = 0.0025, Turkey's: a vs b = 0.99, a vs c = 0.02, a vs d = 0.04, b vs c = 0.01, b vs d = 0.03, c vs d = 0.98
	b) 2 CS+, 1 min ITI	10	yes		
	c) 2 CS+, 15 min ITI	10	yes		
	d) 5 CS+, 1 min ITI	10	yes		
Figure 1B	a) No extinction	7	na	ANOVA with Tukey's multiple comparisons test	ANOVA = 0.0025, Turkey's: a vs b = 0.97, a vs c = 0.003, b vs c = 0.004
	b) 2 CS-, 15 min ITI	7	na		
	c) 2 CS+, 15 min ITI	7	na		
Figure 1C	a) R58E02-GAL4 control CS- exposed	8	yes	unpaired t-test for comparison between same genotype but different treatment, ANOVA with Tukey's multiple comparisons test for comparison between different genotype, same treatment	ANOVA (CS-) = 0.0081, Turkey's: a vs c = 0.0292, a vs e = 0.0104, c vs e = 0.8768, ANOVA (CS+) = 0.0046, Turkey's: b vs d = 0.88, b vs f = 0.02, d vs f = 0.006, unpaired t-test: a vs b < 0.0001, c vs d = 0.02, e vs f = 0.4298
	b) R58E02-GAL4 control CS+ exposed	7	na		
	c) UAS-shits control CS- exposed	8	yes		
	d) UAS-shits control CS+ exposed	7	na		
	e) R58E02-GAL4; UAS-Shits1 CS- exposed	8	yes		
	f) R58E02-GAL4; UAS-Shits1 CS+ exposed	7	na		
Figure 1 D	a) MB504B-GAL4 control CS- exposed	6	na	unpaired t-test for comparison between same genotype but different treatment, ANOVA with Tukey's multiple comparisons test for comparison between different genotype, same treatment	ANOVA (CS-) = 0.8581, ANOVA (CS+) = 0.9763, unpaired t-test: a vs b = 0.001, c vs d = 0.01, e vs f = 0.03
	b) MB504B-GAL4 control CS+ exposed	6	na		
	c) UAS-Shits control CS- exposed	6	na		
	d) UAS-Shits control CS+ exposed	6	na		
	e) MB504B-GAL4; UAS-Shits1 CS- exposed	6	na		
	f) MB504B-GAL4; UAS-Shits1 CS+ exposed	6	na		
Figure 2 A and B	g 5	5	na	paired t-test	p = 0.0086
	g 5 control	4	na	paired t-test	p = 0.2664
Figure 2 C	g4	5	na	paired t-test	p = 0.2059
Figure 2 D	b'2p	4	na	paired t-test	p = 0.061
Figure 2 E	b'2m	4	na	paired t-test	p = 0.1805
Figure 2 F	a) VT1211-GAL4 control CS+ exposed	16	yes	ANOVA with Tukey's multiple comparisons test	ANOVA = 0.0108, Turkey's: a vs b = 0.99, a vs e = 0.02, b vs c = 0.02
	b) UAS-Shits1 control CS+ exposed	16	no		
	c) VT1211-GAL4; UAS-Shits1 CS+ exposed	16	yes		
	a) VT1211-GAL4 control CS- exposed	9	yes	ANOVA with Tukey's multiple comparisons test	ANOVA < 0.0001, Turkey's: a vs b = 0.88, a vs e < 0.0001, b vs c = 0.0003
	c) UAS-Shits1 control CS- exposed	9	yes		
	e) VT1211-GAL4; UAS-Shits1 CS- exposed	9	yes		
Figure 3A	MB112C-GAL4 dendrites training no extinction MCH as CS+	11	no	Wilcoxon matched-pairs signed rank test	p=0.0186
Figure 3B	R39A05-GAL4 dendrites training no extinction MCH as CS+	12	no	Wilcoxon matched-pairs signed rank test	p=0.8501
Figure 3C	R66C08-GAL4 dendrites training no extinction MCH as CS+	14	no	Wilcoxon matched-pairs signed rank test	p=0.6698
Figure 3D	MB112C-GAL4 dendrites training extinction MCH as CS+	15	no	Wilcoxon matched-pairs signed rank test	p=0.0125
Figure 3E	R39A05-GAL4 dendrites training extinction MCH as CS+	10	yes	paired t-test	p=0.3506
Figure 3F	R66C08-GAL4 dendrites training extinction MCH as CS+	12	yes	paired t-test	p=0.0019
Figure 6A	VT1211-GAL4 axons no extinction MCH as CS+	15	no	Wilcoxon matched-pairs signed rank test	p=0.0151
Figure 6B	R39A05-GAL4 axons training no extinction MCH as CS+	14	yes	paired t-test	p=0.0378
Figure 6C	R66C08-GAL4 axons training no extinction MCH as CS+	18	yes	paired t-test	p=0.0299
Figure 6D	VT1211-GAL4 axons training extinction MCH as CS+	14	no	Wilcoxon matched-pairs signed rank test	p=0.2166
Figure 6E	R39A05-GAL4 axons training extinction MCH as CS+	16	no	Wilcoxon matched-pairs signed rank test	p=0.0250
Figure 6F	R66C08-GAL4 axons training extinction MCH as CS+	11	yes	paired t-test	p=0.2594
Figure S1A	a) 2 pre-exposures 1 min ITI, 10-3	7	na	One sample t test (theoretical mean = 0), ANOVA with Tukey's multiple comparisons test	t-test: p < 0.0001, ANOVA < 0.0001, Turkey's: a vs b < 0.0001, a vs c < 0.0001, b vs c = 0.246
	b) 2 pre-exposures 15 min ITI, 10-3	8	yes		
	c) 15 pre-exposures 1 min ITI, 10-3	8	yes		
	d) 2 pre-exposures 15 min ITI, 10-4	8	yes	One sample t test (theoretical mean = 0)	p = 0.843
	a) 2 pre-exposures 1 min ITI, 10-6	11	yes		
	b) 2 pre-exposures 15 min ITI, 10-6	11	yes		
Figure S1B	10-3	6	na	paired t-test	p = 0.4852
	10-6	6	na		
Figure S1C left	a) training/extinction/retraining/immediate test	9	yes	ANOVA with Tukey's multiple comparisons test	ANOVA = 0.7637
	b) training/---/retraining/immediate test	8	yes		
	c) ---/---/retraining/immediate test	9	yes		
Figure S1C right	a) training/extinction/retraining/ 90 min test	9	yes	ANOVA with Tukey's multiple comparisons test	ANOVA = 0.0137, Turkey's: a vs b = 0.975, a vs c = 0.02, b vs c = 0.03
	b) training/---/retraining/ 90 min test	9	yes		
	c) ---/---/retraining/ 90 min test	9	yes		
Figure S1D	a) R58E02-GAL4 control CS- exposed	6	na	unpaired t-test for comparison between same genotype but different treatment, ANOVA with Tukey's multiple comparisons test for comparison between different genotype, same treatment	ANOVA (CS-) = 0.1770, ANOVA (CS+) = 0.9490, unpaired t-test: a vs b = 0.0003, c vs d = 0.0012, e vs f = 0.02
	b) R58E02-GAL4 control CS+ exposed	6	na		
	c) UAS-Shits1 control CS- exposed	6	na		
	d) UAS-Shits1 control CS+ exposed	6	na		
	e) R58E02-GAL4; UAS-Shits1 CS- exposed	6	na		
	f) R58E02-GAL4; UAS-Shits1 CS+ exposed	6	na		
Figure S1E	a) R58E02-GAL4 CS+ exposed	9	yes	ANOVA with Tukey's multiple comparisons test	ANOVA = 0.411
	c) UAS-shits CS+ exposed	9	yes		
	e) R58E02-GAL4; UAS-Shits1 CS+ exposed	9	yes		
		9	yes		
Figure S2A	a) VT1211-GAL4	9	yes	ANOVA with Tukey's multiple comparisons test for comparison	ANOVA = 0.3359
	c) UAS-Shits1	9	yes		
	b) VT1211-GAL4	9	yes		
Figure S2B	a) VT1211-GAL4 control CS- exposed	11	yes	ANOVA with Tukey's multiple comparisons test	ANOVA = 0.5785
	c) UAS-Shits1 control CS- exposed	11	yes		
	b) VT1211-GAL4 control CS+ exposed	10	yes		
	d) VT1211-GAL4 control CS+ exposed	11	yes	ANOVA with Tukey's multiple comparisons test for comparison	ANOVA = 0.6085
	e) UAS-Shits1 control CS+ exposed	11	no		
	f) VT1211-GAL4 control CS+ exposed	10	yes		
Figure S3A	R66C08-GAL4 dendrites training no extinction OCT as CS+	11	yes	paired t-test	p=0.9359
Figure S3B	R66C08-GAL4 dendrites training extinction OCT as CS+	13	yes	paired t-test	p=0.0417
Figure S3C	MB112C-GAL4 dendrites training no extinction OCT as CS+	17	yes	paired t-test	p=0.0107
Figure S3D	MB112C-GAL4 dendrites training extinction OCT as CS+	15	no	Wilcoxon matched-pairs signed rank test	p=0.0302
Figure S3E	VT1211-GAL4 dendrites training no extinction MCH as CS+	14	no	Wilcoxon matched-pairs signed rank test	p=0.3258
Figure S3F	VT1211-GAL4 dendrites training extinction MCH as CS+	13	no	Wilcoxon matched-pairs signed rank test	p=0.0215
Figure S3G	VT1211-GAL4 dendrites training no extinction OCT as CS+	14	yes	paired t-test	p=0.3803
Figure S3H	VT1211-GAL4 dendrites training extinction OCT as CS+	11	yes	paired t-test	p=0.0104
Figure S3I	R39A05-GAL4 dendrites training no extinction OCT as CS+	16	yes	paired t-test	p=0.1284
Figure S3J	R39A05-GAL4 dendrites training extinction OCT as CS+	12	yes	paired t-test	p=0.0934
Figure S3K	MB112C-GAL4 dendrites mock no extinction OCT as CS+	11	no	Wilcoxon matched-pairs signed rank test	p>0.999
Figure S3L	MB112C-GAL4 dendrites mock extinction OCT as CS+	12	no	Wilcoxon matched-pairs signed rank test	p=0.7334
Figure S3M	MB112C-GAL4 dendrites mock no extinction MCH as CS+	18	no	Wilcoxon matched-pairs signed rank test	p=0.7987
Figure S3N	MB112C-GAL4 dendrites mock extinction MCH as CS+	15	no	Wilcoxon matched-pairs signed rank test	p=0.9341
Figure S3O	VT1211-GAL4 dendrites mock no extinction MCH as CS+	11	no	Wilcoxon matched-pairs signed rank test	p=0.7002
Figure S3P	VT1211-GAL4 dendrites mock extinction MCH as CS+	11	no	Wilcoxon matched-pairs signed rank test	p=0.8984
Figure S3Q	VT1211-GAL4 dendrites mock no extinction OCT as CS+	11	yes	paired t-test	p=0.8764
Figure 3R	VT1211-GAL4 dendrites mock extinction OCT as CS+	10	no	Wilcoxon matched-pairs signed rank test	p=0.7695
Figure S6A	VT1211-GAL4 axons training no extinction OCT as CS+	11	yes	paired t-test	p=0.0065
Figure S6B	VT1211-GAL4 axons training extinction OCT as CS+	10	yes	paired t-test	p=0.7695
Figure S6C	R66C08-GAL4 axons training no extinction OCT as CS+	24	no	Wilcoxon matched-pairs signed rank test	p=0.0457
Figure S6D	R66C08-GAL4 axons training extinction OCT as CS+	12	no	Wilcoxon matched-pairs signed rank test	p=0.9697
Figure S6E	R39A05-GAL4 axons training no extinction OCT as CS+	14	yes	paired t-test	p=0.0378
Figure S6F	R39A05-GAL4 axons training extinction OCT as CS+	16	no	Wilcoxon matched-pairs signed rank test	p=0.0250
Figure S6G	VT1211-GAL4 axons mock no extinction MCH as CS+	12	no	Wilcoxon matched-pairs signed rank test	p=0.1099
Figure S6H	VT1211-GAL4 axons mock extinction MCH as CS+	11	yes	paired t-test	p=0.2848
Figure S6I	VT1211-GAL4 axons mock no extinction OCT as CS+	10	no	Wilcoxon matched-pairs signed rank test	p=0.7695
Figure S6J	VT1211-GAL4 axons mock no extinction OCT as CS+	11	yes	paired t-test	p=0.1923