



**Supplementary Information for
Observation of others' threat reactions recovers memories previously
shaped by first-hand experiences**

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Table S1: ACQUISITION TRAINING Experiment 1 rmANOVA SCR

SCR acquisition training, no differences between groups.

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
CS-type	None	0.593	1,33	0.593	5.712	0.023	0.148
CS-type * GROUP	None	0.004	1,33	0.004	0.037	0.848	0.001
Block	None	1.360	1,33	1.360	8.020	0.008	0.196
Block * GROUP	None	0.168	1,33	0.168	0.990	0.327	0.029
Block * CS-type	None	0.176	1,33	0.176	0.532	0.471	0.016
Block * CS-type * GROUP	None	0.069	1,33	0.069	0.209	0.650	0.006

Note. Sphericity corrections not available for factors with 2 levels.*Note.* Type II Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	η^2_p
GROUP	0.227	1,33	0.227	0.504	0.483	0.015

Note. Type II Sum of Squares**Simple Comparisons - CS-type**

		Mean Difference	SE	t	Cohen's d	p_{holm}
CSP	CSM	0.130	0.054	2.394	0.405	0.022

Note. Cohen's d does not correct for multiple comparisons.*Note.* Results are averaged over the levels of: GROUP, Block**Simple Comparisons - Block**

		Mean Difference	SE	t	Cohen's d	p_{holm}
B1	B2	0.199	0.070	2.859	0.483	0.007

Note. Cohen's d does not correct for multiple comparisons.*Note.* Results are averaged over the levels of: GROUP, CS-type**Descriptives**

CS-type	Block	GROUP	Mean	SD	N
CSM	1	0	0.524	0.349	17
		1	0.429	0.297	18
	2	0	0.372	0.439	17
		1	0.327	0.376	18
CSP	1	0	0.782	0.703	17
		1	0.577	0.967	18
	2	0	0.397	0.272	17
		1	0.419	0.220	18

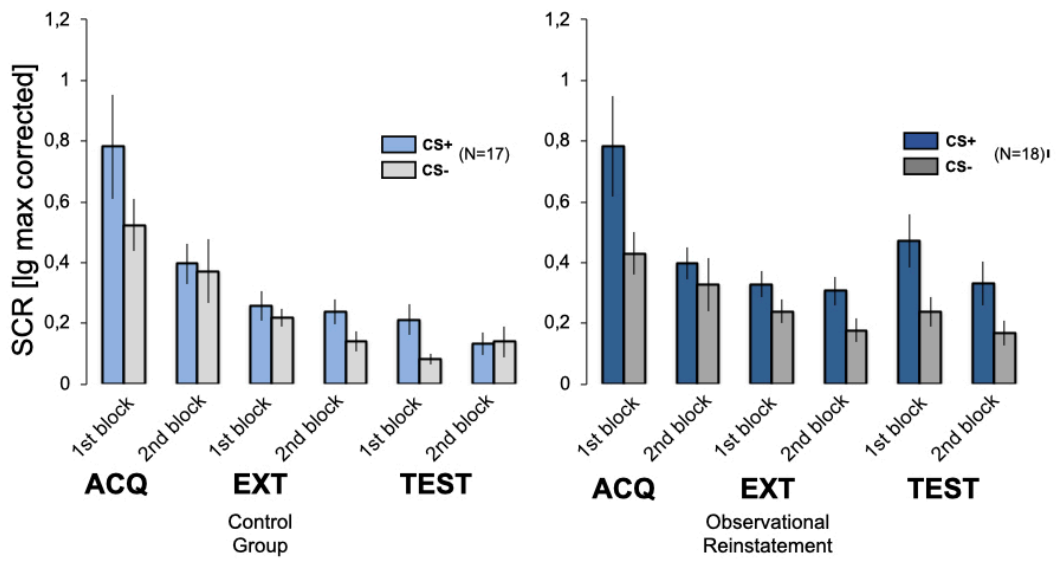


Figure S1: SCRs Experiment 1 block-wise

Table S2: EXTINCTION TRAINING Experiment1 rmANOVA SCR

SCR extinction, no differences between groups

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
CS-type	None	0.282	1,33	0.282	9.482	0.004	0.223
CS-type * GROUP	None	0.015	1,33	0.015	0.496	0.486	0.015
Block	None	0.072	1,33	0.072	2.889	0.099	0.080
Block * GROUP	None	2.707e-4	1,33	2.707e-4	0.011	0.917	3.301e-4
Block * CS-type	None	0.020	1,33	0.020	0.957	0.335	0.028
Block * CS-type * GROUP	None	8.786e-4	1,33	8.786e-4	0.042	0.839	0.001

Note. Sphericity corrections not available for factors with 2 levels.*Note.* Type II Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	η^2_p
GROUP	0.085	1,33	0.085	2.113	0.156	0.060

Note. Type II Sum of Squares

Simple Comparisons - CS-type

	Mean Difference	SE	t	Cohen's d	p _{holm}
CSP CSM	0.089	0.029	3.058	0.517	0.004

Note. Cohen's d does not correct for multiple comparisons.*Note.* Results are averaged over the levels of: GROUP, Block

Late EXTINCTION (Block 2)

Two-sided Independent Samples T-Test between groups

No difference between groups at the end of extinction

Independent Samples T-Test

	t	df	p	Mean Difference	SE Difference	Cohen's d
CSP EXT Block 2	-1.071	33	0.292	-0.068	0.063	-0.362
CSM EXT Block 2	-0.718	33	0.478	-0.037	0.051	-0.243

Descriptives

CS-type	Block	GROUP	Mean	SD	N
CSM	1	0	0.218	0.127	17
		1	0.239	0.168	18
	2	0	0.140	0.139	17
		1	0.177	0.161	18
CSP	1	0	0.257	0.200	17
		1	0.329	0.179	18
	2	0	0.238	0.169	17
		1	0.306	0.202	18

Table S3: REINSTATEMENT analyses Experiment1 rm ANOVA SCR

Reinstatement Analysis (second block extinction, first block reinstatement Test) reveals difference between groups.

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
CS-type	None	0.771	1,33	0.771	21.050	6.176e-5	0.389
CS-type * GROUP	None	0.039	1,33	0.039	1.058	0.311	0.031
Reinstatement	None	0.049	1,33	0.049	1.131	0.295	0.033
Reinstatement * GROUP	None	0.212	1,33	0.212	4.891	0.034	0.129
Reinstatement * CS-type	None	0.042	1,33	0.042	1.356	0.253	0.039
Reinstatement * CS-type * GROUP	None	0.011	1,33	0.011	0.354	0.556	0.011

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type II Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	η^2_p
GROUP	0.591	1,33	0.591	9.136	0.005	0.217

Note. Type II Sum of Squares

Simple Comparisons - CS-type

	Mean Difference	SE	t	Cohen's d	p_{holm}
CSP CSM	0.147	0.032	4.557	0.770	6.766e-5

Note. Cohen's d does not correct for multiple comparisons.

Note. Results are averaged over the levels of: GROUP, Reinstatement

Descriptives

Descriptives

CS-type	Reinstatement	GROUP	Mean	SD	N
CSM	Extinction	0	0.140	0.139	17
		1	0.177	0.161	18
	Reinstatement	0	0.081	0.072	17
		1	0.238	0.211	18
CSP	Extinction	0	0.238	0.169	17
		1	0.306	0.202	18
	Reinstatement	0	0.212	0.209	17
		1	0.471	0.373	18

Table S4: REINSTATEMENT Experiment 1**One-sided independent samples t-Test SCR between groups**

The increase in SCRs from extinction (last block) to reinstatement test (first block) is larger after observational reinstatement, when compared to the increase in the control group. Furthermore, responses are larger to the CSP and the CSM during reinstatement test after observational reinstatement, when compared to the control group

	t	df	p _{uncorr}	p _{Holm}	Mean Difference	SE Difference	Cohen's d
Mean increase (CSP and CSM) from EXTINCTION (Block2) to REINSTATEMENT-Test (Block 1)	-2.213	33	0.017	0.017	-0.156	0.070	-0.748
CSP REINSTATEMENT-Test (Block 1)	-2.513	33	0.009	0.018	-0.259	0.103	-0.850
CSM REINSTATEMENT-Test (Block 1)	-2.903	33	0.003	0.009	-0.157	0.054	-0.982

Note. For all tests, the alternative hypothesis specifies that group 0 is less than group 1

Note. Corrected p-values (p_{Holm}) correct for 3 comparisons.

Additionally, we explored the CS-specific increase in SCRs. These post-hoc tests were not indicated by the ANOVA and results are displayed for additional information.

	t	df	p _{uncorr}	p _{Holm}	Mean Difference	SE Difference	Cohen's d
Mean increase CSP from EXTINCTION (Block2) to REINSTATEMENT-Test (Block 1)	-1.728	24 ^a	0.048	0.048	-0.191	0.101	-0.857
Mean increase CSM from EXTINCTION (Block2) to REINSTATEMENT-Test (Block 1)	-2.903	33	0.038	0.076	-0.120	0.066	-0.620

Note. For all tests, the alternative hypothesis specifies that group 0 is less than group 1

Note. Corrected p-values (p_{Holm}) correct for 2 comparisons.

Note. ^a A welch test was performed in order to account for violations of sphericity (deviation from equality of variances)

Descriptives

Group Descriptives (Group 0 = Control; Group 1= Experimental-Group)

	Group	N	Mean	SD	SE
Increase Mean EXTINCTION(Block2) to REINSTATEMENT Test (Block 1)	0	17	-0.043	0.150	0.036
	1	18	0.113	0.251	0.059
CSP REINSTATEMENT (Block 1)	0	17	0.212	0.209	0.051
	1	18	0.471	0.373	0.088
CSM REINSTATEMENT (Block 1)	0	17	0.081	0.072	0.017
	1	18	0.238	0.211	0.050

Table S5 Control analyses: REINSTATEMENT-Test Block 1&2 One-sided independent Samples T-Test

Larger responses to the CSP and CSM in the Reinstatement-Test reinstatement when comparing the whole reinstatement test phase (Block 1 and 2) between groups.

	t	df	p _{uncorr}	p _{Holm}	Mean Difference	SE Difference	Cohen's d
CSP REINSTATEMENT-Test (Block 1 & 2)	2.905	33	0.003	--	-0.229	0.079	-0.983
CSM REINSTATEMENT-Test (Block 1 & 2)	1.883	33	0.034	--	-0.093	0.050	-0.637

Note. For all tests, the alternative hypothesis specifies that group 0 is less than group 1.

Descriptives

Group Descriptives

	Group	N	Mean	SD	SE
CSP Reinstatement-Test (Block 1&2)	0	17	0.172	0.174	0.042
	1	18	0.401	0.277	0.065
CSM Reinstatement-Test (Block 1&2)	0	17	0.110	0.113	0.027
	1	18	0.203	0.172	0.041

Table S6 REINST rm ANOVA Experiment 1 SCR, including all participants

Inclusion of the excluded participants in Experiment 1 still revealed a significant increase of SCRs from late extinction to the first block of the Reinstatement-Test after the observational reinstatement procedure in the experimental, but not in the control group [group by phase interaction: $F(1,37) = 4.14, p = 0.049; \eta^2 = 0.129; \eta^2 = .098$].

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
CS-type	None	0.680	1.000	0.680	18.245	$1.302e^{-4}$	0.330
CS-type * GROUP	None	0.022	1.000	0.022	0.587	0.449	0.016
Residuals	None	1.379	37.000	0.037			
Reinstatement	None	0.042	1.000	0.042	1.001	0.324	0.026
Reinstatement * GROUP	None	0.176	1.000	0.176	4.144	0.049	0.101
Residuals	None	1.569	37.000	0.042			
Reinstatement * CS-type	None	0.028	1.000	0.028	0.972	0.331	0.026
Reinstatement * CS-type * GROUP	None	0.005	1.000	0.005	0.181	0.673	0.005
Residuals	None	1.569	37.000	0.042			

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type II Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	η^2_p
GROUP	0.587	1	0.587	9.264	0.004	0.200
Residuals	2.345	37	0.063			

Note. Type II Sum of Squares

Descriptives

Descriptives

CS-type	Reinstatement	GROUP	Mean	SD	N
CSM	Extinction	0	0.135	0.137	18
		1	0.179	0.159	21
	Reinstatement	0	0.081	0.070	18
		1	0.236	0.196	21
CSP	Extinction	0	0.227	0.170	18
		1	0.295	0.196	21
	Reinstatement	0	0.202	0.207	18
		1	0.428	0.367	21

Exclusion of outliers (median $\pm 3\sigma$) in observational reinstatement Experiment 1 SCR

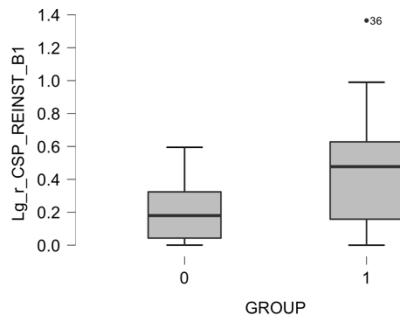


Figure S2: Boxplot labeling outlier participants during CS+ in the reinstatement-test in the control group (=0) and the experimental group (=1)

In order to test if responses within the reinstatement-test were driven by outliers, we excluded outliers, defined as mean responses in the first block during the reinstatement-test that were above or below median $\pm 3\sigma$, respectively (N=1 from the experimental group, see figure S2). The results resembled the findings reported within the whole sample (see table S7).

Table S7: REINSTATEMENT Experiment 1 excluding outliers
One-sided independent samples t-Test SCR between groups

	t	df	p _{uncorr}	Mean Difference	SE Difference	Cohen's d
Mean increase (CSP and CSM) from EXTINCTION (Block2) to REINSTATEMENT-Test (Block 1)	-1.931	32	0.031	-0.126	0.065	-0.662
CSP REINSTATEMENT-Test (Block 1)	-2.286	32	0.014	-0.206	0.090	-0.784
CSM REINSTATEMENT-Test (Block 1)	-2.976	32	0.003	-0.164	0.055	-1.021

Note. For all tests, the alternative hypothesis specifies that group 0 (=control group) is less than group 1 (experimental group).

Alternative range correction of SCRs to the maximum during acquisition

In order to test if observational reinstatement effects in Experiment 1 were contingent on the range-correction of SCRs, we included an additional analysis of range-corrected SCRs to the maximum during acquisition (see table S8 and figure S3).

Table S8: REINSTATEMENT Experiment 1 SCRs Range correction to the maximum during acquisition.
One-sided independent samples t-Test SCR between groups

	t	df	p_{uncorr}	p_{Holm}	Mean Difference	SE Difference	Cohen's d
Range correction to the max of the acquisition							
Mean increase (CSP and CSM) from EXTINCTION (Block2) to REINSTATEMENT-Test (Block 1)	1.966	33	0.029	0.029	0.048	0.024	0.665
CSP REINSTATEMENT-Test (Block 1)	2.563	33	0.008	0.016	0.074	0.029	0.867
CSM REINSTATEMENT-Test (Block 1)	2.749	33	0.005	0.015	0.052	0.019	0.930

Note. For all tests, the alternative hypothesis specifies that group 0 is less than group 1
 Note. Corrected p -values (p_{Holm}) correct for 3 comparisons.

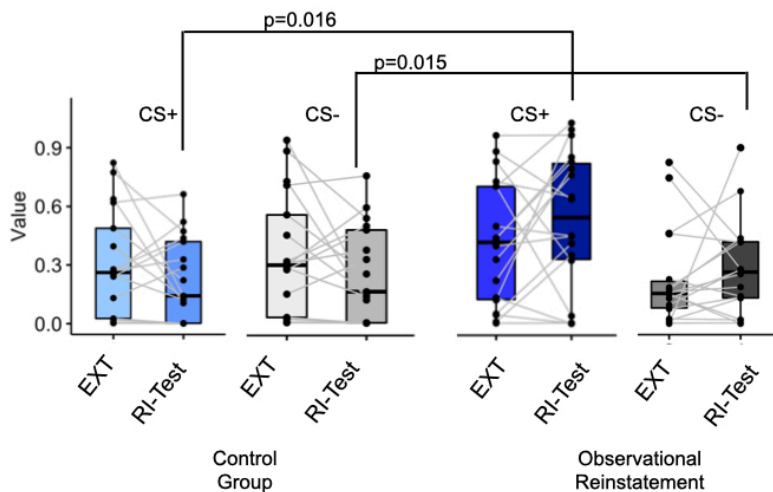


Figure S3: Boxplots of individual SCRs during late extinction (2nd block) reinstatement-test (1st block) for each the CS+ in the control group (left four bars) and observational reinstatement group (right four bars). P-values indicate post-hoc t-test (one-sided in panel c, corrected for multiple comparisons using Bonferroni-Holm).

Table S 9 ACQUISITION TRAINING Experiment 2 rm ANOVA SCR

Successful acquisition of CS-US associations, indicated by higher SCRs towards the CS+ as compared to the CS-.

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
CS-type	None	1.526	1,20	1.526	7.987	0.010	0.285
Block	None	6.141 ^a	3,60 ^a	2.047 ^a	7.349 ^a	2.830e ^{-a} ₄	0.269
	Greenhouse-Geisser	6.141	1.697, 33.937	3.619	7.349	0.003	0.269
CS-type * Block	None	0.326 ^a	3, 60 ^a	0.109 ^a	0.918 ^a	0.438 ^a	0.044
	Greenhouse-Geisser	0.326	1.944, 38.879	0.168	0.918	0.405	0.044

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type II Sum of Squares

^a Mauchly's test of sphericity indicates that the assumption of sphericity is violated ($p < .05$).

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Residuals	16.926	20	0.846		

Note. Type II Sum of Squares

Simple Comparisons – CS-type

	Mean Difference	SE	t	Cohen's d	p_{holm}
CSP CSM	0.191	0.067	2.826	0.617	0.010

Note. Cohen's d does not correct for multiple comparisons.

Note. Results are averaged over the levels of: Block

Descriptives

Descriptives

Stimulus	Block	Mean	SD	N
CSM	1	0.648	0.620	21
	2	0.435	0.409	21
	3	0.264	0.198	21
	4	0.222	0.157	21
CSP	1	0.954	0.979	21
	2	0.532	0.551	21
	3	0.378	0.220	21
	4	0.469	0.550	21

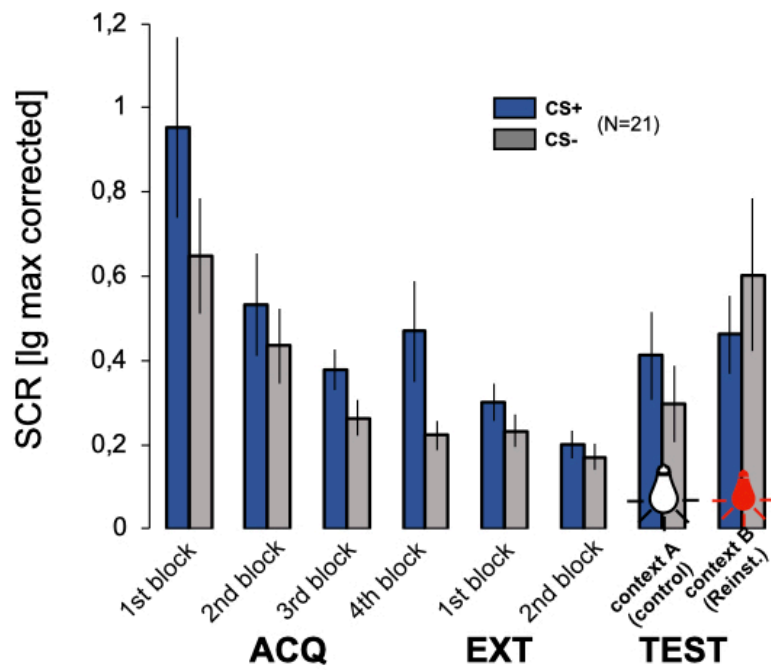


Figure S4: SCRs Experiment 2, block-wise

Table S 10 EXTINCTION TRAINING Experiment 2 rm ANOVA SCR

Decreasing SCRs across extinction, no CS-type effect. 6 trials= 2 Blocks (a 3 trials)

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
CS-type	None	0.047	1,20	0.047	1.831	0.191	0.084
Block	None	0.138	1,20	0.138	5.315	0.032	0.210
CS-type * Block	None	0.008	1,20	0.008	0.418	0.525	0.020

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type II Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Residuals	0.886	20	0.044		

Note. Type II Sum of Squares

Simple comparisons - Stimulus

	Mean Difference	SE	t	Cohen's d	p_{holm}
CSP CSM	0.047	0.035	1.353	0.295	0.191

Note. Cohen's d does not correct for multiple comparisons.

Note. Results are averaged over the levels of: Block

Simple comparisons - Block

	Mean Difference	SE	t	Cohen's d	p_{holm}
X1 X2	0.081	0.035	2.305	0.503	0.032

Note. Cohen's d does not correct for multiple comparisons.

Note. Results are averaged over the levels of: Stimulus

Descriptives

Descriptives

Stimulus	Block	Mean	SD	N
CSM	1	0.233	0.171	21
	2	0.171	0.138	21
CSP	1	0.300	0.209	21
	2	0.199	0.149	21

Table S11 REINSTATEMENT Experiment 2 rm ANOVA SCR

Increase of SCRs from 2nd half of extinction (block2) to Reinstatement Context (Red), but not the Control context.

The factor context includes three levels: late extinction, Context A and Context B

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
Stimulus	None	0.004	1,20	0.004	0.052	0.822	0.003
Context	None	2.292 ^a	2,40 ^a	1.146 ^a	5.554 ^a	0.007 ^a	0.217
	Greenhouse-Geisser	2.292	1.433, 28.659	1.600	5.554	0.016	0.217
Stimulus * Context	None	0.382 ^a	2.000 ^a	0.191 ^a	2.953 ^a	0.064 ^a	0.129
	Greenhouse-Geisser	0.382	1.453	0.263	2.953	0.082	0.129
Residuals	None	2.587	40.000	0.065			
	Greenhouse-Geisser	2.587	29.057	0.089			

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type II Sum of Squares

^a Mauchly's test of sphericity indicates that the assumption of sphericity is violated ($p < .05$).

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Residuals	13.949	20	0.697		

Note. Type II Sum of Squares

Simple comparisons Context (one-sided t-test)

		Mean Difference	SE	t	Cohen's d	p_{holm}
Extinction	RI-Test (control)	-0.152	0.089	-1.702	-0.371	0.052
Extinction	RI-Test (red)	-0.330	0.126	-2.621	-0.572	0.025
RI-Test (control)	RI-Test (red)	-0.178	0.075	-2.371	-0.517	0.028

Note. P-value adjusted for comparing a family of 3

Note. Results are averaged over the levels of: CS-type

Note. For all tests, the alternative hypothesis specifies that Measure 1 is less than Measure 2.

Table S 12: One-sample paired Samples T-Test comparing CS by context

	t	df	p _{uncorr}	p _{Holm}	Mean Difference	SE Difference	Cohen's d
CSP late extinction(block2) vs. CSP reinstatement-test context A (control)	-1.602		0.062	0.124	-0.178	0.111	-0.350
CSP late extinction(block2) vs. CSP reinstatement-test context B (red)	-2.398		0.013	0.039	-0.228	0.095	-0.523
CSM late extinction(block2) vs. CSM reinstatement-test context A (control)	-1.525		0.071	0.071	-0.126	0.083	-0.333
CSM late extinction(block2) vs. CSM reinstatement-test context B (red)	-2.570		0.009	0.036	-0.432	0.168	-0.561

Note. For all tests, the alternative hypothesis specifies that Measure 1 is less than Measure 2.

Table S 13 REINSTATEMENT EXP2 rm ANOVA order control

Order of RI-testing (Context B/Red first or CContext A/Control first) had no effect on Reinstatement-Context effect

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
CS-type	None	0.004	1,19	0.004	0.057	0.815	0.003
CS-type * order	None	0.194	1,19	0.194	2.628	0.121	0.122
Context	None	2.292	2,38	1.146	5.291	0.009	0.218
	Greenhouse-Geisser	2.292	1.427, 27.115	1.606	5.291	0.019	0.218
Context * order	None	0.024	2,38	0.012	0.055	0.947	0.003
	Greenhouse-Geisser	0.024	1.427, 27.115	0.017	0.055	0.894	0.003
CS-type * Context	None	0.382	2,38	0.191	2.977	0.063	0.135
	Greenhouse-Geisser	0.382	1.478	0.258	2.977	0.081	0.135
CS-type * Context * order	None	0.150	2,38	0.075	1.167	0.322	0.058
	Greenhouse-Geisser	0.150	1.478	0.101	1.167	0.312	0.058

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type II Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
order	0.104	1,19	0.104	0.143	0.709

Note. Type II Sum of Squares

Table S14 REINSTATEMENT Experiment rm ANOVA STAI Trait

STAI trait had no effect on Reinstatement-Context effect

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
CS-type	None	0.004	1,19	0.004	0.053	0.820	0.003
CS-type * STAI Trait	None	0.112	1,19	0.112	1.431	0.246	0.070
Context	None	2.292	2,38	1.146	5.294	0.009	0.218
	Greenhouse-Geisser	2.292	1.435, 27.257	1.598	5.294	0.019	0.218
Context * STAI Trait	None	0.028	2,38	0.014	0.064	0.938	0.003
	Greenhouse-Geisser	0.028	1.435, 27.257	0.019	0.064	0.883	0.003
CS-type * Context	None	0.382	2,38	0.191	2.895	0.068	0.132
	Greenhouse-Geisser	0.382	1.399, 26.575	0.273	2.895	0.089	0.132
CS-type * Context * STAI Trait	None	0.080	2,38	0.040	0.607	0.550	0.031
	Greenhouse-Geisser	0.080	1.399, 26.575	0.057	0.607	0.496	0.031

Table S15 REINSTATEMENT Experiment 2 rm ANOVA STAI State

STAI state had no effect on Reinstatement-Context effect

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
CS-type	None	0.004	1,19	0.004	0.050	0.826	0.003
CS-type * STAI State	None	7.76e-6	1,19	7.7e-6	9.2e-5	0.992	4.2e-6
Context	None	2.292	2,38	1.146	5.303	0.009	0.218
	Greenhouse-Geisser	2.292	1.427, 27.120	1.606	5.303	0.019	0.218
Context * STAI State	None	0.041	2,38	0.021	0.095	0.910	0.005
	Greenhouse-Geisser	0.041	1.427, 27.120	0.029	0.095	0.845	0.005
CS-type * Context	None	0.382	2,38	0.191	2.994	0.062	0.136
	Greenhouse-Geisser	0.382	1.449, 27.537	0.264	2.994	0.081	0.136
CS-type * Context * STAI State	None	0.163	2,38	0.082	1.279	0.290	0.063
	Greenhouse-Geisser	0.163	1.449, 27.537	0.113	1.279	0.284	0.063

Table S16 EXT to RI-Test Repeated Measures ANOVA Experiment 2, inclusion of all participants

Inclusion of all participants in Experiment 2 did not conceptually change the results, as analyses of this sample revealed a significant main effect of context ($F(2,44) = 5.220$, $p = .019$, $\eta^2 = .129$).

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
CS-type	None	0.002	1.000	0.002	0.024	0.878	0.001
Residuals	None	1.606	22.000	0.073			
Context	None	2.026 ^a	2.000 ^a	1.013 ^a	5.220 ^a	0.009 ^a	0.192
	Greenhouse-Geisser	2.026	1.418	1.429	5.220	0.019	0.192
Residuals	None	8.539	44.000	0.194			
	Greenhouse-Geisser	8.539	31.191	0.274			
Context * CS-type	None	0.339 ^a	2.000 ^a	0.169 ^a	2.815 ^a	0.071 ^a	0.113
	Greenhouse-Geisser	0.339	1.462	0.232	2.815	0.089	0.113
Residuals	None	8.539	44.000	0.194			
	Greenhouse-Geisser	8.539	31.191	0.274			

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type II Sum of Squares

^a Mauchly's test of sphericity indicates that the assumption of sphericity is violated ($p < .05$).

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Residuals	15.248	22	0.693		

Note. Type II Sum of Squares

Simple comparisons Context (one-sided t-test)

		Mean Difference	SE	t	Cohen's d	p_{holm}
Extinction	RI-Test (control)	-0.134	0.083	-1.623	-0.338	0.060
Extinction	RI-Test (red)	-0.296	0.117	-2.530	-0.528	0.029
RI-Test (control)	RI-Test (red)	-0.162	0.069	-2.348	-0.489	0.029

Note. P-value adjusted for comparing a family of 3

Note. Results are averaged over the levels of: CS-type

Note. For all tests, the alternative hypothesis specifies that Measure 1 is less than Measure 2.

Exclusion of outliers (median $\pm 3\sigma$) in observational reinstatement Experiment 2 SCR

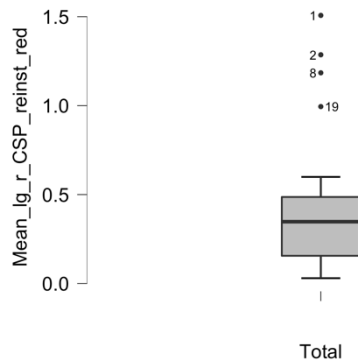


Figure S5: Boxplot labeling outlier participants by CS+ responses in the reinstatement-test in context B (red reinstatement context)

In order to test if responses within the reinstatement-test were driven by outliers, we excluded outliers, defined as mean CS+ responses in reinstatement-test within context B (red reinstatement context) that were above or below median $\pm 3\sigma$, respectively (N=4, see figure S2). The results resembled the findings reported within the whole sample (see table S7), albeit missing the alpha level of $p=0.05$.

Table S 17: One-sample paired Samples T-Test comparing responses in the reinstatement and control context with extinction learning when excluding outliers (CS+ responses in the red reinstatement context).

	t	df	p_{uncorr}	Mean Difference	SE Difference	Cohen's d
Ext vs control context (mean across CS)	-0.461	16	0.326	-0.030	0.066	-0.112
Ext vs red reinstatement context (mean across CS)	-1.566	16	0.068	-0.083	0.053	-0.380
CSP_ext_block2 vs. CSP_reinst_contr	-0.174	16	0.432	-0.016	0.094	-0.042
CSP_ext_block2 vs. CSP_reinst_red	-0.871	16	0.198	-0.048	0.055	-0.211
CSM_ext_block vs. CSM_reinst_contr	-0.760	16	0.229	-0.045	0.059	-0.184
CSM_ext_block2 vs. CSM_reinst_red	-1.706	16	0.054	-0.117	0.069	-0.414

Note. For all tests, the alternative hypothesis specifies that Measure 1 is less than Measure 2.

Alternative range correction of SCRs to the maximum during acquisition

In order to test if observational reinstatement effects in Experiment 2 were contingent on the range-correction of SCRs, we included additional analyses of range-corrected SCRs to the maximum during acquisition (see table S18, S19 and figure S4).

Table S 18: Experiment 2 Range correction to maximal responses during acquisition.

Simple comparisons Context (one-sided t-test)

		Mean Difference	SE	t	Cohen's d	p_{holm}
Extinction	RI-Test (control)	-0.138	0.085	-1.625	-0.355	0.060
Extinction	RI-Test (red)	-0.331	0.126	-2.632	-0.574	0.024
RI-Test (control)	RI-Test (red)	-0.193	0.075	-2.583	-0.564	0.024

Note. P-value adjusted for comparing a family of 3

Note. Results are averaged over the levels of: CS-type

Note. For all tests, the alternative hypothesis specifies that Measure 1 is less than Measure 2.

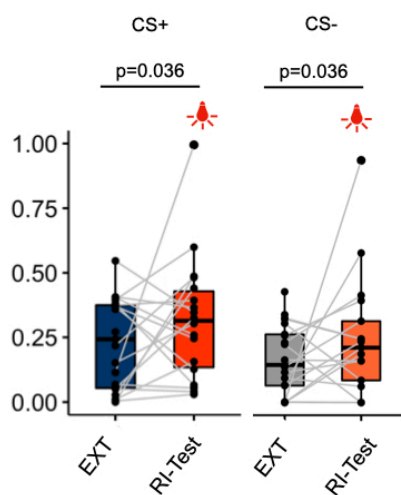


Figure S6: Boxplots of individual SCRs to both CSs during late extinction (2nd block) and reinstatement-test (1st block) in the reinstatement context.

Table S20 EXTINCTION Test Experiment 3 rm ANOVA Freezing

Both, observers and demonstrators show reduced freezing to the extinguished CS1 in comparison to the non-extinguished CS2. No support for a difference between observer and demonstrator (to-be) animals.

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
CS-type	None	1608.348	1,21	1608.348	112.196	7.008e-10	0.842
CS-type * type of learning	None	8.864	1,21	8.864	0.618	0.440	0.029

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type II Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	η^2_p
type of learning	13.660	1,21	13.660	0.930	0.346	0.042

Note. Type II Sum of Squares

Simple Comparisons – CS type

	Mean Difference	SE	t	Cohen's d	p _{holm}
CSP extinguished vs. CSP non-extin.	-11.788	1.118	-10.548	-2.199	7.550e-10

Note. Cohen's d does not correct for multiple comparisons.

Note. Results are averaged over the levels of: type of learning

Descriptives

CS_type	type of learning	Mean	SD	N
CSP extinguished	DEMONSTRATOR	3.167	3.346	12
	OBSERVER	2.955	2.274	11
CSP non-extin	DEMONSTRATOR	15.833	3.620	12
	OBSERVER	13.864	5.390	11

Table S21 REINSTATEMENT-Test Experiment3 rm ANOVA Freezing

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2_p
CS-type	None	1071.696	1,21	1071.696	78.821	1.491e-8	0.790
CS-type * type of learning	None	1.402	1,21	1.402	0.103	0.751	0.005
Reinstatement	None	47.348	1,21	47.348	4.802	0.040	0.186
Reinstatement * type of learning	None	21.209	1,21	21.209	2.151	0.157	0.093
CS-type * Reinstatement	None	575.000	1,21	575.000	38.186	3.944e-6	0.645
CS_type * Reinstatement * type of learning	None	9.159	1,21	9.159	0.608	0.444	0.028

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type II Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	η^2_p
type of learning	96.671	1,21	96.671	6.774	0.017	0.244

Note. Type II Sum of Squares

Simple comparisons – CS-type

	Mean Difference	SE	t	Cohen's d	p holm
CSP extinguished vs. CSP non-extin	-6.815	0.770	-8.856	-1.847	1.555e-8

Note. Cohen's d does not correct for multiple comparisons.

Note. Results are averaged over the levels of: type of learning, Reinstatement

Simple Comparisons – CS-type * Reinstatement

Increase in freezing from Ext to RI to CS1, decrease in freezing for CS2. No difference between CS1 and CS2 after Reinstatement.

		Mean Difference	SE	t	p holm
CSP extinguished, Extinction Test	CSP non-extin., Extinction Test	-11.788	1.117	-10.551	1.36e-12
	CSP extinguished, RI-Test	-6.366	1.042	-6.110	1.294e-6
	CSP non-extin, RI-Test	-8.208	1.011	-8.120	2.283e-9
CSP non-extin, Extinction Test	CSP extinguished, RI-Test	5.422	1.011	5.364	1.038e-5
	CSP non-extin, RI-Test	3.580	1.042	3.436	0.003
CSP extinguished, RI-Test	CSP non-extin, RI-Test	-1.843	1.117	-1.649	0.107

Note. P-value adjusted for comparing a family of 6

Note. Results are averaged over the levels of: type of learning

Simple Comparisons - type of learning

	Mean Difference	SE	t	Cohen's d	p _{holm}
DEMONSTRATOR OBSERVER	2.052	0.788	2.603	0.543	0.017

Note. Cohen's d does not correct for multiple comparisons.

Note. Results are averaged over the levels of: CS_type, Reinstatement

Table S22 Comparisons between demonstrators and observers Two-sided Independent Samples T-Test Freezing

Besides a main effect for "type of learning" in the ANOVA, there is no support for a difference in freezing behaviour during extinction test or reinstatement test between demonstrators and observers.

	t	df	p _{uncorr}	p _{holm}	Mean Difference	SE Difference	Cohen's d
CSP extinguished, Extinction Test	0.176	21	0.862	0.862	0.212	1.205	0.074
CSP extinguished, RI-Test	2.212	21	0.038	0.152	3.398	1.536	0.924
CSP non-extin., Extinction Test	1.037	21	0.311	0.622	1.970	1.899	0.433
CSP non-extin., RI-Test	1.970	21	0.062	0.186	2.629	1.335	0.822

Note. Student's t-test.

Descriptives

CS_type	Reinstatement	type of learning	Mean	SD	N
CSP extinguished	Extinction Test	DEMONSTRATOR	3.167	3.346	12
		OBSERVER	2.955	2.274	11
	RI-Test	DEMONSTRATOR	11.125	3.562	12
		OBSERVER	7.727	3.804	11
CSP non-extin.	Extinction Test	DEMONSTRATOR	15.833	3.620	12
		OBSERVER	13.864	5.390	11
	RI-Test	DEMONSTRATOR	12.583	2.193	12
		OBSERVER	9.955	4.022	11

**Table S23 One-sided paired samples t-Test Observers only
Experiment 3 Freezing**

Paired Samples T-Test increase from Extinction Test to Reinstatement Test to CS 1 and CS2

Measure 1	Measure 2	t	df	p	Mean Difference	SE Difference	Cohen's d
CSPextinguished, Extinction Test	- CSPextinguished, RI- Test	-5.05	10	2.490e - 4	-4.773	0.945	-1.523
CSPnon-extin., Extinction Test	- CSP non-extin., RI- Test	2.120	10	0.970	3.909	1.844	0.639

Note. For all tests, the alternative hypothesis specifies that Measure 1 is less than Measure 2.

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE
CSP extinguished, Extinction Test	11	2.955	2.274	0.686
CSP extinguished, RI- Test	11	7.727	3.804	1.147
CSP non-extin., Extinction Test	11	13.864	5.390	1.625
CSP non-extin., RI- Test	11	9.955	4.022	1.213

Table S24 One-sided paired samples t-Test _ Experiment 3 Freezing

Paired Samples T-Test increase from Extinction Test to Reinstatement Test to CS 1 and CS2

Measure 1	Measure 2	t	df	p	Mean Difference	SE Difference	Cohen's d
CSPextinguished, Extinction Test	- CSPextinguished, RI- Test	-4.97	11	2.154e - 4	-7.958	1.605	-1.431
CSPnon-extin., Extinction Test	- CSP non-extin., RI- Test	2.440	11	0.984	3.250	1.332	0.704

Note. For all tests, the alternative hypothesis specifies that Measure 1 is less than Measure 2.

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE
CSP extinguished, Extinction Test	12	3.167	3.346	0.966
CSP extinguished, RI- Test	12	11.125	3.562	1.028
CSP non-extin., Extinction Test	12	15.833	3.620	1.045
CSP non-extin., RI- Test	12	12.583	2.193	0.633

Exclusion of outliers (median $\pm 3\sigma$) in observational reinstatement Experiment 3 Freezing behaviour

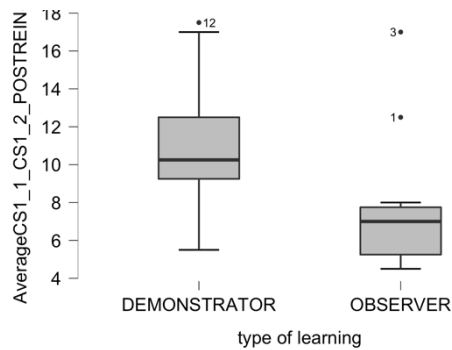


Figure S7: Boxplots labeling outlier rats by responses to the extinguished CS+ in the reinstatement-test in the demonstrator group and the observer group.

In order to test if responses within the reinstatement-test were driven by outliers, we excluded outliers, defined as mean responses to the extinguished CS+ in the reinstatement-test that were above or below median $\pm 3\sigma$, respectively (N=3, see figure S3).

Table S25

Paired Samples T-Test increase from Extinction Test to Reinstatement Test to CS+extinguished and CS+unextinguished

Measure 1	Measure 2	t	df	p	Mean Difference	SE Difference	Cohen's d
Whole sample (outlier excluded)							
CSP extinguished – Extinction Test	CSP extinguished – RI-Test	5.457	18	1.747e-5	-5.842	1.071	-1.252
CSP non-extin Extinction Test	CSP non-extin – RI-Test	2.40	18	0.986	3.000	1.249	0.551
Observers only (outlier excluded)							
CSP extinguished – Extinction Test	CSP extinguished – RI-Test	5.265	7	5.834e-4	-3.688	0.700	-1.861
CSP non-extin Extinction Test	CSP non-extin – RI-Test	1.165	7	0.859	2.688	2.307	0.412

Note. For all tests, the alternative hypothesis specifies that Measure 1 is less than Measure 2.

Note. Student's t-test.

No evidence for a difference in neural activation between demonstrators and observers of reinstatement

FOS immunolabeling method and analysis

We examined 18 male Sprague-Dawley rats that were housed similar to the rats in experiment 3. Rats underwent the protocol that is described for experiment 3, but no reinstatement-test was performed.

90 minutes following the last behavioral test, animals were deeply anesthetized with ketamine (100mg/kg) and xylazine (10mg/kg), exsanguinated with approximately 100 ml PBS and perfused with 500 ml of freshly made 4% paraformaldehyde (PFA). The brain was removed from the skull, blocked into 4 mm slabs and post-fixed overnight in 4% PFA. The following day, the brains were cut on a Leica V1000S Vibratome into 50 μ m sections, and collected in PBS/0.05% sodium azide. Tissue sections from similar AP levels were selected from each condition incubated for 30 min in 1% bovine serum albumin (BSA; Sigma) to block nonspecific binding and then incubated overnight (18 h) in polyclonal rabbit anti-c-Fos antiserum (1:20,000; PC38, Calbiochem, La Jolla, CA). Free-floating sections were then rinsed with PBS (0.01 M, pH 7.4, at room temperature), incubated for 30 min in biotinylated goat anti-rabbit IgG (Vector Laboratories, Burlingame, CA), rinsed and incubated for 30 min in the avidin–biotin–horseradish peroxidase complex (VECTASTAIN Elite Kit, Vector). Staining was visualized using the chromogen Very Intense Purple (VIP:Vector Laboratories). Sections were then mounted on gelatinized slides, dehydrated and coverslipped. Primary and secondary antibody incubations were made in 1% BSA/PBS; the primary incubation also contained 0.2% Triton-X. Alternate sections were Nissl-stained to help delineate the borders between the amygdala nuclei.

High-resolution low and higher (2 and 10X) magnification digital images were acquired using an Olympus VS-120 microscope (Tokyo, Japan) and the brain region of interest delineated using alternate Nissl-stained sections and criteria from the Paxinos and Watson stereotaxic atlas. The color images were converted to black and white and a trained rater blinded to experimental conditions quantified labeled cells using NIH's ImageJ automated cell counter pluggin. Cell counts were expressed as the density of labelled cells per mm² of tissue and cell counts were made according to hemisphere. Within each animal, multiple tissue sections were pooled to produce a mean value for each group of rats.

Results

We expected that the expression of immediate early genes (c-fos) would diverge in demonstrator and observer rats within the thalamic parafascicular nucleus and the anterior cingulate cortex (CG1), since both regions have been found to play a role in animals that observe aversive experiences (1–4). Additionally, we examined c-fos expression within regions that are known to be involved in acquisition and reinstatement of CS-US memory (i.e., centromedial amygdala, basolateral amygdala, the infralimbic and pre-limbic cortex (5–7)). In line with previous reports of neural activation after reinstatement, we found enhanced expression of c-fos within these ROIs [main effect of ROI: $F(5,10)=8.71$; $p=0.002$].

Against our hypothesis, we found no univariate differences between demonstrators and observers within any of our ROIs [main effect of demonstrator / observer: $F<1$; $p>0.9$; interaction between ROIs and demonstrator/ observer $F<1$; $p>0.6$]. Bayesian statistics further supported these results, by providing moderate evidence for ROI specific c-fos expression in the data (BF_{10} for inclusion to a model =2.7), but there was no support for an influence of demonstrator or observer status in the c-fos data (BF_{10} for inclusion to a model = 0.3). We point out that the rather unspecific method of c-fos staining does not unambiguously provide evidence for an absence of differences between observers and demonstrators in neural activation. In fact, studies in rodents and humans have shown that general responses in brain regions overlap between observational and first-hand aversive

events, yet the underlying processes within these brain regions (e.g, connectivity or projection neurons) diverge. Hence, our data can merely suggest that stark contrasts in neural activation that would be visible in c-fos expression between observers and demonstrators is not supported by our data.

While our finding supports no difference in c-fos activity between observed and direct reinstatement provides, we investigated only a subset of regions that we defined *a priori* and a technique that does not allow to examine finer-grained neural processes.

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