

during conditioning and within-session extinction on Day 1. Individuals with PTSS exhibited significant renewal in $CS+ > CS-$ responding from late extinction to early renewal for SCR ($t(21) = 3.52$, $P=0.002$) and trending renewal for shock expectancy ($t(23) = 1.99$, $P = 0.059$), while healthy adults did not exhibit renewal for either SCR ($t(21) = 1.40$, $P = 0.18$) or expectancy ($t(23) = 1.26$, $P = 0.22$). C. Recognition memory performance does not differ by group. $CS+ - CS-$ high confidence hit rates are shown for each group and encoding context. Note that values differ slightly from Hennings et al., 2021², as participants were not excluded in the present analyses for low memory performance as they were in Hennings et al., 2021. D. False alarm rate differed slightly between groups. A mixed ANOVA revealed a trending main effect of *group* ($F_{1, 46} = 4.01$, $P = 0.051$), but no interactions with *group* (all P s ≥ 0.13). Even though there exists this slight bias in behavioral responding to novel lures, a mixed ANOVA of high-confidence corrected recognition (hit – false alarm rate) reveals no significant group difference in actual memory performance (main effect of *group*: $F_{1, 46} = 0.05$, $P = 0.83$, all interactions with *group* P s ≥ 0.39).

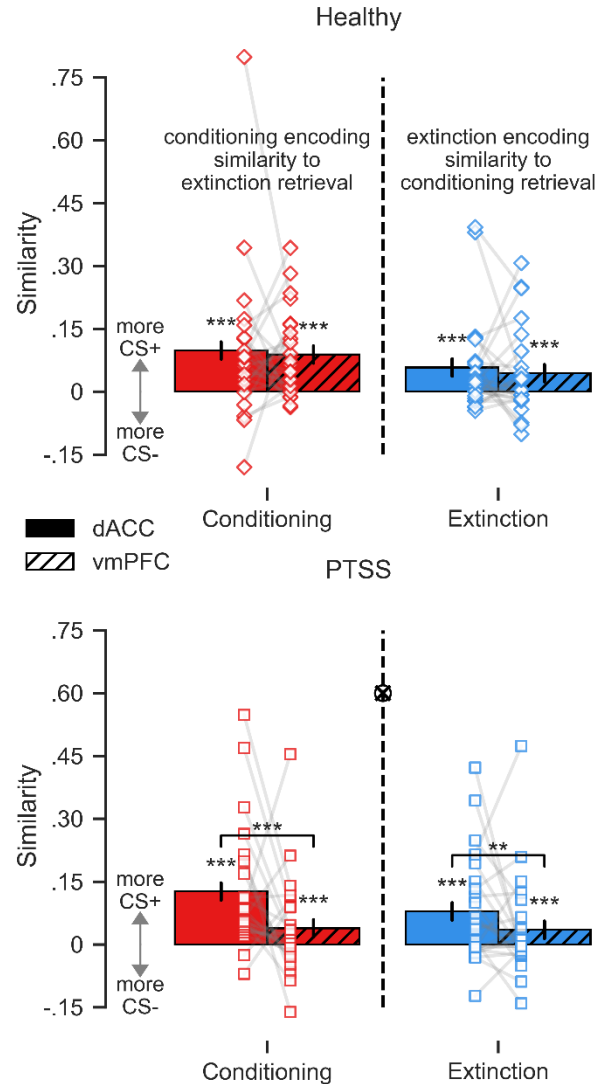


Figure S2. Cross phase encoding-retrieval similarity. Related to Figure 2. A possible alternative explanation for our main results is that there exists a general pattern of activity for all CS+ trials, regardless of when (conditioning or extinction) the particular item was encoded. Our interpretation of our mPFC results was to suggest the dACC and vmPFC separately and selectively organize CS+s as a function of the temporal context at encoding. But a reasonable question is to ask whether this double dissociation is truly item specific, or instead can be uncovered using any CS+ to CS+ comparison. To test this alternative hypothesis, we analyzed the mean cross phase encoding-retrieval similarity in each ROI. For example, we correlated the encoding pattern of a single CS+ from conditioning to the retrieval patterns of all CS+ from extinction. We calculated this similarity for all encoding trials during conditioning and extinction using the corresponding retrieval trials (i.e., extinction and conditioning). As with our other analyses this procedure was done within category, and the CS+ - CS- difference (based on encoding phase) was taken in our two mPFC regions of interest. In healthy adults, we found significant greater CS+ cross phase similarity in both the dACC and vmPFC for both conditioning and extinction. Crucially however, there was no difference in cross phase similarity between the dACC and vmPFC for either conditioning or extinction. Unlike in our item-to-item analysis, there was no significant double dissociation between the dACC and vmPFC. These results suggest two

things: firstly, and unsurprisingly, they suggest that there are shared neural responses between CS+ items that are encoded during conditioning and extinction across the mPFC. Secondly, this analysis supports our main hypothesis that the double dissociation we observed in the item-to-item analysis arises as a function of the temporal context in which each item encoded, not simply CS type. In individuals with PTSS, we also observed significant greater CS+ cross phase encoding retrieval similarity, again indicating shared neural responses for these items. However, unlike healthy adults, this group displayed greater cross phase similarity in the dACC (compared to the vmPFC) for both conditioning and extinction. There was a significant *CS type * encoding context * ROI* interaction in this group, such that the dACC – vmPFC difference was stronger in conditioning compared to extinction. These results further support that in individuals with PTSS, the vmPFC is dysregulated during the encoding and retrieval of fear and extinction. All error bars correspond to the 95% confidence interval of the CS+ – CS- difference. *** $P < 0.001$, ** $P < 0.01$, * $P < 0.05$, FDR corrected.

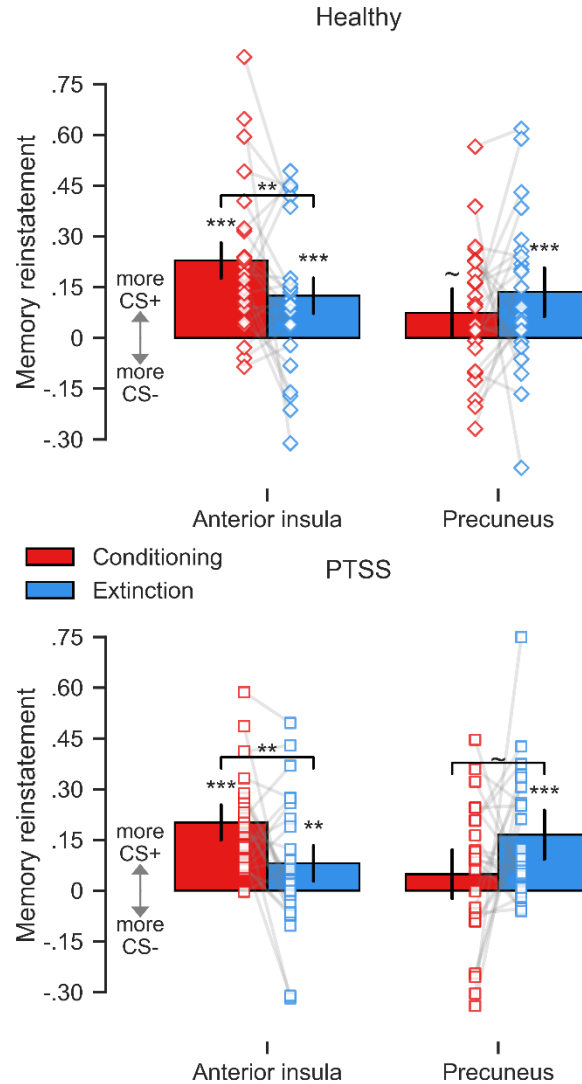


Figure S3. Emotional memory reinstatement in anterior insula and precuneus. Related to Figure 2. Post-hoc ROIs were defined coordinates from meta-analyses. Error bars correspond to 95% CI of the CS+ - CS- difference in reinstatement. Both healthy adults and individuals with PTSS exhibited significant emotional memory reinstatement in the anterior insula, with both groups showing more fear memory reinstatement. In the precuneus both group exhibited significant emotional reinstatement for extinction memories only. *** $P < 0.001$, ** $P < 0.01$, * $P < 0.05$ FDR corrected. ~ $P < 0.05$ before FDR correction.

Searchlight Clusters

Group	Encoding context	Label (hemisphere)	MNI coord. peak	Size in voxels (3mm ³)
Healthy	Conditioning	Inferior frontal gyrus (R)	33, 9, 27	741
		Superior frontal gyrus (L)	-6, 18, 51	608
		Middle frontal gyrus (L)	-39, 33, 15	414
		Angular gyrus (L)	33, -57, 36	308
		Insula (L)	-27, 24, -6	280
		Inferior frontal gyrus (L)	-45, 3, 21	178
		Precuneus (L)	-9, -66, 42	175
		Inferior parietal lobule (R)	30, -54, 42	117
		Cerebellar tonsil (R)	36, -63, -45	40
		Cerebellar tonsil (L)	-33, -60, -33	32
		Medial frontal gyrus (L)	-15, 48, -3	25
		Precuneus (R)	12, -75, 42	25
		Middle temporal gyrus (L)	-57, -51, -6	22
	Extinction	Medial frontal gyrus (L)	-3, 51, 0	191
		Precuneus (L)	-6, -63, 27	113
		Angular gyrus (L)	-39, -75, 36	69
		Angular gyrus (R)	42, -69, 30	44
		Middle temporal gyrus (R)	63, 0, -24	26

PTSS	Conditioning	Superior frontal gyrus (R)	-6, 18, 51	326
		Insula (L)	-33, 24, 9	214
		Insula (R)	30, 24, -6	201
		Precuneus (L)	-18, -66, 48	119
		Supramarginal gyrus (L)	-54, -48, 27	62
		Culmen / Parahippocampal gyrus (L)	-30, -51, -24	61
		Inferior frontal gyrus (R)	45, 6, 24	52
		Middle frontal gyrus (L)	-51, -3, 39	52
		Fusiform gyrus (L)	-57, -63, -12	29
		Precentral gyrus (L)	-42, -3, 51	23
		Middle frontal gyrus (L)	-42, 24, 24	22
		Superior temporal gyrus (L)	-51, -54, 15	20
	Extinction	Cuneus (L)	-6, -75, 30	42
		Insula (R)	36, 30, 3	34
		Insula (L)	-39, 27, 0	25

Table S1. Whole-brain searchlight results. Related to Figure 2. Clusters correspond to significant CS+ – CS- reinstatement. Coordinates refer to the peak voxel in each cluster. Anatomical labels were derived from the Talairach-Tournoux Atlas.

Supplemental References

- S1. Hennings, A.C., McClay, M., Lewis-Peacock, J.A., and Dunsmoor, J.E. (2020). Contextual reinstatement promotes extinction generalization in healthy adults but not PTSD. *Neuropsychologia* 147, 107573.
- S2. Hennings, A.C., Lewis-Peacock, J.A., and Dunsmoor, J.E. (2021). Emotional learning retroactively enhances item memory but distorts source attribution. *Learn. Mem.* 28, 178–186.