Supplemental Digital Content

Supplement 1. Overview of statistical models and respective formulas

Table S1. *Overview of Bayesian Multilevel Models*

A - Manipulation checks		
	Pain (I)	UR_self-rep_pain ~ Pain × Film + (1 + Pain × Film | Subject), family = cumulative
	Pain (II)	UR_NPS-pos ~ Pain × Film + (1 + Pain × Film | Subject), family = gaussian
	Neg. emo (I)	UR_valence ~ Pain × Film + (1 + Pain × Film | Subject), family = cumulative
	Neg. emo (II)	UR_PINES ~ Pain × Film + (1 + Pain × Film | Subject), family = gaussian
	Arousal (I)	UR_arousal ~ Pain × Film + (1 + Pain × Film | Subject), family = cumulative
	Arousal (II)	UR_SCR ~ Pain × Film + (1 + Pain × Film | Subject), family = skew_normal
B - Main analyses		
CRs acquisition (TPC)	Pain (I)	CR_self-rep_pain ~ Pain × Film × Time + (1 + Pain × Film × Time | Subject), family = cumulative
	Pain (II)	CR_NPS-pos ~ Pain × Film × Time + (1 + Pain × Film × Time | Subject), family = gaussian
	Neg. emo (I)	CR_valence ~ Pain × Film × Time + (1 + Pain × Film × Time | Subject), family = cumulative
	Neg. emo (II)	CR_PINES ~ Pain × Film × Time + (1 + Pain × Film × Time | Subject), family = gaussian
	SCRs	CR_SCRs ~ Pain × Film × Time + (1 + Pain × Film × Time | Subject), family = skew_normal
CRs retention (MTT)	Pain (I)	CR_self-rep_pain ~ Pain × Film × Time + (1 + Pain × Film × Time | Subject), family = cumulative
	Pain (II)	CR_NPS-pos ~ Pain × Film × Time + (1 + Pain × Film × Time | Subject), family = gaussian
	Neg. emo (I)	CR_PINES ~ Pain × Film × Time + (1 + Pain × Film × Time | Subject), family = gaussian
	SCRs	CR_SCRs ~ Pain × Film × Time + (1 + Pain × Film × Time | Subject), family = skew_normal
C - Relationship between self-reported pain and NPS-pos CRs		
	Acquisition	CR_self-rep_pain ~ CR_NPS-pos × Pain × Film + (1 + Pain × Film | Subject), family = skew_normal
	MTT	CR_self-rep_pain ~ CR_NPS-pos × Pain × Film + Time + (1 + Pain × Film | Subject), family = cumulative

D - Relationship between pain-CRs and pain-intrusions

Acquisition	Pain_ints ~ Day × self-rep-pain-CRs_withinNeutral, Hu ~ Day × self-rep-pain-CRs_withinNeutral + (1+ Day | Subject), family = hurdle_lognormal Pain_ints ~ Day × NPS-pos-pain-CRs_withinNeutral, Hu ~ Day × NPS-pos-pain-CRs_withinNeutral + (1+ Day | Subject), family = hurdle_lognormal Pain_ints ~ Day × self-rep-pain-CRs_withinAversive, Hu ~ Day × self-rep-pain-CRs_ withinAversive + (1+ Day | Subject), family = hurdle_lognormal Pain_ints ~ Day × NPS-pos-pain-CRs_ withinAversive, Hu ~ Day × NPS-pos-pain-CRs_ withinAversive + (1+ Day | Subject), family = hurdle_lognormal
MTT	Pain_ints ~ Day × self-rep-pain-CRs_withinNeutral, Hu ~ Day × self-rep-pain-CRs_withinNeutral + (1+ Day | Subject), family = hurdle_lognormal Pain_ints ~ Day × NPS-pos-pain-CRs_withinNeutral, Hu ~ Day × NPS-pos-pain-CRs_withinNeutral + (1+ Day | Subject), family = hurdle_lognormal Pain_ints ~ Day × self-rep-pain-CRs_withinAversive, Hu ~ Day × self-rep-pain-CRs_ withinAversive + (1+ Day | Subject), family = hurdle_lognormal Pain_ints ~ Day × NPS-pos-pain-CRs_ withinAversive, Hu ~ Day × NPS-pos-pain-CRs_ withinAversive + (1+ Day | Subject), family = hurdle_lognormal

Note. In acquisition analyses, Time encoded the habituation and acquisition phases, yielding one level for self-report data (habituation/full acquisition) and three levels (habituation/early acquisition, late acquisition) in analyses estimating imaging data and SCRs. In MTT analyses, Time encoded early and late MTT blocks. For analyses D, we operationalized pain-CRs with difference scores between pain responses to the CSpain+neutral-film – CSnopain+neutral-film for pain-CRs within the neutral-film affective context ("withinNeutral"), and with difference scores between pain responses to the CSpain+aversive-film – CSnopain+neutral-film for pain-CRs within the aversive-film affective context ("withinAversive"). Abbreviations: UR = unconditioned response; CR = conditioned response; self-rep_pain = self-reported pain; NPS-pos = neural pain signature with positive weights only; SCRs=skin conductance responses; TPC = Trauma-Pain-Conditioning procedure; MTT = Memory-Triggering-Task.

Supplement 2. Results with NPS-responses excluding occipital cortex [manually edited NPS mask in SPM]

S2a. Acquisition

Results were comparable to NPS responses derived from the NPS-pos mask. Specifically, NPS [without occipital regions] responses to CSs revealed a significant Pain × Time_acq1 interaction. The interaction between Pain × Time_acq2 was in the same direction but associated with somewhat more uncertainty (see Table S2A for regression coefficients and 95%-CIs). As displayed in Fig. S2 and corroborated by post-hoc analyses on NPS responses to CSs during each study timepoint (habituation/acq1+acq2), these interactions suggested that participants showed greater NPS responses CS_{pain} than CS_{nopain} (*b* = 0.32, 95%-CI = [0.10, 0.61]): The non-significant Pain × Acquisition-time (acq1+acq2) interaction suggested that the main-effect of Pain held across both acq1 and acq2 (*b* = -0.06, 95%-CI = [-0.52, 0.39]). During habituation, participants did not show significantly greater NPS responses to CS_{pain} than CS_{nopain} (*b* = -0.06, 95%-CI = [-0.21, 0.09]). Post-hoc analyses within each study phase (hab/acq1+acq2) and film condition further suggested that within the neutral-film condition participants showed significantly greater NPS responses to CS_{pain} than CS_{nopain} during acq1 (*b* = 0.36, 95%-CI = [0.02, 0.69]). During acq2, this effect was associated with somewhat more uncertainty but nevertheless pointed in the same direction (*b* = 0.29, 95%-CI = [-0.06, 0.64]). Within the aversive-film condition, participants did not show significantly greater NPS responses to CS_{pain} than CS_{nopain} during acq1 (*b* = 0.13, 95%-CI = [-0.20, 0.45]) or acq2 (*b* = -0.16, 95%-CI = [-0.31, 0.36]).

S2b. MTT

As can be seen in Table S2B and Fig. S2B, analyses revealed that NPS responses were stronger during the CS_{pain} than CS_{nopain} conditions. There were no significant interaction between Pain, Film, and Time.

Table S2. *Effects of Pain, Film-Valence, and Time on NPS-responses calculated with a mask excluding voxels in the occipital cortex during (A) Acquisition and (B) MTT.*

	b	*95%-CI*	R^2	*95%-CI*
(A) Acquisition				
Pain	-0.05	[-0.22, 0.11]	0.19	[0.12, 0.25]
Film	0.07	[-0.10, 0.23]		
Time_acq1	0.02	[-0.28, 0.31]		
Time_acq2	0.11	[-0.20, 0.44]		
Pain × Film	0.06	[-0.17, 0.29]		
Pain × Time_acq1	**0.46**	**[0.07, 0.87]**		
Pain × Time_acq2	0.38	[-0.04, 0.78]		
Film × Time_acq1	-0.09	[-0.52, 0.34]		
Film × Time_acq2	-0.06	[-0.47, 0.34]		
Pain × Film × Time_acq1	-0.30	[-0.89, 0.28]		
Pain × Film × Time_acq2	-0.35	[-0.92, 0.24]		
(B) MTT			0.28	[0.18, 0.38]
Pain	**0.35**	**[0.05, 0.65]**		
Film	0.06	[-0.24, 0.37]		
Time_mtt2	0.10	[-0.20, 0.41]		
Pain × Film	-0.10	[-0.53, 0.33]		
Pain × Time_mtt2	-0.17	[-0.63, 0.29]		
Film × Time_mtt2	-0.08	[-0.51, 0.35]		
Pain × Film × Time_mtt2	-0.25	[-0.94, 0.45]		

Note. Coefficients are considered significantly different from zero if the corresponding 95% CI does not contain zero and are highlighted in bold. For improved readability, we do not display intercepts. Abbreviations: acq = acquisition; NPS-pos = neural pain signature with positive weights only; SCRs = skin conductance responses.

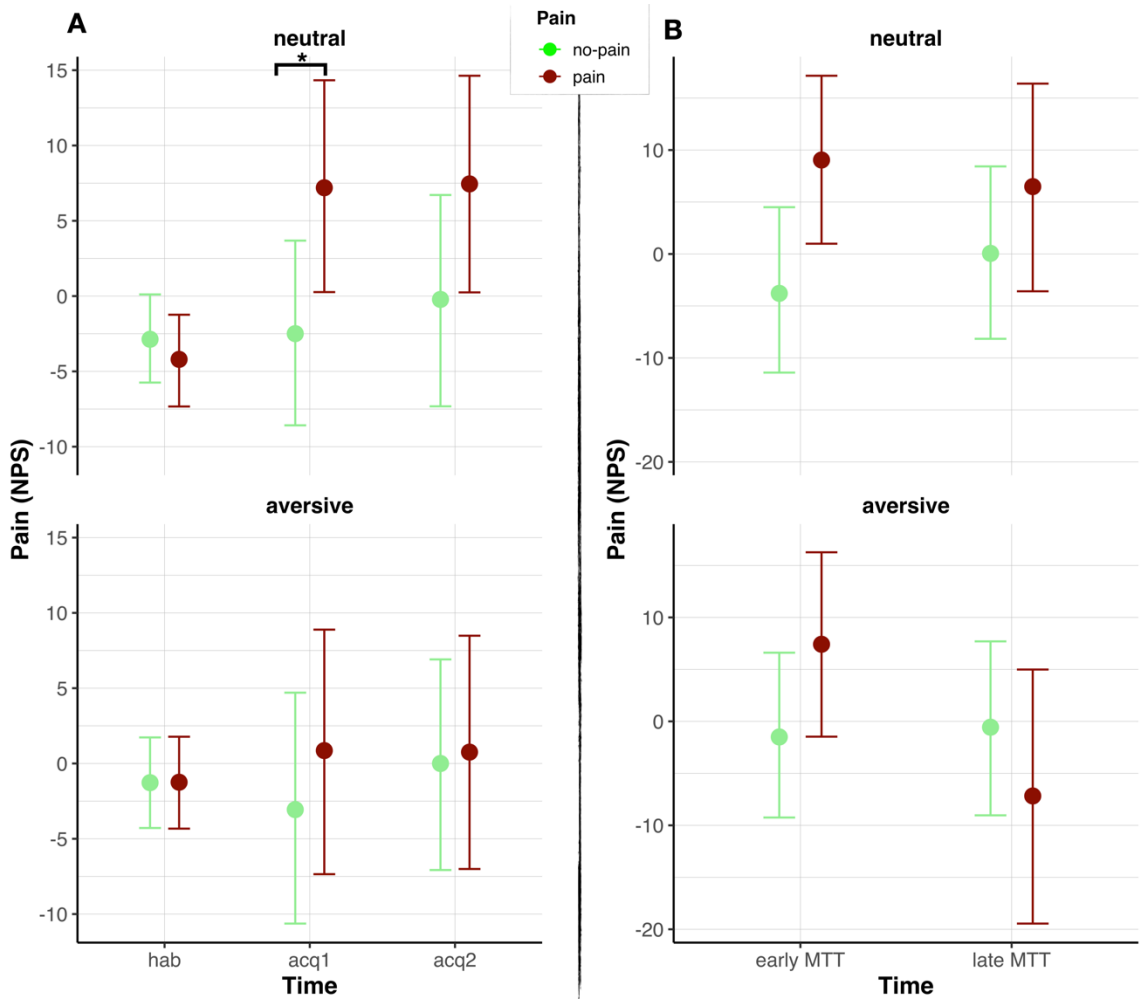

Figure S2. Conditioned NPS responses (CRs) to each CS condition during Acquisition (left panel A) and Memory Triggering Task (MTT, right panel B). Asterisks mark under which study phase (hab/acq1/acq2) and affective film-condition (aversive/neutral) the CS_{pain} vs. CS_{nopain} comparisons were significantly different from zero as determined by post-hoc analyses. Abbreviations: hab = habituation; acq = acquisition with trials averaged over both acquisition halves; acq1 = first acquisition halve; acq2 = second acquisition halve; MTT = Memory Triggering Task.

Supplement 3. Whole-brain analyses on CS-activations.

Method:

For all analyses, the threshold was set to $p < .05$ corrected for multiple comparisons (based on the false discovery rate (FDR), whole brain level), and a cluster size of $k \geq 5$.

Results acquisition:

Main effect of Film during acquisition (F-test; FDR-corrected $p < 0.05$; $k \geq 5$).

No effects.

Main effect of Pain during acquisition (F-test; FDR-corrected $p < 0.05$; k=5).

No effects.

Table S3a. Interaction Pain × Film during acquisition (F-test; FDR-corrected $p < 0.05$; $k \geq 5$).

Region	**Cluster Size, Voxels**	**z Score**	**MNI coordinates, (x, y, z)**
R Middle Temporal/Occipital Gyrus	2667	Inf	42, -66, 4
		6.70	48, -56, 6
		6.49	38, -82, 2
L Occipital Gyrus	1175	Inf	-42, -72, 8
L Fusiform Gyrus		5.44	-34, -80, -16
		5.34	-28, -72, -6
L Superior Temporal Gyrus	695	7.78	-52, -20, 4
L Inferior Parietal Lobe		6.15	-44, -38, 26
L Superior Temporal Gyrus		5.53	-42, -32, 10
L Rolandic Operculum		5.20	-38, -36, 18
R Superior Temporal Gyrus	825	6.47	62, -12, 4
		6.45	64, -32, 14
		6.02	52, -18, 6
R Rolandic Operculum		4.89	54, -18, 10
L Cerebellum	17	5.41	-10, -72, -40
L Lingual Gyrus	17	5.38	-4, -60, 0
R Precentral Gyrus	101	5.20	42, -2, 56
		5.19	44, -2, 46
L Occipital Gyrus	54	5.13	-16, -86, 30
		4.68	-22, -88, 22

L Anterior Insula	63	5.09	-30, 26, 6
L Occipital Gyrus	63	4.98	-10, -82, 42
		4.90	-18, -74, 32
L Brainstem	40	4.80	-12, -24, -10
		4.51	-6, -30, -10
R Precentral Gyrus	10	4.78	44, 4, 32
R Anterior Insula	22	4.78	34, 28, 4
R Cerebellum	8	4.75	4, -70, -30
R Lingual Gyrus	22	4.72	12, -58, 2
L Lingual Gyrus	13	4.70	-4, -82, 2
L Superior Temporal Gyrus	6	4.69	-60, -44, 12
L Calcarine sulcus	17	4.68	-10, -74, 12
R Inferior Frontal Cortex	10	4.61	42, 16, 22
R Cerebellum	8	4.59	8, -58, -38
L Lingual Gyrus	10	4.58	-8, -74, -8
R Supplementary Motor Area	16	4.55	8, 12, 54

Table S3b. Pain > NoPain within neutral-film condition during acquisition (t-test; FDR-corrected $p < 0.05$; $k \geq 5$).

Region	**Cluster Size, Voxels**	**z Score**	**MNI coordinates, (x, y, z)**
R Middle Temporal/Occipital Gyrus	2671	7.84	42, -64, 4
		7.11	44, -76, 4
		6.88	50, -54, 6
L Occipital Gyrus	2199	7.34	-42, -72, 8
L Fusiform Gyrus		6.24	-34, -80 -16
		6.09	-42, -82, 6
L Superior Temopral Gyrus	549	6.71	-50, -22, 6
		5.82	-46, -38, 28
		5.31	-54, -40, 22
R Superior Temoporal Gyrus	558	6.41	62, -34, 14
		5.85	50, -18, 6
		5.59	60, -12, 4
L Anterior Insula	315	6.17	-30, 22, 10
		5.44	-32, 28, -2
R Anterior Insula	353	5.88	36, 28, 2
		5.18	34, 26 -10
L Cerebellum	340	5.51	-8, -76 -38
R Cerebellum		5.41	16, -78 -34
		5.01	16, -78 -22
R Precentral Gyrus	308	5.44	44, 0, 48
		5.33	46, 4, 34
		4.81	40, 2, 56
L Precentral Gyrus	59	5.09	-36, -2, 50
L Inferior Parietal Lobe	61	4.98	-28, -48, 46

R Precuneus	18	4.90	8, -46, 52
R Cerebellum	31	4.90	10, -58 -38
R Occipital Gyrus	19	4.89	22, -72, 40
R Supplementary Motor Area	54	4.87	8, 16, 54
		4.83	4, 30, 50
L Supramarginal Gyrus	9	4.83	-60, -24, 32
R Cingulate Gyrus	14	4.83	12, 20, 36
R Superior Frontal Gyrus	10	4.80	12, -2, 72
L Superior Temporal Gyrus	12	4.71	-60, -44, 12
L Cerebellum	12	4.66	-14, -74 -22
L Rolandic Operculum	13	4.64	-48, 6, 4
L Occipital Gyrus	15	4.61	-22, -62 -10
R Brainstem	5	4.60	6, -32 -24
L Lingual Gyrus	8	4.58	-4, -82, 2
R Cerebellum	19	4.54	26, -70 -30
R Cerebellum	7	4.49	24, -60 -28
R Cerebellum	7	4.49	34, -58 -24
R Superior Temoporal Gyrus	6	4.47	52, 2, -6
L Calcarine	5	4.46	-8, -74, 14
R Inferior Frontal Gyrus	7	4.44	56, 14, 6

Pain > NoPain within aversive-film condition revealed no sig. effects at FDR-corrected $p < 0.05$; $k \geq 5$.

Results MTT:

Early MTT: No effect of Film x Pain interaction, main effect of Film and main effect of Pain (F-tests; FDR-corrected $p < 0.05$; $k \geq 5$).

Late MTT: No effect of Film x Pain interaction, main effect of Film and main effect of Pain (F-tests; FDR-corrected $p < 0.05$; $k \geq 5$).