

Figure S1. Individual fear discrimination and recording summary, Related to Figure 1.

Mean (bar) and individual session (data points) suppression ratio for each cue (D, danger, red; U, uncertainty, purple; S, safety, blue) is shown for each individual for all recording sessions with cue-responsive neurons. Animal identity is shown in the top left. For each individual, bregma recording level (B), the number of recording sessions with cue-responsive neurons, the number of cue-responsive neurons, and the number of neurons in each cluster: k1 (currant), k2 (sky blue), k3 (red), k4 (blue), k5 (orange), k6 (dark blue), k7 (yellow), and k8 (purple) are provided.

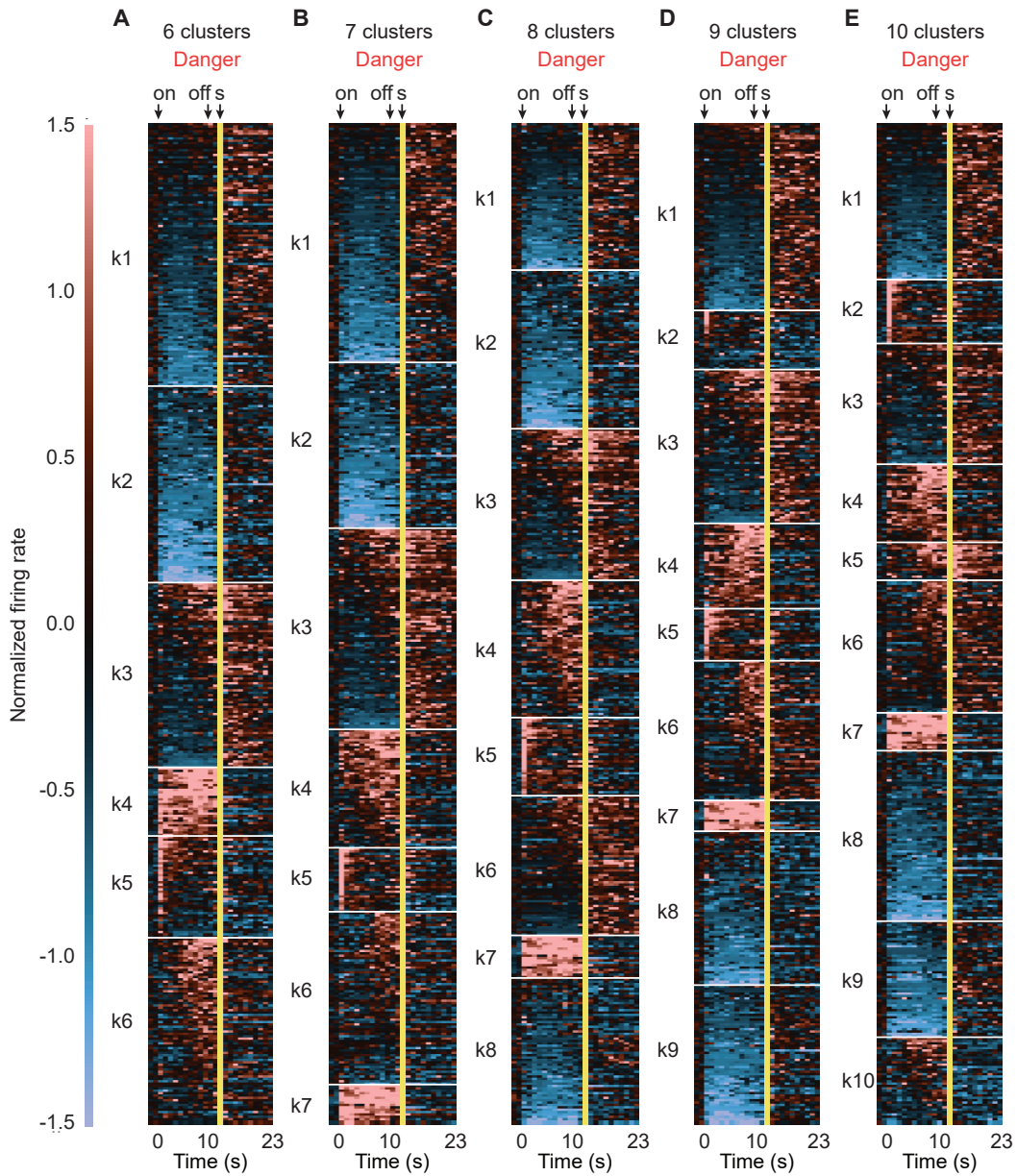


Figure S2. Alternative clustering, Related to Figure 2. Heat plot showing mean normalized firing rate to danger (red) for each cue-responsive neuron ($n = 423$), from 2 s prior to cue onset through post-shock, in 1-s bins. A normalized firing rate of zero is indicated by the color black. Firing increases in light red and firing decreases in light blue. Results for selecting (A) 6 clusters, (B) 7 clusters, (C) 8 clusters, (D) 9 clusters, and (E) 10 clusters. Cue onset (on) and offset (off) are indicated by black arrows. Foot shock delivery indicated by yellow bar.

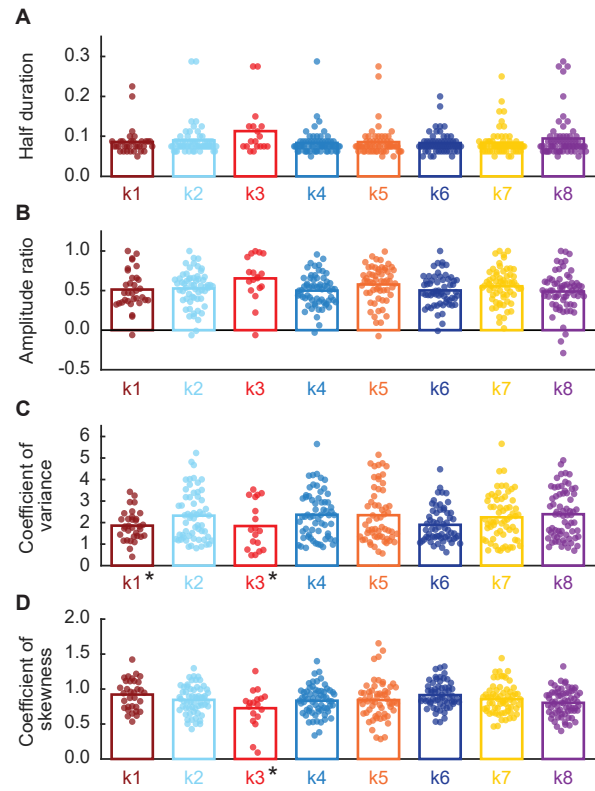


Figure S3. Firing and waveform characteristics, Related to Figure 1. (A) Mean (bar) and individual mean (data points) waveform half duration, during a 10-s baseline period just prior to cue onset, for each cluster: k1 (n = 33, currant), k2 (n = 59, sky blue), k3 (n = 18, red), k4 (n = 63, blue), k5 (n = 58, orange), k6 (n = 61, dark blue), k7 (n = 64, yellow), and k8 (n = 67, purple). (B) Mean and individual mean waveform amplitude ratio, (C) coefficient of variance, and (D) coefficient of skewness shown, as in A. *Independent samples t-test, $p < 0.05$.

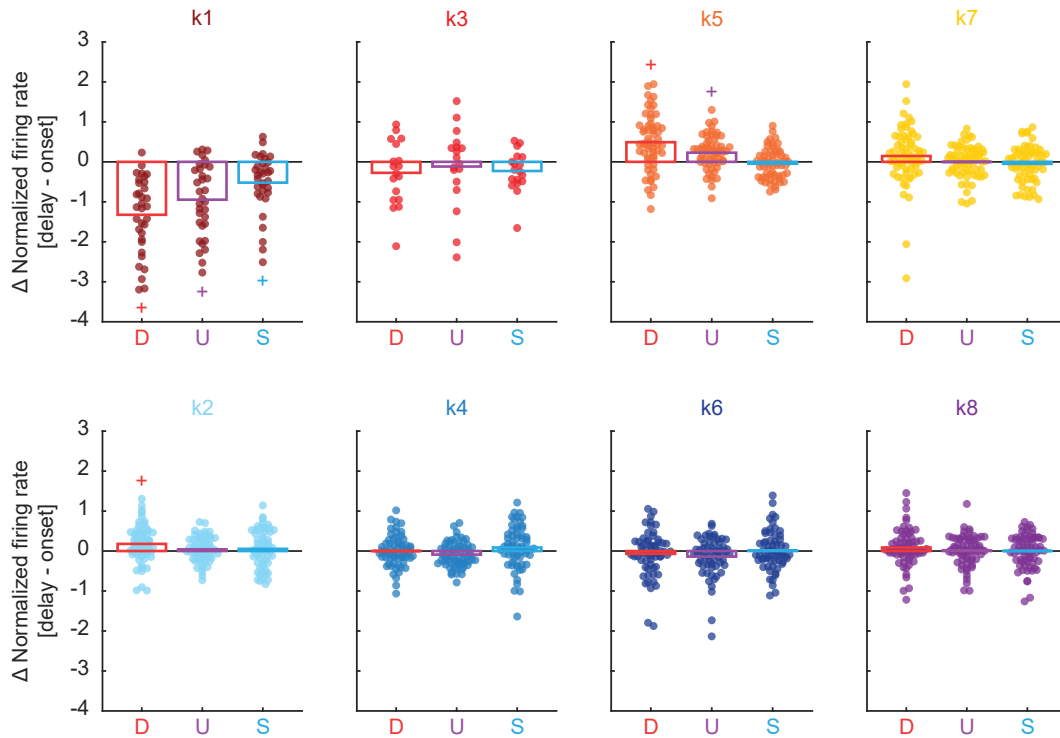


Figure S4. Temporal firing characteristics, Related to Figure 3 and Table 1. Mean (bar) and individual mean (data points) differential firing [delay - onset] is plotted for each cue (D, danger, red; U, uncertainty, purple; S, safety, blue) and cluster: k1 (n = 33, currant), k2 (n = 59, sky blue), k3 (n = 18, red), k4 (n = 63, blue), k5 (n = 58, orange), k6 (n = 61, dark blue), k7 (n = 64, yellow), and k8 (n = 67, purple). Danger (M = -1.32, 95% CI [-1.62, -0.97]), uncertainty, (M = -0.95, 95% CI [-1.25, -0.63]), and safety (M = -0.52, 95% CI [-0.73, -0.20]) firing decreases from onset to delay were observed for the phasically responsive k1 neurons. Danger (M = 0.50, 95% CI [0.32, 0.66]) and uncertainty (M = 0.23, 95% CI [0.11, 0.35]) firing increases from onset to delay were observed for the ramping k5 neurons. A danger (M = 0.18, 95% CI [0.06, 0.31]) firing increase from onset to delay was observed for k2 neurons. *95% bootstrap confidence interval for differential firing does not contain zero (colored plus signs).

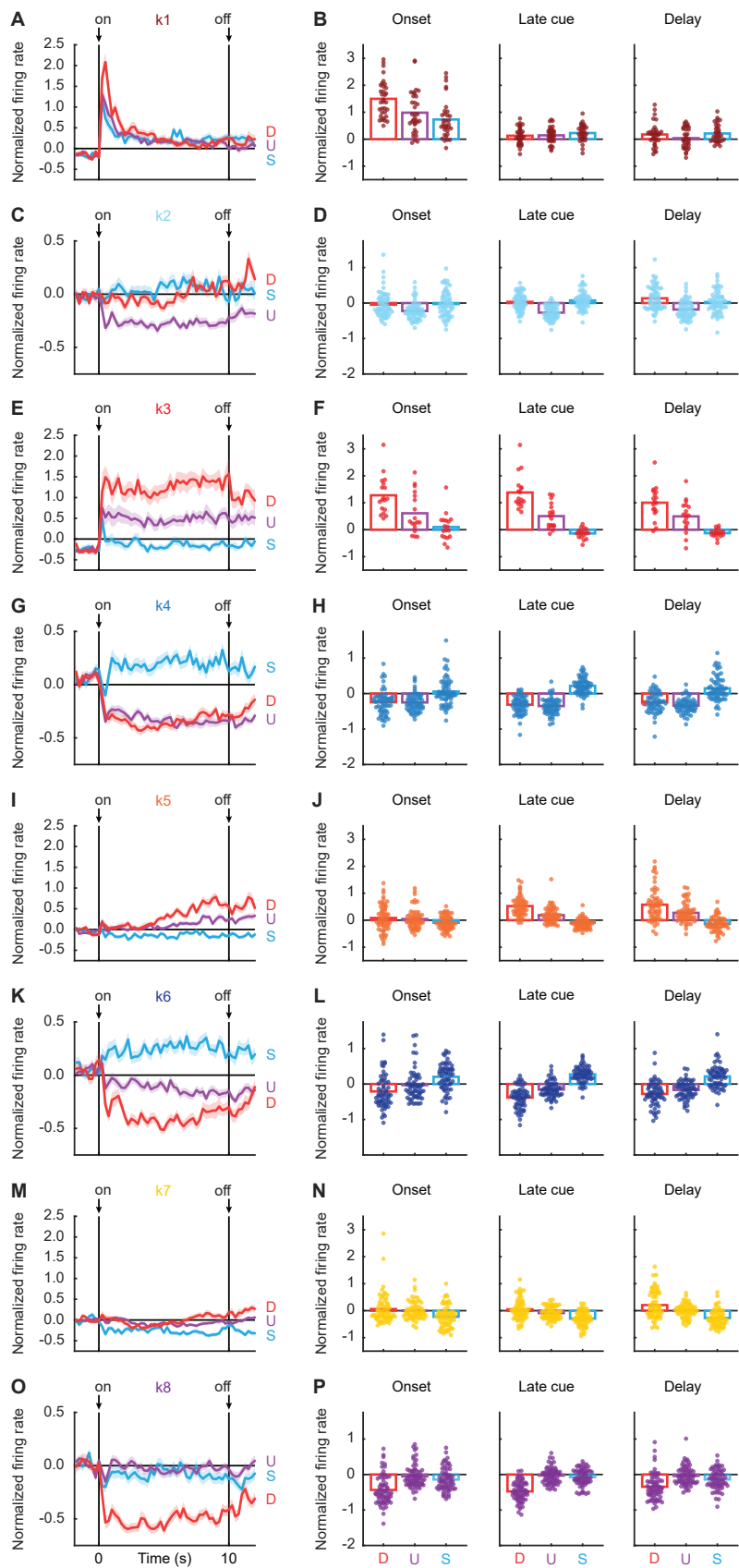


Figure S5. Cue responding of all clusters, Related to Figure 4. (A) Mean normalized firing rate to danger (D, red), uncertainty (U, purple), and safety (S, blue) is shown from 2 s prior to cue onset to 2 s following cue offset for k1 neurons ($n = 33$, currant). Cue onset (on) and offset (off) are indicated by vertical black lines. SEM is indicated by shading. (B) Mean (bar) and individual (data points), normalized firing rate for k1 neurons during the first 1-s cue interval (onset, left), the last 5-s cue interval (late cue, middle), and 2 s following cue offset (delay, right) are shown for each cue (D, danger; U, uncertainty; S, safety; colors maintained form A). (C-P) Identical plots are constructed for k2 ($n = 59$, sky blue), k3 ($n = 18$, red), k4 ($n = 63$, blue), k5 ($n = 58$, orange), k6 ($n = 61$, dark blue), k7 ($n = 64$, yellow), and k8 ($n = 67$, purple) neurons.

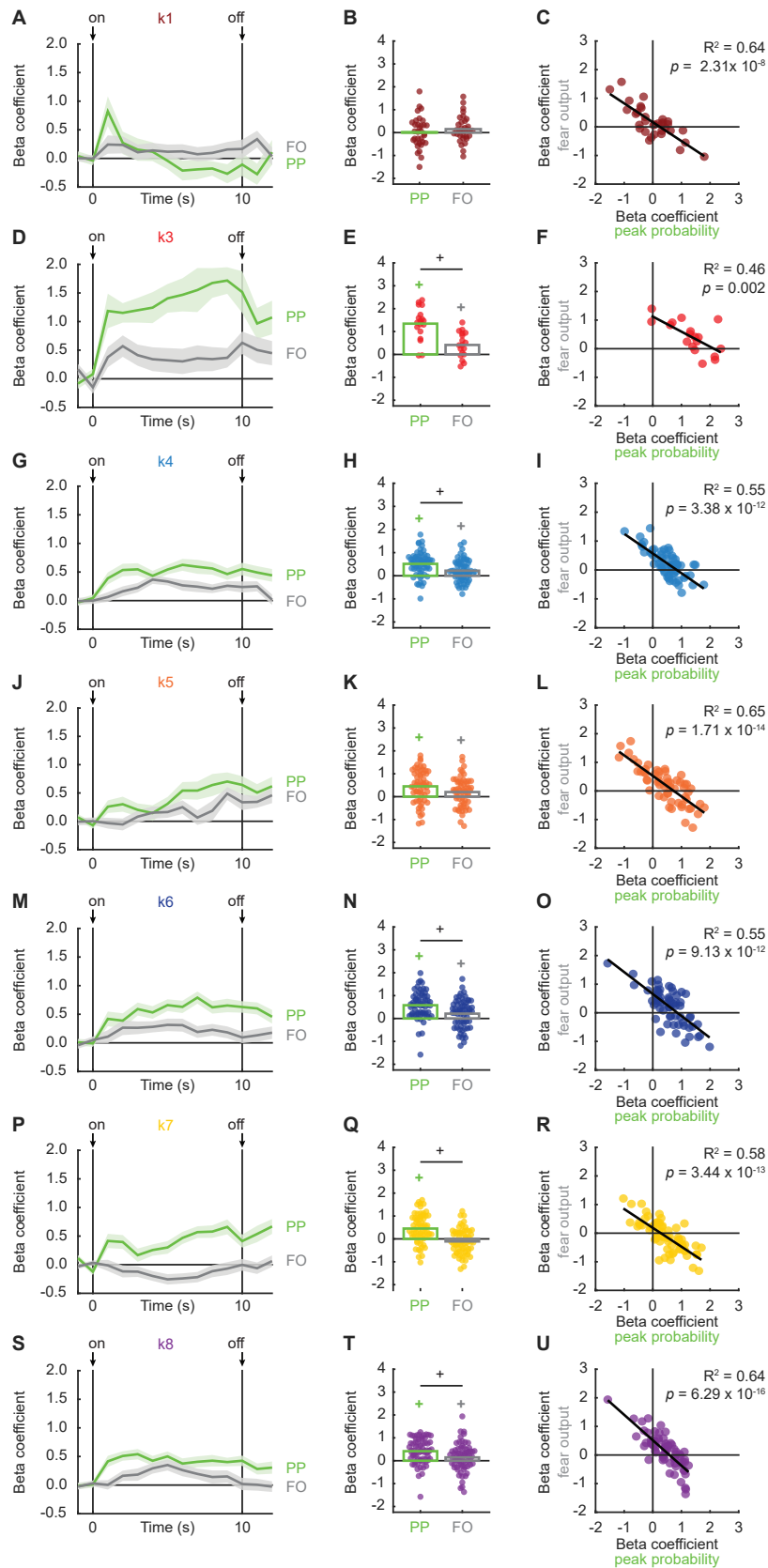


Figure S6. Cluster-specific threat signaling, Related to Figure 5. (A) Mean beta coefficients for each regressor (PP, peak threat probability, green; FO, fear output, gray) are plotted for k1 neurons ($n = 33$, currant) over cue presentation in 1-s bins. Cue onset (on) and offset (off) are indicated by vertical black lines. SEM is indicated by shading. (B) Mean (bar) and individual (data points) beta coefficient for each regressor (PP, peak threat probability; FO, fear output) are shown for k1 neurons during 10-s cue interval (colors maintained from A). *95% bootstrap confidence interval for differential beta coefficient does not contain zero. +95% bootstrap confidence interval for beta coefficient does not contain zero (colored plus signs). (C) Mean beta coefficient (fear output) vs. beta coefficient (peak threat probability) is plotted for k1 neurons. Trendline, the square of the Pearson correlation coefficient (R^2) and associated p -value (p) are shown. (D-U) Identical plots are constructed for k3 ($n = 18$, red), k4 ($n = 63$, blue), k5 ($n = 58$, orange), k6 ($n = 61$, dark blue), k7 ($n = 64$, yellow), and k8 ($n = 67$, purple) neurons.

		k1	k2	k3	k4	k5	k6	k7	k8
Danger vs. Uncertainty	M	0.51	0.27	0.73	0.01	0.33	-0.23	0.21	-0.45
	LB	0.30	0.20	0.37	-0.05	0.20	-0.30	0.08	-0.51
	UB	0.74	0.33	0.95	0.07	0.45	-0.15	0.33	-0.38
Uncertainty vs. Safety	M	0.25	-0.30	0.62	-0.50	0.35	-0.37	0.27	0.06
	LB	-0.11	-0.37	0.38	-0.56	0.24	-0.44	0.17	-0.01
	UB	0.59	-0.23	0.80	-0.44	0.44	-0.29	0.37	0.13

Table S1. 95% bootstrap confidence interval results for cue firing by cluster, Related to Figure 3 and Table 1. Mean (M), lower bound (LB), and upper bound (UP) of the 95% bootstrap confidence interval are provided for differential cue firing (danger vs. uncertainty; uncertainty vs. safety) for each cluster.

	Peak Probability			Fear Output			Peak Prob vs. Fear Output		
	M	LB	UB	M	LB	UB	M	LB	UB
pre1	0.02	-0.02	0.07	-0.01	-0.05	0.03	0.04	-0.05	0.13
pre2	-0.02	-0.07	0.02	0.01	-0.03	0.05	-0.04	-0.12	0.04
cue1	0.46	0.34	0.56	0.06	-0.01	0.14	0.40	0.23	0.56
cue2	0.45	0.35	0.55	0.12	0.03	0.21	0.33	0.16	0.49
cue3	0.43	0.33	0.52	0.14	0.06	0.21	0.29	0.11	0.46
cue4	0.38	0.29	0.47	0.18	0.10	0.27	0.20	0.05	0.35
cue5	0.46	0.38	0.55	0.18	0.11	0.26	0.28	0.14	0.42
cue6	0.50	0.40	0.61	0.17	0.08	0.26	0.33	0.17	0.52
cue7	0.56	0.45	0.67	0.10	0.02	0.19	0.45	0.28	0.63
cue8	0.55	0.45	0.66	0.13	0.03	0.25	0.41	0.24	0.59
cue9	0.55	0.44	0.65	0.20	0.11	0.29	0.35	0.20	0.51
cue10	0.52	0.42	0.62	0.16	0.06	0.25	0.36	0.17	0.54
delay1	0.44	0.34	0.53	0.17	0.08	0.25	0.27	0.11	0.45
delay2	0.49	0.39	0.58	0.14	0.04	0.23	0.35	0.19	0.52

Table S2. 95% bootstrap confidence interval results for cue regression, Related to Figure 5. Mean (M), lower bound (LB), and upper bound (UP) of the 95% bootstrap confidence interval are provided for each regressor (peak threat probability and fear output), as well as differential beta coefficients (peak threat probability vs. fear output) over each cue period (14, 1-s bins from 2 s prior to cue onset (pre-cue) to 2 s following cue offset (delay)).

		k1	k3	k4	k5	k6	k7	k8
Regressor x Bin Interaction	F	1.66	1.58	0.97	0.68	1.60	3.01	1.21
	p	0.07	0.09	0.48	0.79	0.08	2.39E-04	0.27
	η^2	0.05	0.09	0.02	0.01	0.03	0.05	0.02
	op	0.88	0.84	0.60	0.42	0.87	1.00	0.73
Main Effect of Regressor	F	0.44	9.35	6.72	2.02	6.28	16.89	4.29
	p	0.51	8.00E-03	0.01	0.16	1.50E-02	1.16E-04	0.04
	η^2	0.01	0.37	0.10	0.04	0.10	0.21	0.06
	op	0.10	0.82	0.72	0.29	0.70	0.98	0.53

Table S3. ANOVA results for cue regression by cluster, Related to Figure 5. F statistic, p -value (p), partial eta squared (η^2), and observed power (op) for the regressor x bin interaction and the main effect of regressor are provided for each cluster.

		k1	k2	k3	k4	k5	k6	k7	k8
Danger	M	0.19	0.33	0.07	0.19	0.04	-0.17	0.29	-0.11
	LB	0.01	0.28	-0.20	0.14	-0.07	-0.24	0.24	-0.16
	UB	0.37	0.38	0.30	0.25	0.14	-0.08	0.35	-0.05
Unc S	M	0.20	-0.18	-0.03	0.25	-0.05	-0.32	0.42	0.32
	LB	0.03	-0.25	-0.24	0.20	-0.16	-0.40	0.35	0.25
	UB	0.37	-0.12	0.15	0.31	0.03	-0.22	0.50	0.39
Unc O	M	-0.02	-0.05	0.20	-0.16	0.25	0.02	0.08	0.18
	LB	-0.13	-0.09	-0.02	-0.19	0.17	-0.05	0.03	0.14
	UB	0.10	0.003	0.43	-0.12	0.32	0.07	0.13	0.21
Safety	M	0.15	0.06	-0.18	0.20	-0.07	0.26	-0.28	-0.02
	LB	0.05	0.01	-0.27	0.15	-0.14	0.20	-0.33	-0.06
	UB	0.24	0.11	-0.07	0.24	-0.003	0.33	-0.22	0.02

Table S4. 95% bootstrap confidence interval results for aversive outcome firing by cluster, Related to Figure 6 and Table 1. Mean (M), lower bound (LB), and upper bound (UP) of the 95% bootstrap confidence interval are provided for danger, uncertainty shock (Unc S), uncertainty omission (Unc O), and safety for each cluster.