Does your past define you? The role of previous visual experience in predicting new affective pictures and sounds

Supplementary materials

Contents

1 Experiment 1

1.1 Stimuli

Table S1: List of NAPS picture names used as S2s in Experiment 1, sorted by valence (Neg = negative, Neu = neutral).

Valence	NAPS pictures names
NEG	Animals_001_h; Animals_024_h; Animals_025_h; Animals_027_h; Animals_033_h; Animals_038_h; Animals_054_h; Animals_068_h; Animals_071_h; Animals_074_h; Animals_077_h; Animals_078_h; Faces_146_h; Faces_150_h; Faces_152_h; Faces_170_h; Faces_271_h; Faces_272_h; Faces_285_h; Faces_290_h; Faces_291_h; Faces_293_h; Faces_294_h; Faces_302_h; Landscapes_002_h; Landscapes_004_h; Landscapes_005_h; Landscapes_007_h; Landscapes_010_h; Landscapes_011_h; Landscapes_014_h; Landscapes_017_h; Landscapes_022_h; Landscapes_026_h; Landscapes_139_h; Landscapes_177_h; Objects_001_h; Objects_002_h; Objects_003_h; Objects_007_h; Objects_011_h; Objects_022_h; Objects_125_h; Objects_132_h; Objects_139_h; Objects_149_h; Objects_283_h; Objects_285_h; People_001_h; People_008_h; People_020_h; People_022_h; People_118_h; People_127_h; People_136_h; People_140_h; People_200_h; People_215_h; People_225_h; People_226_h
NEU	Animals_109_h; Animals_114_h; Animals_122_h; Animals_125_h; Animals_126_h; Animals_136_h; Animals_165_h; Animals_169_h; Animals_170_h; Animals_197_h; Animals_202_h; Animals_206_h; Faces_184_h; Faces_186_h; Faces_188_h; Faces_282_h; Faces_304_h; Faces_314_h; Faces_316_h; Faces_326_h; Faces_329_h; Faces_331_h; Faces_335_h; Faces_343_h; Landscapes_009_h; Landscapes_041_h; Landscapes_048_h; Landscapes_050_h; Landscapes_089_h; Landscapes_100_h; Landscapes_107_h; Landscapes_127_h; Landscapes_143_h; Landscapes_149_h; Landscapes_163_h; Landscapes_172_h; Objects_025_h; Objects_033_h; Objects_041_h; Objects_069_h; Objects_075_h; Objects_078_h; Objects_079_h; Objects_103_h; Objects_254_h; Objects_262_h; Objects_263_h; Objects_270_h; People_069_h; People_089_h; People_099_h; People_101_h; People_109_h; People_153_h; People_162_h; People_167_h; People_173_h; People_178_h; People_194_h; People_250_h

Table S2: Means (M), standard deviations (SD), and results of two-tailed t-tests assuming unequal variance in luminance, contrast, complexity indices (i.e., JPEG size, entropy), and color space indices (i.e., LABL, LABA, LABB), referred to negative (Neg) and neutral (Neu) NAPS pictures employed as S2s in Experiment 1.

	NEG		NEU			
Measure	**M**	**SD**	**M**	**SD**	**t(118)**	**p**
luminance	114.149	27.503	116.943	27.615	-0.555	0.580
contrast	65.682	11.569	66.225	11.490	-0.258	0.797
complexity						
jpeg_size	350,012.367	118,541.318	331,739.683	120,579.766	0.837	0.404
entropy	7.579	0.338	7.608	0.311	-0.489	0.626
color space						
LABL	47.078	11.035	48.411	11.090	-0.660	0.511
LABA	1.684	4.600	0.541	7.901	0.969	0.335
LABB	7.444	9.766	7.492	11.416	-0.025	0.980

Table S3: Trials per experimental condition in the learning and test phases. For each phase and group (CG = certain group, UG = uncertain group) we report the S1 color (S1), the S2 valence (S2), the S1-S2 congruency (%) and the number of trials out of total (N). For the test phase we also report the predictive meaning of the cue according to new contingencies (Cue; Cueneg = cue preceding negative S2s, Cueneu = cue preceding neutral S2s), and the S2 congruency (Cong; Con = congruent, NCon = incongruent). Color-valence pairings were counterbalanced between subjects.

	Learning Phase				**Test Phase**					
Group	**S1**	**S2**	**%**	**N/40**	**S1**	**Cue**	**S2**	**Cong**	**%**	**N/80**
CG	red	neg	100	20	red	cue_{neg}	neg	Con	75	30
						cue_{neu}	neu	NCon	25	10
	blue	neu	100	20	blue	cue_{neg}	neg	NCon	25	10
						cue_{neu}	neu	Con	75	30
UG	red	neg	50	10	red	cue_{neg}	neg	Con	75	30
		neu	50	10		cue_{neu}	neu	NCon	25	10
	blue	neg	50	10	blue	cue_{neg}	neg	NCon	25	10
		neu	50	10		cue_{neu}	neu	Con	75	30

1.2 Time

1.2.1 Block

Table S4: Results of exploratory LMMs investigating the effect of block (1 vs. 2), group (CG vs. UG) and cue (cue_{neg} vs. cue_{neu}) on expectancy ratings in Experiment 1. We reported the unstandardized regression coefficients, standard errors (SE), 95% confidence intervals (CI), and the associated t-test.

Parameter	Estimate	SE	t	df	p	95% CI	
Intercept	52.67	0.62	85.52	253.94	< 0.001	51.46	53.88
UG - CG	-0.66	1.23	-0.54	253.94	0.59	-3.09	1.76
block 2 - block 1	0.50	0.47	1.05	7,070.08	0.294	-0.43	1.43
cue_{neg} - cue_{neu}	24.59	1.91	12.89	208.45	< 0.001	20.83	28.36
group x block	1.16	0.95	1.22	7,070.08	0.222	-0.70	3.02
cue x group	23.88	3.82	6.26	208.45	< 0.001	16.35	31.40
block x cue	1.84	0.95	1.94	7,083.16	0.052	-0.02	3.70
group x block x cue	-8.77	1.90	-4.62	7,083.16	< 0.001	-12.49	-5.05
σ ID	6.99						
σ cue	24.18						
σ residual	20.00						

Table S5: Anova table of exploratory LMMs investigating the effect of block (1 vs. 2), group (CG vs. UG) and cue (cue_{neg} vs. cue_{neu}) on expectancy ratings in Experiment 1.

Effect	SS	Df_{num}	Df_{den}	F	p
Group	2.20	1	183.07	0.01	0.941
Block	441.38	1	7,070.08	1.10	0.294
Cue	76,327.03	1	183.02	190.74	< 0.001
Group x Block	597.69	1	7,070.08	1.49	0.222
Group x Cue	11,137.28	1	183.02	27.83	< 0.001
Block x Cue	1,509.38	1	7,083.16	3.77	0.052
Group x Block x Cue	8,553.04	1	7,083.16	21.37	< 0.001

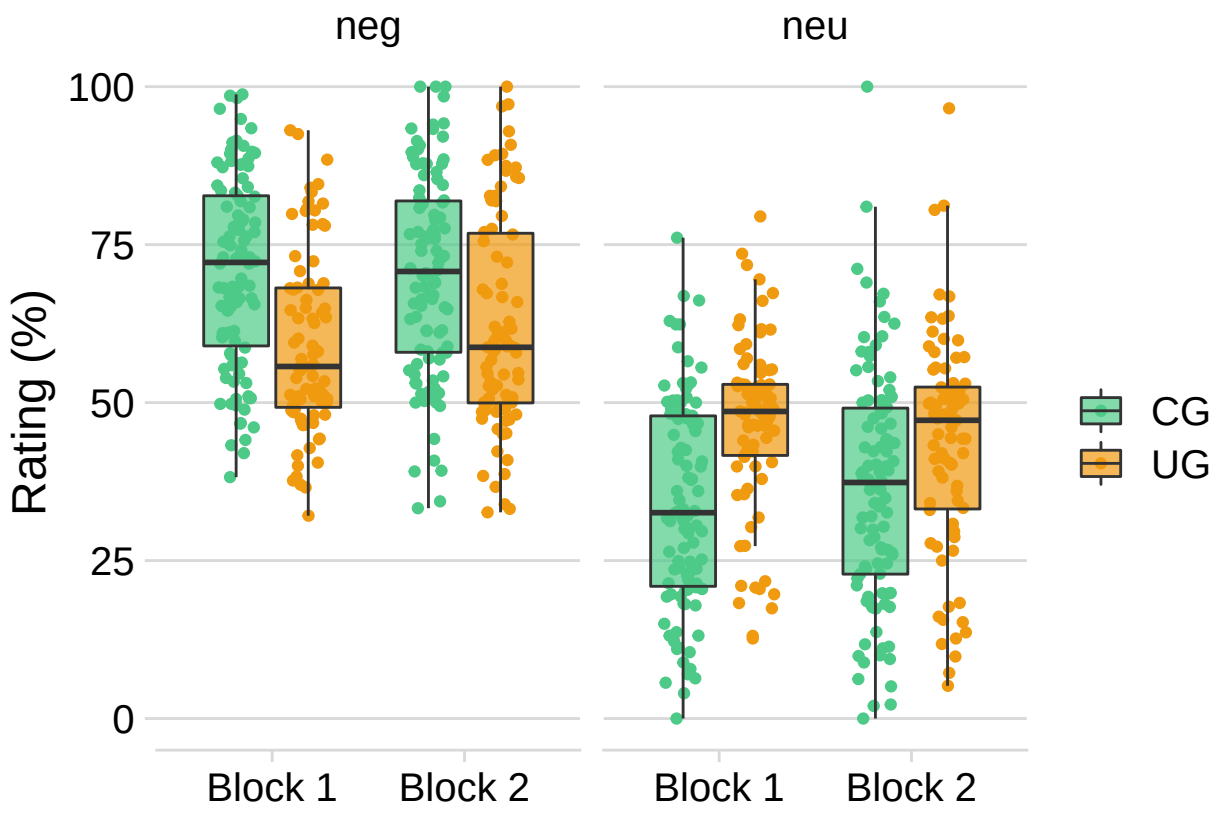

Figure S1: Box-plot of expectancy ratings in Experiment 1 according to the group (CG vs. UG), the block (1 vs. 2) and the cue (cue_{neg} vs. cue_{neu}). Points represent the mean estimated value for each participant and condition.

1.2.2 Trials

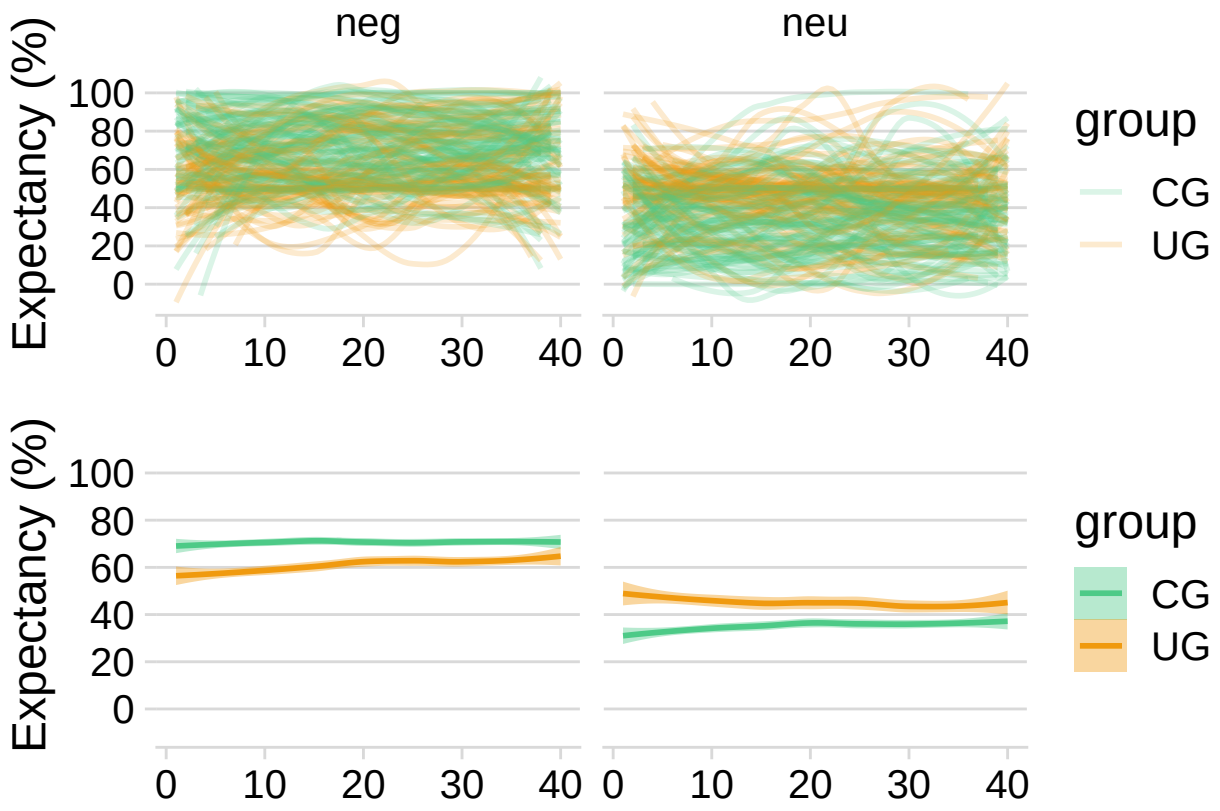

Figure S2: Relationship between trials, group (CG vs. UG) and cue (cue_{neg} vs. cue_{neu}) on expectancy ratings for Experiment 1. For each subject and group a loess regression is fitted using the internal `$ggplot2::geom_smooth()$` function in order to represent the non-linear pattern. Furthermore, given the non-linearity we did not report the linear mixed-model analysis.

1.3 Discussion (Experiment 1 exploratory model on expectancy ratings)

Results of the exploratory model on expectancy ratings in Experiment 1 showed a significant three-way interaction between group, cue and block $F(1, 7083) = 21.37$,$p < 0.001$). Post-hoc contrasts decomposing the interaction showed that in the CG expectancy ratings to cue_{neg} became slightly less negative, even though not significantly, between block 1 and block 2 ($block1 - 2 : 0.19$, $SE = 0.90$, $t(7081) = 0.22$, $p = 0.83$), while expectancy ratings to cue_{neu} became more negative from block 1 to block 2 ($block1 - 2 : -2.35$, $SE = 0.90$, $t(7081) = -2.62$, $p = 0.009$). In the UG, expectancy ratings to cue_{neg} became more negative between block 1 and block 2 ($block1 - 2 : -3.03$, $SE = 1.00$, $t(7073) = -3.04$, $p = 0.002$), while expectancy ratings to cue_{neu} became less negative from block 1 to block 2 ($block1 - 2 : 3.20$, $SE = 1.00$, $t(7073) = 3.21$, $p = 0.001$). Thus, results suggest that both groups learn the new 75% contingencies of the test phase, and they adapt their expectancy ratings accordingly. In fact, the CG shows progressively less extreme expectancy ratings as the test phase proceeds, proving that they transitioned from a more reliable predictive context (100%, experienced during the learning phase, according to which they generate their expectancies in the first half of the test phase) to a new, less reliable context (75%, experienced during the test phase, according to which they adapt their expectancies as the test phase proceeds). The UG, instead, shows progressively more extreme ratings as the test phase progresses, proving that they transitioned from a less reliable predictive context (50%, experienced during the learning phase, according to which they generate their expectancies in the first half of the test phase) to a new, more reliable context (75%, experienced during the test phase, according to which

they adapt their expectancies as the test phase proceeds).

2 Experiment 2

2.1 Stimuli

Table S6: List of NAPS picture names used as S2s in Experiment 1, sorted by valence (Neg = negative, Neu = neutral).

Valence	NAPS pictures names	IADS-2 sounds numbers
NEG	Animals_074_h, Animals_077_h, Animals_078_h, Animals_024_h, Faces_293_h, Faces_290_h, Faces_302_h, Faces_152_h, Landscapes_139_h, Landscapes_005_h, Landscapes_026_h, Landscapes_002_h, Objects_139_h, Objects_125_h, Objects_149_h, Objects_003_h, People_226_h, People_022_h, People_140_h, People_127_h	105, 106, 115, 116, 241, 242, 244, 255, 276, 277, 279, 283, 285, 286, 289, 290, 292, 293, 295, 296, 420, 422, 423, 424, 501, 502, 600, 611, 624, 625, 626, 703, 709, 711, 712, 713, 714, 719, 730, 732
NEU	Animals_170_h, Animals_206_h, Animals_125_h, Animals_109_h, Faces_304_h, Faces_316_h, Faces_331_h, Faces_326_h, Landscapes_127_h, Landscapes_149_h, Landscapes_163_h, Landscapes_107_h, Objects_262_h, Objects_254_h, Objects_263_h, Objects_078_h, People_194_h, People_099_h, People_173_h, People_101_h	107, 109, 113, 120, 132, 150, 152, 170, 171, 172, 206, 225, 254, 262, 270, 355, 360, 361, 363, 364, 365, 370, 374, 375, 377, 378, 400, 403, 601, 602, 610, 698, 704, 705, 716, 721, 724, 725, 726, 808

Table S7: Means (M), standard deviations (SD), and results of two-tailed t-tests assuming unequal variance in luminance, contrast, complexity indices (i.e., JPEG size, entropy), and color space indices (i.e., LABL, LABA, LABB) for affective pictures, and in physical properties (i.e., min dB, max dB, peak dB) for affective sounds, referred to negative (Neg) and neutral (Neu) NAPS pictures and IADS-2 sounds employed as S2s in Experiment 2.

	NEG		NEU				
Measure	**M**	**SD**	**M**	**SD**	**t**	**df**	**p**
luminance	110.232	23.168	121.242	24.168	-1.471		0.150
contrast	65.834	10.017	61.919	10.617	1.199		0.238
jpeg_size	345,480.200	115,725.462	357,945.550	111,068.563	-0.348		0.730
entropy	7.623	0.399	7.663	0.216	-0.394	38	0.695
LABL	45.552	9.136	50.539	9.667	-1.677		0.102
LABA	2.089	4.294	-1.576	10.822	1.408		0.167
LABB	5.316	5.992	6.630	15.278	-0.358		0.722
min dB	-0.673	0.058	-0.657	0.094	-0.916		0.362
max dB	0.668	0.052	0.681	0.116	-0.638	78	0.526
peak amp dB	-93.125	566.920	-3.582	1.347	-0.999		0.321

2.2 Time

2.2.1 Block

Table S8: Results of exploratory LMMs investigating the effect of block (1 vs. 2), group (CG vs. UG) and cue (cue_{neg} vs. cue_{neu}) on expectancy ratings in Experiment 2. We reported the unstandardized regression coefficients, standard errors (SE), 95% confidence intervals (CI), and the associated t-test.

Parameter	Estimate	SE	t	df	p	95% CI	
Intercept	53.52	0.60	89.08	239.32	< 0.001	52.34	54.70
UG - CG	1.14	1.20	0.95	239.32	0.345	-1.23	3.50
block 2 - block 1	-0.04	0.49	-0.09	6,420.49	0.926	-1.00	0.91
cue_{neg} - cue_{neu}	17.99	2.10	8.59	185.89	< 0.001	13.86	22.13
group x block	-1.20	0.97	-1.23	6,420.49	0.219	-3.11	0.71
cue x group	10.87	4.19	2.59	185.89	0.01	2.60	19.13
block x cue	5.70	0.97	5.86	6,445.98	< 0.001	3.79	7.61
group x block x cue	0.89	1.95	0.46	6,445.98	0.649	-2.93	4.70
σ ID	6.37						
σ cue	25.57						
σ residual	19.57						

Table S9: Anova table of exploratory LMMs investigating the effect of block (1 vs. 2), group (CG vs. UG) and cue (cue_{neg} vs. cue_{neu}) on expectancy ratings in Experiment 2.

Effect	SS	Df_{num}	Df_{den}	F	p
Group	92.30	1	165.96	0.24	0.624
Block	3.27	1	6,420.49	0.01	0.926
Cue	40,124.42	1	165.99	104.76	< 0.001
Group x Block	579.16	1	6,420.49	1.51	0.219
Group x Cue	2,952.91	1	165.99	7.71	0.006
Block x Cue	13,155.20	1	6,445.98	34.35	< 0.001
Group x Block x Cue	79.33	1	6,445.98	0.21	0.649

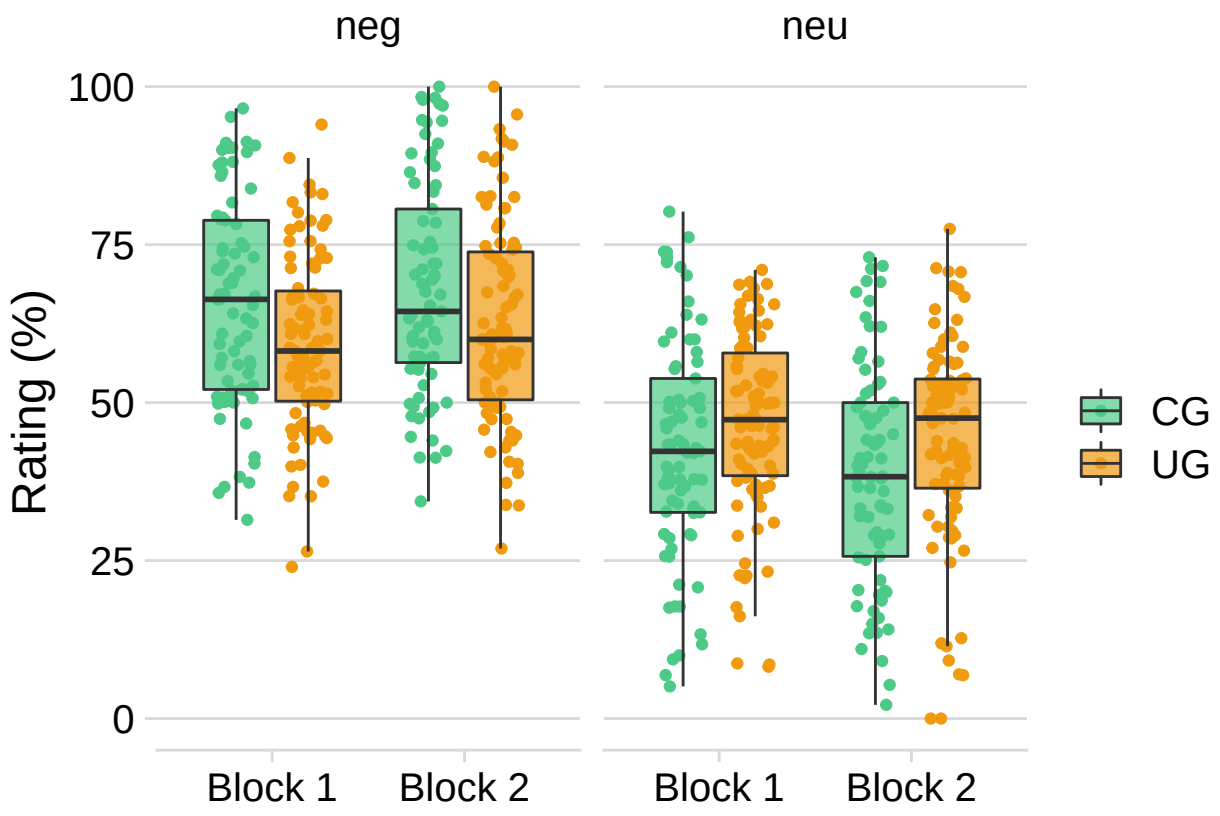

Figure S3: Box-plot of expectancy ratings in Experiment 2 according to the group (CG vs. UG), the block (1 vs. 2) and the cue (cue_{neg} vs. cue_{neu}). Points represent the mean estimated value for each participant and condition.

2.2.2 Trials

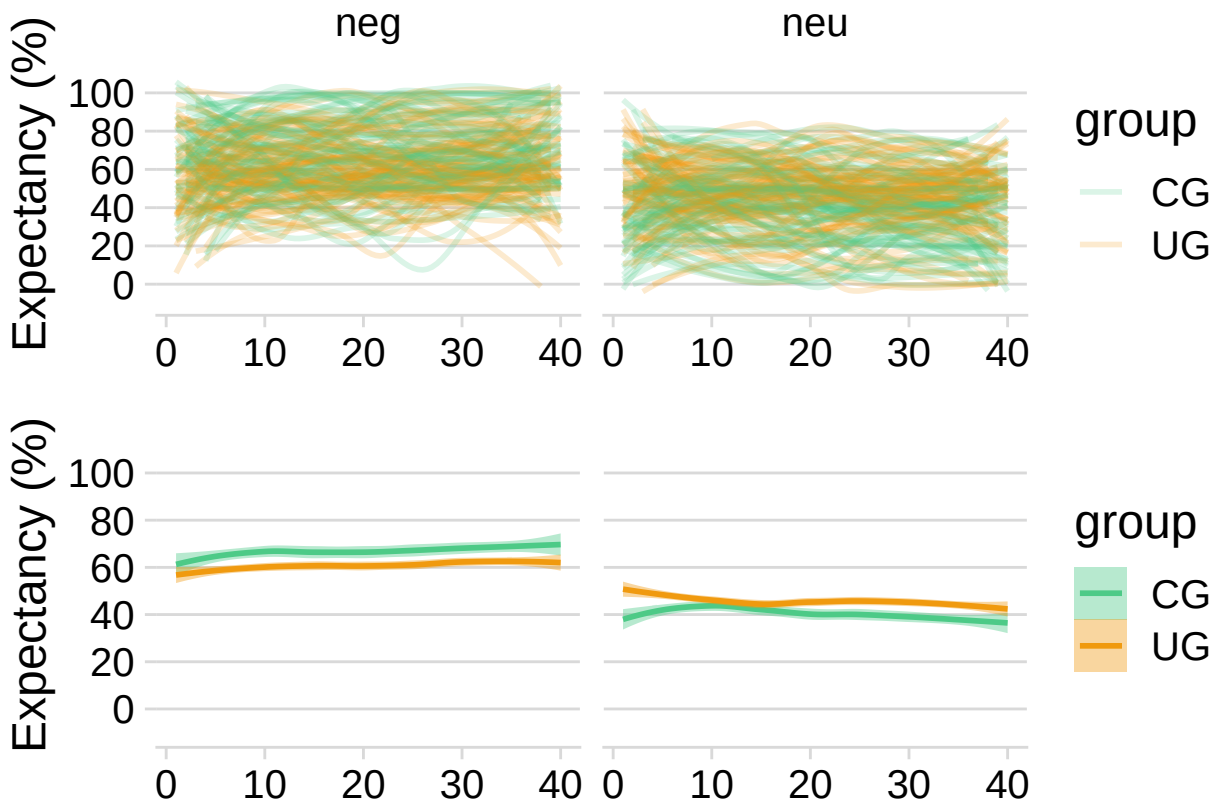

Figure S4: Relationship between trials, group (CG vs. UG) and cue (cue_{neg} vs. cue_{neu}) on expectancy ratings for Experiment 2. On the top, for each subject and group a loess regression is fitted using the internal `$ggplot2::stat_smooth()$` function in order to represent the non-linear pattern. On the bottom, we applied the same approach at the group level. Furthermore, given the non-linearity we did not reported the linear mixed-model analysis.

2.3 Discussion (Experiment 2 exploratory model on expectancy ratings)

Results of the exploratory model on expectancy ratings in Experiment 2 showed only a significant interaction between cue and block ($F(1, 6561) = 30.76$, $p < 0.001$). Post-hoc contrasts decomposing the interaction showed that, regardless of group, expectancy ratings to cueneg became more negative between block 1 and block 2 ($block1 - 2 : -2.69$, $SE = 0.68$, $t(6549) = -3.97$, $p < 0.001$), while expectancy ratings to cue_{neu} became less negative from block 1 to block 2 ($block1 - 2 : 2.63$, $SE = 0.68$, $t(6546) = 3.87$, $p < 0.001$). Thus, results suggest that both groups show progressively more extreme ratings as the test phase progresses. While this trend is consistent with what might be expected (and with what was found in Experiment 1) for the UG, as they transitioned from a less reliable (50%) to a more reliable (75%) context, it is reversed from the expected trend (found in Experiment 1) for the CG. Speculating on the possible reason of such a different pattern of results, it could be possible that for participants in the CG (for which expectancies based on previous learnings are actually more reliable) it might be harder to adapt their expectancy ratings to a new probabilistic ratio when it draws on a different sensory modality than that involved in prior learning (as is the case in Experiment 2). Thus, they could be more resilient - and perhaps they could need more trials - to adapt their expectancies to new learnings as compared to participants in the UG, for which in both cases (same or different sensory modalities) a reliable previous experience is not available, and thus learning new contingencies may be equally easy - or may require less trials. However, this very speculative interpretation

should be taken with caution, as further studies are needed to shed light on how quickly people adapt their expectancies to new contingencies within vs. across sensory modalities.