Supplementary materials

Stimulus discriminability and induction as separable components of generalization

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Effect of test order

In our procedure all participants completed two generalization tests, in randomized order. Analyses in the main paper are based on the *first* test that each participant completed (Figure 3 in the paper). Figure S1 below shows the test data for *both* the first and the second tests for Experiment 1. Comparison of the upper and lower panels shows that having previously completed one test had a substantial impact on the gradients observed in the second test. In particular, the expectancy gradient became much more similar to the identification gradient when expectancy was tested second. This pattern was supported by a significant interaction between quadratic trend and test order, $F(1, 343)=39.39$, $p<.001$, 95% CI=0.42, 0.80. Test order also interacted significantly with the contrasts testing responding on the left hand (CS-) side of the gradient, $F(1, 343)=8.85$, $p=.003$, 95% CI=0.07, 0.34, and on the right hand side of the gradient, $F(1, 343)=24.44$, $p<.001$, 95% CI=0.25, 0.57.

The impact of prior completion of the Identification test on the expectancy gradient is consistent with the finding reported in the paper that these participants were more likely to report a similarity rule in the questionnaire that was administered immediately following the Expectancy test. Thus, having been asked to indicate how similar each stimulus was to the trained CS+ appears to have led participants to assume that the rule governing likelihood of shock was also similarity-based.

There was also evidence that prior completion of the expectancy test impacted on the identification measure. The identification gradients remained approximately symmetrical when tested second, but were broader and with slightly lower peaks, leading to a significant effect of test order on false alarms, F(1,343)=19.08, p<.001, 95% CI=-0.68, -0.26, and hit rate, χ^2(1, N=347)=6.06, p=.014, but not on symmetry, F<1, p>.05, 95% CI=-0.13, 0.29.

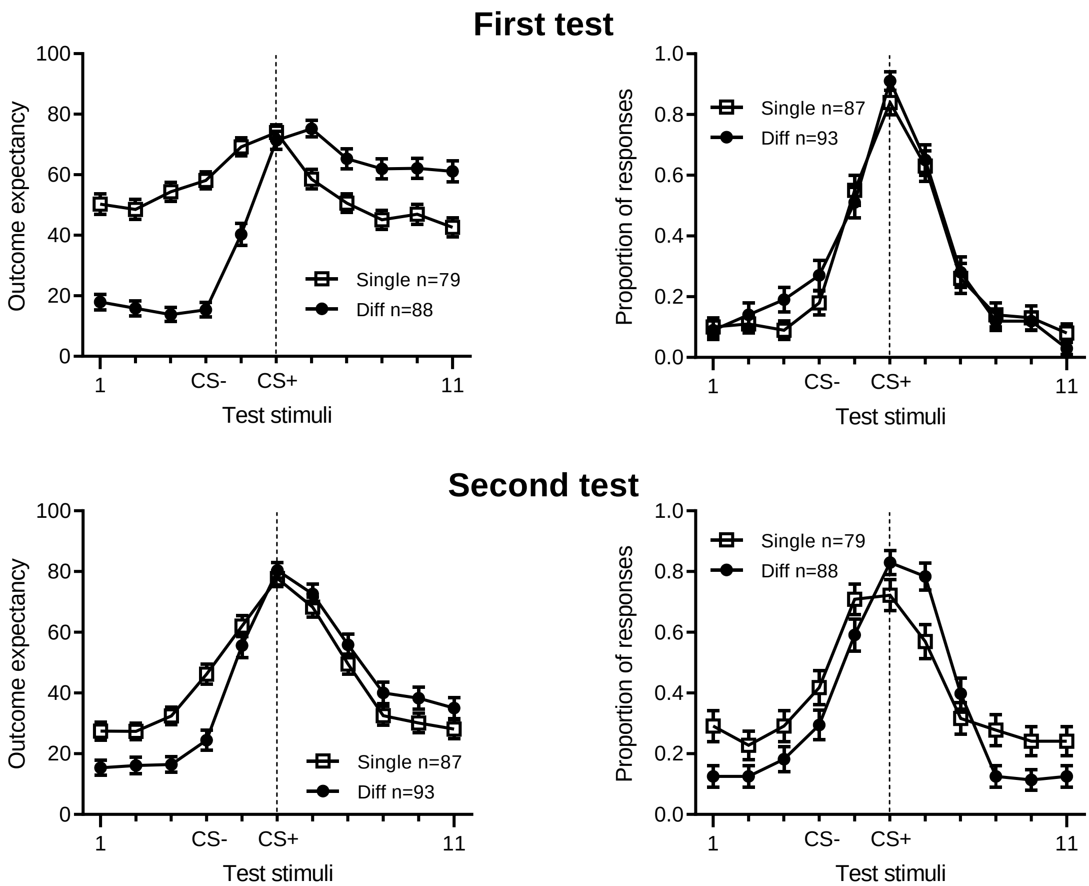

Figure S1. Mean outcome expectancy ratings (left panel) and proportion of CS+ identification responses (right panel) across the 11 test stimuli for all participants who met the inclusion criteria in Experiment 1. The upper panels show data from the first administered test and the lower panels show data from the second administered test. Single = Single cue group; Diff = Differential group.

Analysis of response times

Our software recorded response times for both the expectancy ratings and identification responses, which are graphed in Figure S2. In Experiment 1, expectancy RTs were fairly flat across the color dimension, and were longer overall in the Differential group. Identification RTs were longer for test colors near CS+, but with a dip at CS+ itself. Identification RTs were also longer overall in the Differential group. In Experiment 2, expectancy RTs showed a similar pattern to Experiment 1. Identification RTs in the Identify CS+ group also showed a similar pattern to Experiment 1. In the Identify CS- group, RTs were longest for the test color adjacent to CS-, and declined for colors on either side. These data are consistent with the idea that the differential design was harder than the single cue design, and that there was greater uncertainty when identifying colors close to the target value.

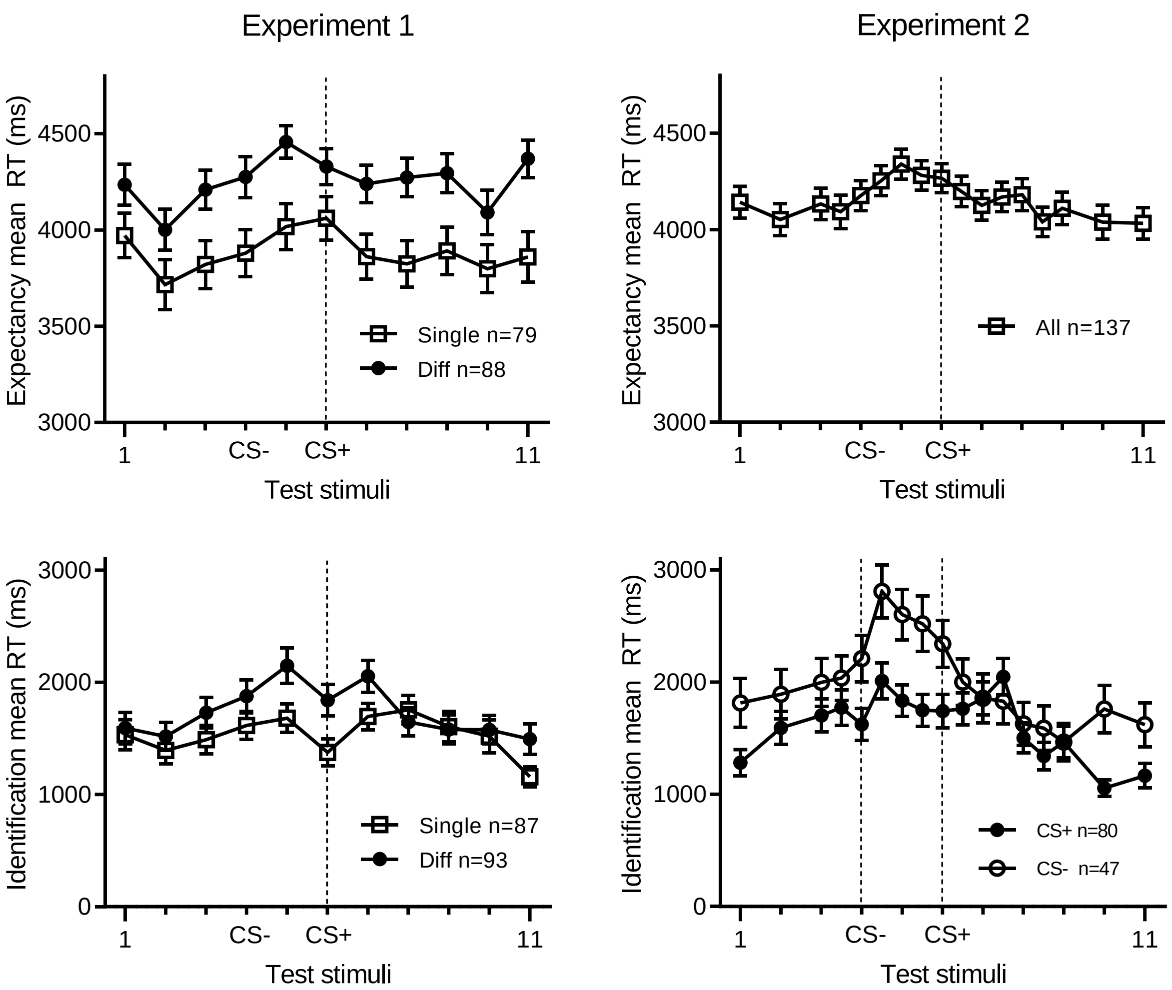

Figure S2. Mean response times for outcome expectancy ratings top panels) and identification responses (bottom panels) in Experiment 1 (left panels) and Experiment 2 (right panels). Data are shown only for the first test that each participant completed.

Analysis of test data for non-learners

In the main paper we only analyzed and presented data for participants who met the acquisition criteria ("learners"). Figure S3 shows the expectancy and identification data for the remaining participants ("non-learners"). In both experiments, the expectancy test gradients were flat, consistent with their initial failure to learn. In Experiment 1, the identification gradients were recognizably peaked but less sharp than for the learners, and in Experiment 2 the gradients showed no clear pattern. These results are consistent with the idea that the non-learners did not understand the task instructions or did not engage with the task, particularly in Experiment 2.

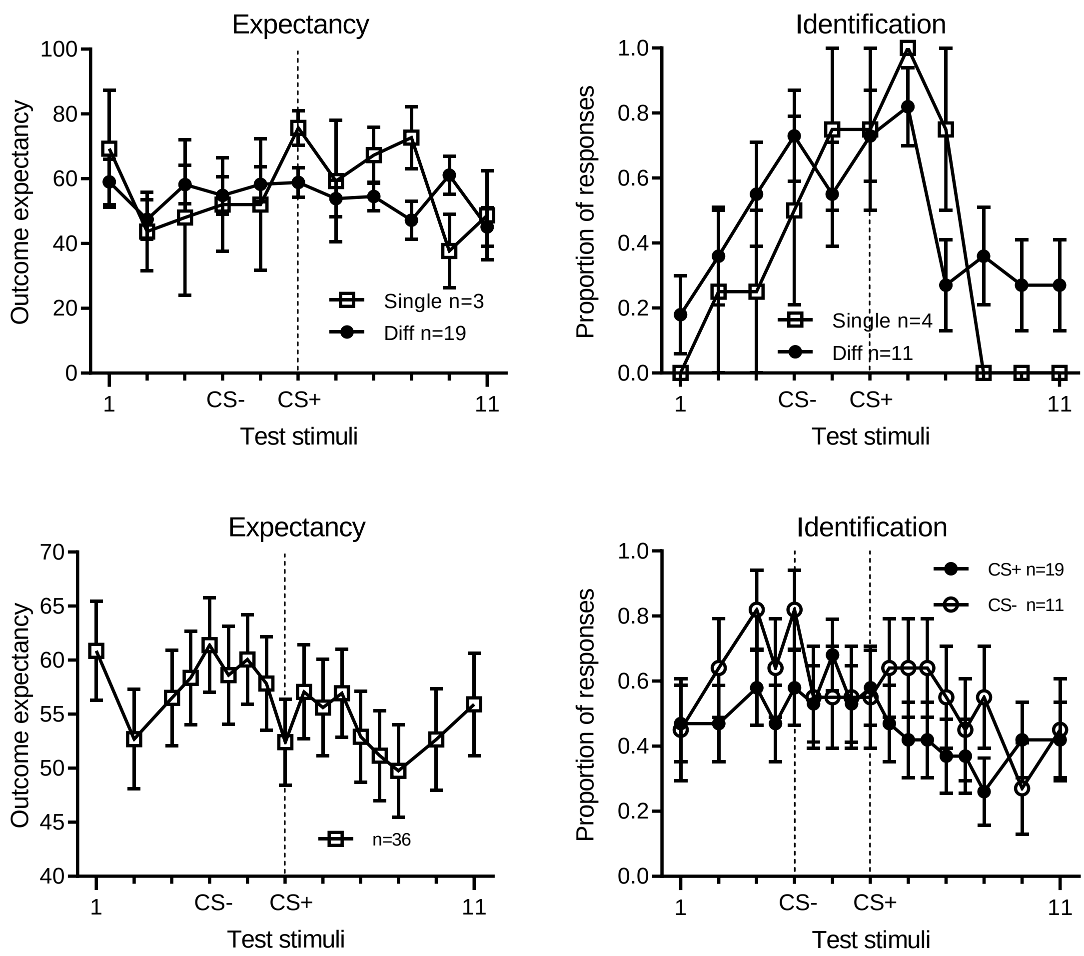

Figure S3. Mean outcome expectancy ratings (left panels) and proportion of CS+ identification responses (right panels) for non-learners in Experiment 1 (top panels) and Experiment 2 (bottom panels). Data are shown only for the first test that each participant completed.

Experiment 2 rule subgroup comparison separated by identification group

In the paper, Figure 8 plots the identification gradients for the Similarity and Linear subgroups, collapsed over target stimuli. Figure S4 below shows the same data but separated by target stimulus (Identify CS+ vs. Identify CS-).

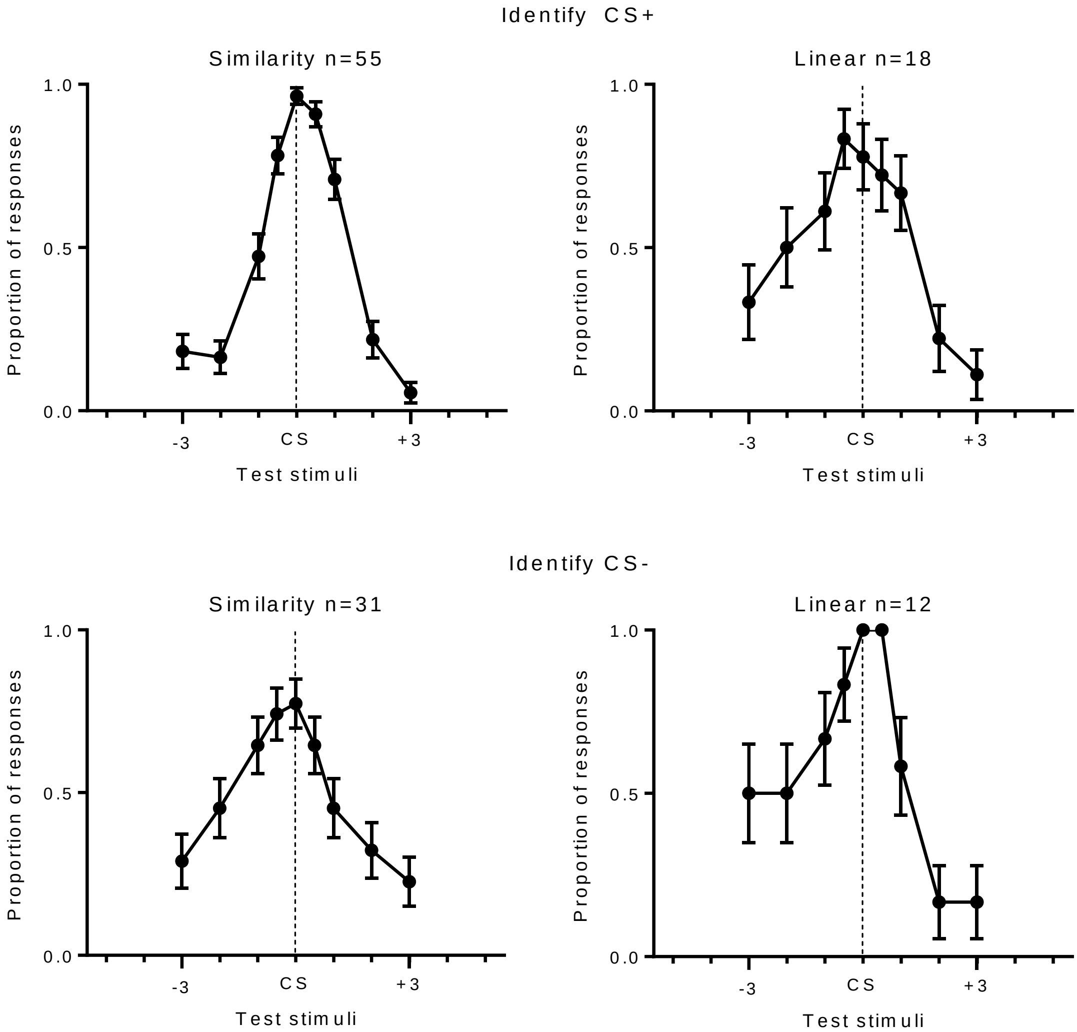

Figure S4. Proportion identification of the target stimuli for the Identify CS+ group (top panels) and Identify CS- group (bottom panel) in Experiment 2, for the Similarity rule subgroups (left panels) and the Linear rule subgroups (right panels). Only participants who passed the manipulation check are included.