Supplemental Results

Bias

We were interested in whether there was any bias for MinE/MaxE (from the negative-patterning data) to be restricted towards either X or Y. Delamater, Sosa, and Katz (1999) showed that a patterning discrimination can involve a better discrimination between the elements and compound based on salience. Stimuli A and B were trained to elicit R1 (+) and R2 (!) depending on whether they were alone (A+/B+) or in compound (AB!) where B was less salient. The discrimination between the responses elicited by A+ or B+ and the AB! compound was greater with B than with A. A better patterning discrimination was obtained with the *less* salient element.

Our counterbalancing should eliminate any differences in stimulus salience between X and Y. Nevertheless, we wanted to assess whether there could be any such bias in our data, and determine whether it was surreptitiously restricted to one element. That is, we asked whether MaxE could be consistently more X than Y, or vice versa, for any individual. The difference in suppression (Y minus X) was calculated on each trial and averaged by participant. Then, each participant's average was tested against a hypothetical mean of zero with a t-test using the variance of the differences across trials upon which the individual's differences were calculated. Mean differences (based on $p < .05$) were categorized as "Bias" with bias indicating a tendency for one stimulus to condition better than another. Positive differences were categorized as X biased, negative differences were categorized as Y biased, and those which were not significant were categorized as "Unbiased."

In the entire sample, 25 were biased towards X, 568 were unbiased, and 14 were biased towards Y. Bias was independent of the distribution of discriminators/non-discriminators and Group, *p*s ≥ .1. Within the discriminators, analyzed in the main paper, 8 were biased towards X, 255 had no bias, and 3 were biased towards Y, and that distribution was independent of Group, $p = .87$. (Biased toward X by Group Ext A = 2, Ext B = 4, No Ext = 2; No Bias by Group Ext A = 92, Ext B = 80, No Extinction 83; Biased toward Y, n = 1 in each group).

Correlations among Discriminators

No Extinction

This section contains the detailed report of the summary in the main text. Table 1 shows the correlations, their confidence limits, and probabilities in group No Extinction.

Table 1

Correlations among test variables and transforms in Group No Extinction.

No Extinction					
DF = 81	X				
Y	$r = .61_{(.4 - .67)}$ $p = 6.7 \times 10^{-10}$	Y			
XY	$r = .08_{(-.12- .29)}$ $p = .45$	$r = .24_{(.03 - .43)}$ $p = .028$	XY		
C	0	0	$r = .97_{(.95 - .98)}$ $p = 2 \times 10^{-50}$	C	
XY – Y	$r = .43_{(.24-.59)}$ $p = 5 \times 10^{-5}$	$r = .61_{(.46-.73)}$ $p = 5 \times 10^{-10}$	$r = -.62_{-(.73 - 46)}$ $p = 4 \times 10^{-9}$	$r = -.79_{-(.86-.69)}$ $p = 8 \times 10^{-19}$	XY – Y

Note. Table 1 shows the correlations and degrees of freedom (n – 2) for the test variables and their transforms. Confidence intervals (95%) are shown in parentheses and the associated probability is shown below. Shaded cells indicate correlations with $p \geq .05$. A "-" preceding parentheses indicates all intervals were negative.

Suppression to X and Y was related, but suppression to X alone showed no relationship with XY while suppression to Y predicted more suppression to XY. The X/XY and Y/XY correlations were both weaker than the X/Y correlation, $Z \geq 2.98$, $p \leq .003$, $Q \geq .47$, $CI_{95\%}\%Q$ = .16 -.77. X and Y were treated the same in this group, thus they should not differ in their correlations with XY. Despite one reaching significance and the other not, the size of the significant X/XY and insignificant Y/XY correlations did not differ in size, $p = .102$, suggesting the correlations of the elements with the compound were weak at best.

Suppression to X and Y correlated with the size of the XY-Y discrimination. Suppression to Y is expected to correlate with XY-Y as it is part of the XY-Y calculation. Y is correlated with both X and the discrimination so the X/XY-Y relationship was re-examined with a partial correlation of X/XY-Y.Y (with suppression to Y removed) and there was no relationship between responding to X and the size of the XY-Y discrimination, $r(81) = -.08$, $p = .45$. As should be suspected, the variable C correlated strongly with XY explaining 94% of the response to XY. C, (XY with X and Y removed) was negatively correlated with the XY-Y discrimination, where greater suppression to C predicted less discrimination.

Extinction B

Table 2 shows the correlations in group Ext B, along with the variable "Extinction" which was the last trial of extinction minus the first and "Renewal" which was the last extinction trial minus the test trial.

Table 2.

Correlations among test variables and transforms in Group Ext B.

Ext B						
DF = 78	X					
Y	$r = .61_{(.44-.73)}$ $p = 4 \times 10^{-9}$	Y				
XY	$r = .19_{(-.04 - .39)}$ $p = .10$	$r = .09_{(-.13 - .31)}$ $p = .41$	XY			
C	0	0	$r = .98_{(.97 - .99)}$ $p = 9 \times 10^{-58}$	C		
XY – Y	$r = .35_{(.14-.53)}$ $p = .002$	$r = .73_{(.61-.82)}$ $p = 3 \times 10^{-14}$	$r = -.61_{-(.73 - 45)}$ $p = 3 \times 10^{-9}$	$r = -.68_{-(.78-.53)}$ $p = 1 \times 10^{-11}$	XY – Y	
Extinction	$r = .31_{(.09 - .5)}$ $p = .006$	$r = .41_{(.22-.59)}$ $p = .0002$	$r = -.20_{(-.4 - .2)}$ $p = .07$	$r = -.26_{-(.45-.04)}$ $p = .02$	$r = .48_{(.28-.63)}$ $p = 1 \times 10^{-5}$	Extinction
Renewal	$r = .78_{(.68-.86)}$ $p = 2 \times 10^{-17}$	$r = .41_{(.21-.58)}$ $p = .0002$	$r = -.13_{(-.34-.1)}$ $p = .25$	$r = -.29_{-(.48-.07)}$ $p = .01$	$r = .42_{(.22-.59)}$ $p = .0001$	$r = .59_{(.43-.71)}$ $p = 1 \times 10^{-8}$

Note. Table 2 shows the correlations and degrees of freedom (n – 2) for the test variables and their transforms in Group Ext B. Confidence intervals (95%-in parentheses) along with the associated probability are also shown. Shaded cells indicate correlations with $p \geq .05$. A "-" preceding parentheses indicates all intervals were negative.

As X underwent renewal in this group, we would expect similar correlations to those of group No Extinction, which is reflected in the two tables. Suppression to X and Y was correlated. Neither the suppression to X nor to Y was related to XY, and both correlations were less than that of X/Y, $Z \geq 3.19$, ps $\leq .001$, $Q \geq .51$, $CI_{95\%}\%Q = .2 - .71$. These two correlations did not differ, $p = .36$, and neither differed from the corresponding correlations in group No Extinction, ps $\geq .34$. X was correlated with the XY-Y discrimination, but not with Y partialled out, $r_{X/XY\text{-}Y.Y} = -.16$, $p = .15$. C was correlated with XY, $r_{C/XY} = .98$, $CI_{95\%}r = .97 - .99$, accounting for 96% of the variance in responding to XY, and did not differ from that in No Extinction, Z = 1.91, $p = .06$. C was correlated with the XY-Y discrimination where greater suppression to C predicted a smaller discrimination.

Extinction in Ext B. As Ext B underwent renewal on test and was not under the influence of extinction, correlations of Extinction with the variables are an index of the extent to which learning extinction relates to the learning involved with those variables. Extinction was positively correlated with suppression to X where those who showed strong suppression (renewal) had shown good extinction. Extinction was also positively correlated with suppression to Y, even with X partialled out, $r_{Ext/Y.X}$ (75) = .31, p = .006, $CI_{95\%}r$ = .09 - .5, indicating that good learning of suppression was generally related to good extinction learning. Extinction was correlated with the size of the XY-Y discrimination which was maintained with both Y and X partialled out, $r(74)$ $r_{Ext/XY-Y.X.Y}$ = .28, p = .01, $CI_{95\%}r$ = .06 - .48. A better ability to learn extinction was related to a better ability to learn an element/compound discrimination. Extinction was correlated with C and was maintained with both X and Y partialled out, $r(74)_{Ext/C.X.Y}$ = -.29, p = .01, $CI_{95\%}r$ = -.48 - -.06, (X and Y were already removed from C, thus the partial correlation removed them from Extinction). Those who were better at learning extinction showed less suppression to C. Extinction did not correlate with C when renewal (below) was partialled out, r = .11

Renewal. Renewal correlated with both X and Y. Renewal correlated with the XY-Y discrimination, and persisted with both X and Y partialled out, $r(74)$ $_{ren/XY-Y.X.Y}$ = .47, p = 3.2 x 10^{-5}, $CI_{95\%}r$ = .26 - .63. Though the tendency in the sample for Renewal to decrease suppression to XY alone was not significant, there was a correlation between Renewal and C, where greater renewal predicted less suppression to C that persisted with X and Y partialled out, r(74)ren/C.X.Y = -.47, p = 2 x 10^{-5}, $CI_{95\%}r$ = -.62 - -.27.

Combining Groups No Extinction and Ext B

Groups No Extinction and Ext B showed equivalent suppression to X, Y and XY, as shown in the main text. Comparisons between groups on the correlations based in Table 2 with the corresponding correlations in Table 3 showed no differences on any correlation. Apart from those already reported, all *p*s ≥ .13. For simplicity, in comparisons with group Ext A involving variables that all groups share, these two groups were combined.

The correlations of the groups combined were consistent with those of the groups individually (see Table 3). The X/XY correlation was not reliable, while the Y/XY may have been, but the two did not differ in size, $p = .54$, and both were smaller than the X/Y correlation, $Z \geq 4.91$, $p \leq 9 \times 10^{-7}$, $Q = .53$, $CI_{95\%}Q = .32$ - .74.

Table 3

Groups Ext A and Ext B combined on common variables.

No Ext and Ext B combined					
DF = 160	X				
Y	$r = .61_{(.5\text{-}.7)}$ $p = 9 \times 10^{-18}$	Y			
XY	$r = .13_{(-.02\text{-}.28)}$ $p = .09$	$r = .18_{(.02\text{-}.32)}$ $p = .03$	XY		
C	0	0	$r = .98_{(.978\text{-}.988)}$ $p = 2 \times 10^{-121}$	C	
XY – Y	$r = .39_{(.28\text{-}.51)}$ $p = 4 \times 10^{-7}$	$r = .67_{(.58\text{-}.75)}$ $p = 2 \times 10^{-22}$	$r = -.61_{-(.7\text{-}.5)}$ $p = 4 \times 10^{-18}$	$r = -.74_{-(.80\text{-}.66)}$ $p = 1 \times 10^{-29}$	XY – Y

Note. Table 3 shows the correlations and degrees of freedom (n – 2) for the test variables and their transforms in Groups Ext A and B combined. Confidence intervals (95%-in parentheses) along with the associated probability are also shown. Shaded cells indicate correlations with $p \geq .05$. A "-" preceding parentheses indicates all intervals were negative.

Extinction in A

The correlations among the test variables and transforms for group Ext A are shown in Table 4.

Table 4.

Correlations among the test variables and transforms for group Ext A.

Ext A						
DF = 87	X					
Y	$r = .28_{(.08-.46)}$ $p = .007$	Y				
XY	$r = .38_{(.19-.54)}$ $p = .0002$	$r = .42_{(.23-.58)}$ $p = .4 \times 10^{-5}$	XY			
C	0	0	$r = .87_{(.80-.91)}$ $p = 6 \times 10^{-28}$	C		
XY – Y	$r = -.11_{(-.31-.11)}$ $p = .33$	$r = .5_{(.33-.64)}$ $p = 5 \times 10^{-7}$	$r = -.58_{-(.7-.42)}$ $p = 4 \times 10^{-9}$	$r = -.83_{-(.88-.74)}$ $p = 2 \times 10^{-23}$	XY – Y	
Extinction	$r = -.29_{-(47-.09)}$ $p = .006$	$r = .36_{(.16-53)}$ $p = .0006$	$r = .12_{(-.05-35)}$ $p = .27$	$r = .09_{(-.23-.18)}$ $p = .41$	$r = .21_{(.002-.4)}$ $p = .0482$	Extinction

Note. Table 4 shows the correlations and degrees of freedom (n – 2) for the test variables and their transforms in Group Ext A. Confidence intervals (95%-in parentheses), along with the associated probability are also shown. Shaded cells indicate correlations with p ≥ .05. A "-" preceding parentheses indicates all intervals were negative.

Suppression to X and Y was correlated positively. The X/Y correlation was significantly less than in the groups not under the influence of extinction, $Z = 3.09$, $p = .002$, $Q = .41$, $CI_{95\%}$%$Q = .15 - .68$.

Suppression to X was related to XY and it was greater than that of the groups not under the influence of extinction, $Z = 1.98$, $p = .048$, $Q = .26$, $CI_{95\%}$%$Q = .002 - .57$. Suppression to X and XY remained correlated with Y partialled out, $r_{X/XY.Y}(86) = .30$, $p = .005$, $CI_{95\%}r = .1 - .48$. The X/XY correlation did not differ from the X/Y correlation, $p = .38$.

Suppression to Y was also related to XY, and it was greater than that of the groups not under the influence of extinction, $Z = 2.03$, $p = .04$, $Q = .27$, $CI_{95\%}Q = .008$ - .53. The Y/XY correlation remained with X partialled out, $r_{Y/XY.X}(86) = .35$, $p = .0009$, $CI_{95\%}r = .15$ - .52. The Y/XY correlation did not differ from the X/Y correlation, $p = .21$. The X/XY and Y/XY correlations did not differ, $p = .72$.

These conclusions regarding group differences (ps = .048 and .04) are tentative. However, that they are both element/compound discriminations is consistent with the idea of changes in X resulting in a reduction in the salience of C, increasing the correlation of the elements with the compound.

Extinction was related to suppression to X where greater extinction produced less suppression to X, but remained positively correlated with Y, where those better at learning extinction showed better suppression to Y. There was an Ext/XY-Y correlation, $r = .21$, $p = .048$. However, the Ext/XY-Y correlation disappeared with X and Y partialled out, $r = -.1$. Extinction did not correlate with control by C, $r = .09$. Removing X and Y from extinction did not change the correlation, $r = .11$.

There was still a discrimination between XY and Y in group Extinction; Extinction reduced, but did not eliminate, suppression to XY. However, there was no correlation of suppression to X with the XY-Y discrimination, which was significantly lower than the groups not under the influence of extinction, $Z = 3.84$, $p = .0001$, $Q = .51$, $CI_{95\%}\%Q = .25$ -.78. "C" should still be intact, though to a lesser extent. In group Ext A, C was correlated with XY, but was less so than in the groups not under the influence of extinction, $Z = 8.14$, $p = 4.4 \times 10^{-16}$, $Q = 1.08$, $CI_{95\%}Q = .82$ -.1.35. Consistent with extinction of X increasing suppression to XY between groups,

extinction of X increased the variance in XY explained by X and Y, decreasing the variance explainable by C.

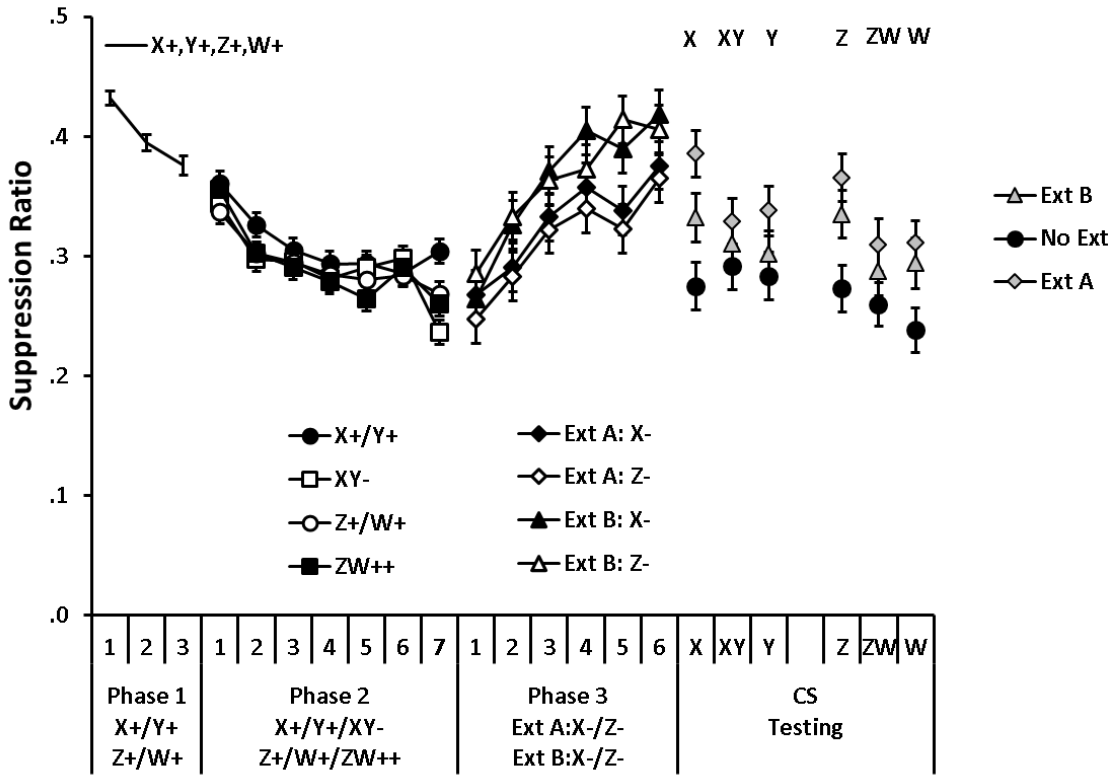
Training and Testing- Non-Discriminators

Data from Non-Discriminators throughout training and testing are shown in Supplement Figure 1.

Phase 1 Initial conditioning

ITI response screening eliminated 2, 1, and 2 participants from groups Ext A, Ext B and No Extinction, respectively. Suppression to X, Y, Z, and W in the initial conditioning of phase 1 was analyzed with a CS x Group x Trials ANOVA. There was an effect of trials $F(2, 666) = 43.48$, $p = 1.8 \times 10^{-18}$, $MSE = 0.03$, $\eta^2_p = 0.12$, $CI_{95\%} = 0.07 - 0.16$, and no other effects, ps ≥ .47.

Supplement Figure 1.



Note. Training and testing data for non discriminators. Vertical bars show the standard error of the mean. Values on testing are shown in Supplement Figure 2 below.

Phase 2 Negative Patterning

ITI response screening eliminated 3, 1, and 4 participants from groups Ext A, Ext B and No Extinction, respectively.

MinE vs MaxE vs XY. As described in the main text, we separated the elements X and Y on each trial into MinE and MaxE and compared those to the compound with a CS (MinE x MaxE x XY) x Group x Trials ANOVA. There was a Trials x Group interaction, $F(12, 1980) = 1.98$, $p = 0.02$, $MSE = 0.03$, $\eta^2_p = 0.012$, $CI_{95\%} = 8.0 \times 10^{-5} - 0.02$, (not shown in the discriminators) and a CS x Trials interaction, $F(12, 3960) = 10.56$, $p = 6.7 \times 10^{-21}$, $MSE = 0.013$, $\eta^2_p = 0.03$, $CI_{95\%} = 0.02$ -

0.04 (consistent with the discriminators). No other effects, not already superseded by these interactions, were reliable, *p*s ≥ .62.

To investigate the Trials x Group interaction we averaged MinE, MaxE, and XY on each trial. A series of one-way ANOVAS of Group on each trial revealed no differences, *F*s(2,330) ≤ 1.58, *p*s ≥ .21. Trials ANOVAs within each group revealed significant effects of trials in each Group, $F(6, 654) = 5.25$, $p = 2.7 \times 10^{-5}$, $MSE = 0.008$, $\eta^2_p = 0.05$, $CI_{95\%} = 0.014 - 0.07$, with progressively larger effect sizes in each group (Ext A $\eta^2_p = .046$, Ext B $\eta^2_p = .058$, No Extinction $\eta^2_p = .13$). Averaged over the trial types, suppression increased overall across trials. Though there were no group differences on any trial, group No Extinction showed a steeper progression as indicated by its greater effect size.

Comparisons of MaxE to XY on each trial revealed that suppression to MaxE was greater than to XY on every trial, *F*s(1, 332) ≥ 13.79, $p \geq 0.0002$, $MSE = 0.014$, $\eta^2_p \geq 0.04$, $CI_{95\%} = 0.009 - 0.09$, except the final trial, $F < 1$. Comparisons of MinE to XY on each trial revealed that suppression to XY was greater than MinE on every trial *F*s(1, 332) ≥ 6.33, $p \leq 0.012$, $MSE = 0.02$, $\eta^2_p \geq 0.02$, $CI_{95\%} = 0.0008 - 0.06$. MaxE showed greater suppression than MinE on every trial, *F*s(1, 332) ≥ 70.77, $p \geq 1.2 \times 10^{-15}$, $MSE = 0.02$, $\eta^2 p \geq 0.18$, $CI_{95\%} = 0.11 - 0.25$.

X and Y vs XY. A CS (X and Y average vs XY) x Trials ANOVA revealed, as should be expected, the same Trials x Group interaction detected in the MinE x MaxE x XY analysis above, and a CS x Trials interaction, $F(6, 1980) = 9.37$, $p = 3.7 \times 10^{-10}$, $MSE = 0.011$, $\eta^2_p = 0.03$, $CI_{95\%} = 0.013 - 0.04$. No other effects not already superseded by this interaction were notable, *p*s ≥ .32. The suppression to X and Y averaged (i.e., the average of MinE and MaxE) was less than the

suppression to XY on trials 2 and 7, Fs(1, 332) ≥ 10.91, p ≤ 0.0011, MSE = 0.013, η^2_p ≥ 0.03, $CI_{95\%}$ = 0.005 - 0.08. There were no differences on the other trials, ps ≥ .056.

Phase 2 Positive Patterning

MinE x MaxE x ZW. A CS x Group x Trials ANOVA of MinE, MaxE (applied to Z and W) and ZW revealed a CS x Trials interaction, F(12, 3960) = 8.93, p = 3.8 x 10^{-17}, MSE = 0.013, η^2_p = 0.03, $CI_{95\%}$ = 0.02 - 0.03. No other effects, not already superseded by the interaction, were reliable, ps ≥ .053. Suppression to MaxE was greater than MinE on every trial, Fs(1, 332) ≥ 31.47, p ≤ 4.3 x 10^{-8}, MSE = 0.015, η^2_p ≥ 0.09, $CI_{95\%}$ = 0.04 - 0.15. Suppression to MinE was less than ZW on every trial, Fs(1, 332) ≥ 19.58, p ≤ 1.3 x 10^{-5}, MSE = 0.02, η^2_p ≥ 0.06, $CI_{95\%}$ = 0.02 - 0.11, except trial 6, p = .052. Suppression to MaxE was greater than ZW on every trial, F(1, 332) ≥ 11.25, p ≤ 0.0009, MSE = 0.02, η^2_p ≥ 0.03, $CI_{95\%}$ = 0.006 - 0.08, except for trial 5, p = .29.

Z and W x ZW. A CS (Z and W x ZW) x Group x Trials ANOVA of Z and W averaged compared to ZW showed only an effect of trials F(6, 1980) = 27.12, p = 3.2 x 10^{-31}, MSE = 0.02, η^2_p = 0.08, $CI_{95\%}$ = 0.05 - 0.1, with no other effects, ps ≥ .07. There were no differences in the average response to the elements vs. compound.

Phase 3 Extinction

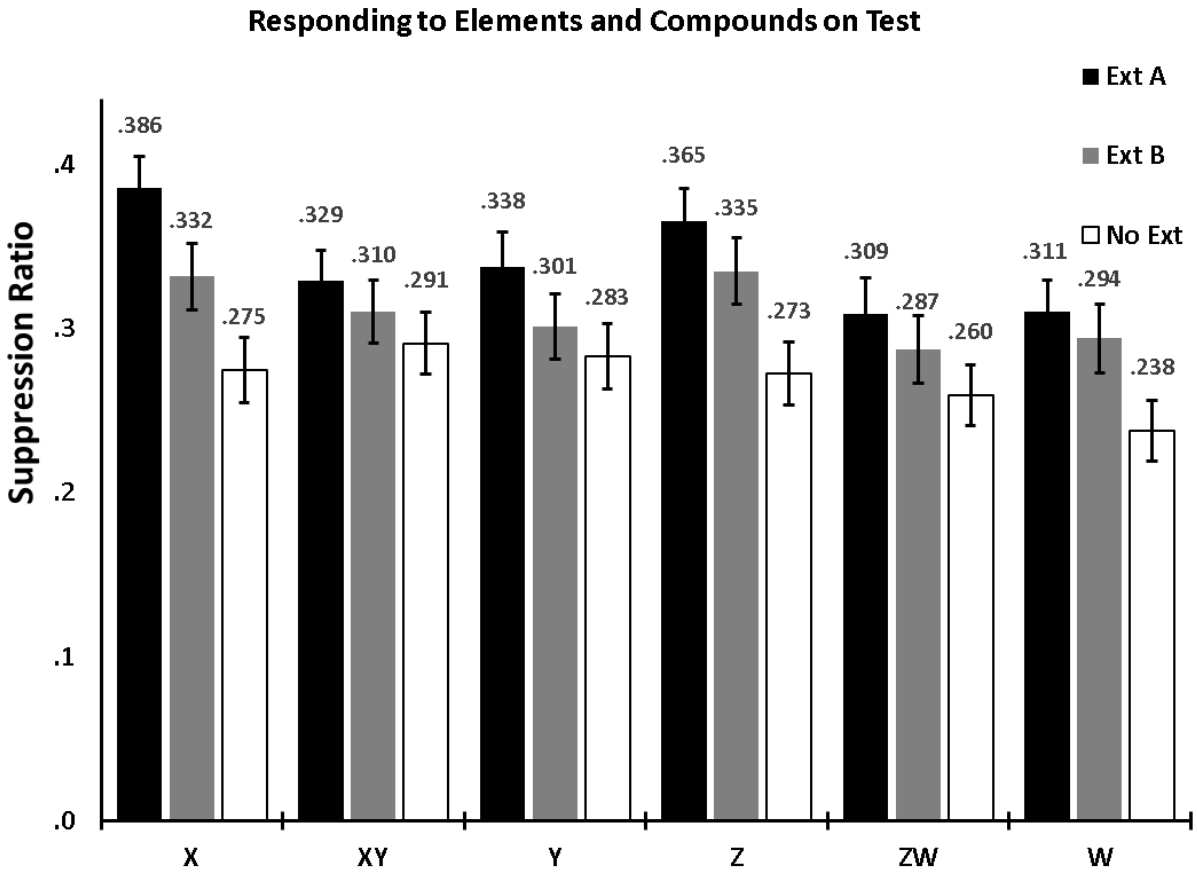
Screening on ITI responses eliminated 4, 2, and 2 participants from groups Ext A, Ext B, and No Extinction, respectively. A CS (X or Z) x Context (Ext A vs Ext B) x Trials ANOVA of the extinction data revealed an effect of Trials, F(5, 1080) = 34.96, p = 3.3 x 10^{-33}, MSE = 0.03, η^2_p = 0.14, $CI_{95\%}$ = 0.1 - 0.17 as suppression decreased. There was also an effect of Context, F(1, 216) = 5.2, p = 0.02, MSE = 0.23, η^2_p = 0.02, $CI_{95\%}$ = 9.3 x 10^{-5} - 0.08, with less suppression in Ext B than in Ext A.

Testing Negative Patterning

ITI response screening eliminated 10, 9, and 12 participants from groups Ext A, Ext B and No Extinction, respectively. Suppression to the test stimuli alone is shown in Supplement Figure 2.

X, Y, XY Overall. The test data alone are shown in Supplement Figure 2. A CS x Group ANOVA of suppression to X, Y, and XY showed only a main effect of Group, $F(2, 307) = 4.18$, $p = 0.02$, $MSE = 0.09$, $\eta^2_p = 0.03$, $CI_{95\%} = 0.0008 - 0.07$. The CS ($p = .057$) and Group x CS effects ($p = .063$) only approached reliability. The largest difference in the samples was the effect of extinguishing X on X itself in group Ext A, which generalized to XY and Y, reducing suppression to both to a lesser extent producing the overall Group effect. Averaged over the three CSs, group Ext A showed less suppression overall than did group No Extinction, $F(1,307) = 8.35$, $p = .004$, $MSE = .029$, $\eta^2_p = .04$, $CI_{95\%} = .004 – .10$. There were no other differences among the groups, ps ≥ .13.

Supplement Figure 2.



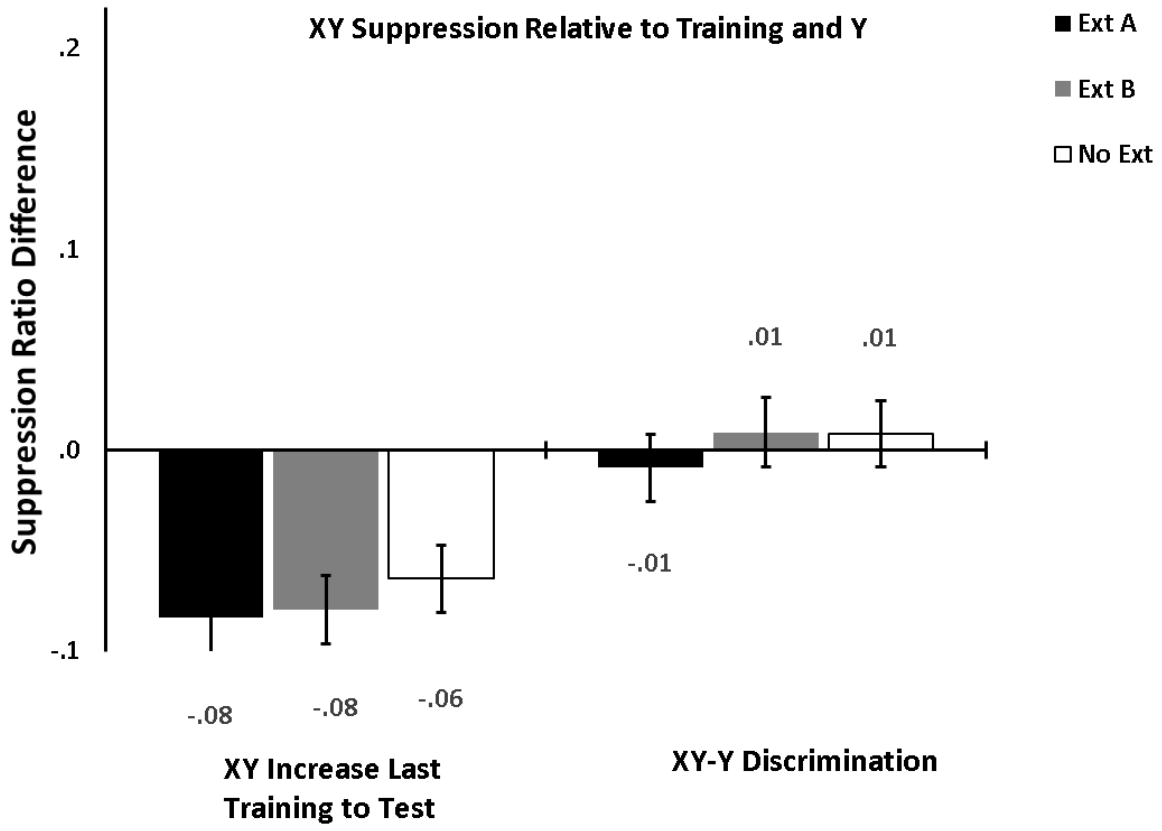
Note. Data from testing; Non-Disriminators. Numbers represent the mean suppression to the indicated CS and Group. Error bars represent the standard error of the mean.

Inspection of the figure and error bars indicates that "significant" differences would be found between the three groups in suppression to X, with the least in Ext A, some renewal in Ext B, and the greatest suppression in group No Extinction. Though there was considerable overlap in the error bars, the same pattern was evident with the other CSs, indicating some generalization between the suppression to X and that of the other CSs. The lack of a CS x Group interaction leaves the interpretative difficulty that arises when "significant" and "insignificant"

differences are not significantly different. These individuals clearly did not discriminate the elements X and Y from the XY compound in training, and showed little discrimination on test where extinction of X had a somewhat general effect across stimuli and contexts.

Increase in suppression to XY. Suppression decreased overall between the last training trial and the test. A Trial x Group ANOVA showed an effect of Trial, $F(1, 307) = 56.56$, $p = 6.0 \times 10^{-13}$, $MSE = 0.02$, $\eta^2_p = 0.16$, $CI_{95\%} = 0.09 - 0.23$, and no effects involving Group, ps ≥ .49. These data are shown in Supplement Figure 3.

Supplement Figure 3.



Note. Data from testing; Non-Discriminators. Numbers represent the mean suppression to the indicated CS and Group. Error bars represent the standard error of the mean.

Testing Positive Patterning

Z, W, ZW Overall. A CS x Group ANOVA showed effects of CS, $F(2, 614) = 11.1$, $p = 1.8 \times 10^{-5}$, $MSE = 0.02$, $\eta^2_p = 0.03$, $CI_{95\%} = 0.011 - 0.07$, and Group, $F(2, 307) = 4.55$, $p = 0.011$, $MSE = 0.09$, $\eta^2_p = 0.03$, $CI_{95\%} = 0.002 - 0.07$, with no interaction, $p = .44$. Suppression in Groups Ext A and Ext B did not differ, $F < 1$. Group No Extinction suppressed more overall than group Ext A, $F(1, 307) = 8.67$, $p = 0.003$, $MSE = .03$, $\eta^2_p = 0.04$, $CI_{95\%} = 0.004 - 0.11$, or Ext B, $F(1, 307) = 4$, $p = 0.05$, $MSE = .03$, $\eta^2_p = 0.02$, $CI_{95\%} = 5.3 \times 10\text{-}7 - 0.08$.

Suppression to Z was less than to W, $F(1, 614) = 54.91$, $p = 4.2 \times 10\text{-}13$, $MSE = 0.005$, $\eta^2_p = 0.15$, $CI_{95\%} = 0.08 - 0.22$, and ZW, $F(1, 614) = 44.58$, $p = 5.5 \times 10\text{-}11$, $MSE = 0.005$, $\eta^2_p = 0.13$, $CI_{95\%} = 0.07 - 0.2$. Suppression to W and ZW did not differ, $F < 1$.

Increase in suppression to ZW. Suppression decreased overall between the last training trial and the test, and did so equally by Group. A Trial x Group ANOVA showed an effect of Trial, $F(1, 307) = 8.05$, $p = 0.005$, $MSE = 0.02$, $\eta^2_p = 0.03$, $CI_{95\%} = 0.002 - 0.07$, and no effects involving Group, $ps \geq .26$.

Correlations

We used correlations to examine patterns of responding between the stimuli which might further indicate configural processing, or its absence, and the influence of extinction. The rationale and expectations are discussed in the main manuscript.

No Extinction. The correlations among the test variables and transforms are shown in Table 5.

Table 5.

Correlations among the test variables and their transforms in the Non-discriminators of Group No Extinction

No Extinction					
DF = 103	X				
Y	$r = .56_{(.41-.68)}$ $p = 7 \times 10^{-10}$	Y			
XY	$r = .56_{(.41-.68)}$ $p = 7 \times 10^{-10}$	$r = .63_{(.5-.73)}$ $p = 6 \times 10^{-13}$	XY		
C	0	0	$r = .74_{(.63 - .81)}$ $p = 4 \times 10^{-19}$	C	
XY – Y	$r = .01_{(-.19-.19)}$ $p = .94$	$r = .44_{(.27-.58)}$ $p = 2 \times 10^{-6}$	$r = -.41_{-(.56-.25)}$ $p = 9 \times 10^{-6}$	$r = -.85_{-(.9-.79)}$ $p = 3 \times 10^{-30}$	XY – Y

Note. Table 5 shows the correlations and degrees of freedom (n – 2) for the test variables and their transforms. Confidence intervals (95%-in parentheses) along with the associated probability are also shown. Shaded cells indicate correlations with p ≥ .05. A "-" preceding parentheses indicates all intervals were negative.

Suppression to the elements was correlated and each element was correlated with the compound. These three correlations did not differ among themselves, *p*s ≥ .29. The elements X and Y continued to be correlated with the XY compound with the other element partialled out, *r*s(102) = .32, .46, respectively, *p*s ≤ .001. The X/Y correlation did not differ from that of the discriminators in the main text, *p* = .57. The X/XY and Y/XY correlations were both stronger in the non-discriminators than the discriminators in the main text, Z ≥ 3.34, *p* ≤ .0008 *Q* ≥ .5, $CI_{95\%}$%*Q* = .21 - .79. The variable C correlated with XY explaining 54% of the response to XY, which was less than in the discriminators in the main text, *Z* = 7.4, $p = 1.3 \times 10^{-13}$, *Q* = 1.1, $CI_{95\%}$%*Q* = .81 – 1.39.

Extinction B. In this group's correlations, unless otherwise noted, the degrees of freedom were 100. The correlations and associated probabilities and confidence intervals are shown in Table 6.

Table 6.

Correlations among the test variables and their transforms in the Non-discriminators of Group Ext B

Ext B						
DF = 100	X					
Y	$r = .53_{(.39-.66)}$ $p = 7 \times 10^{-9}$	Y				
XY	$r = .56_{(.41-.68)}$ $p = 7 \times 10^{-10}$	$r = .56_{(.49-.73)}$ $p = 2 \times 10^{-12}$	XY			
C	0	0	$r = .73_{(.62-.81)}$ $p = 3 \times 10^{-18}$	C		
XY – Y	$r = -.03_{(-.23-.16)}$ $p = .73$	$r = .43_{(.26-.58)}$ $p = 5 \times 10^{-6}$	$r = -.43_{-(.58-.25)}$ $p = 6 \times 10^{-6}$	$r = -.85_{-(.89-.77)}$ $p = 5 \times 10^{-29}$	XY – Y	
Extinction	$r = .31_{(.13-.48)}$ $p = .001$	$r = .36_{(.18-.52)}$ $p = .0001$	$r = .41_{(.25-.56)}$ $p = 2 \times 10^{-5}$	$r = .20_{(.003-.38)}$ $p = .047$	$r = -.06_{(-.25-.14)}$ $p = .58$	Extinction
Renewal	$r = .74_{(.64-.81)}$ $p = 3 \times 10^{-19}$	$r = .31_{(.12-.47)}$ $p = .0004$	$r = .34_{(.16-.51)}$ $p = .0004$	$r = -.04_{-(.23-.15)}$ $p = .66$	$r = -.04_{-(.24-.15)}$ $p = .66$	$r = .62_{(.48-.72)}$ $p = 5 \times 10^{-12}$

Note. Table 6 shows the correlations and degrees of freedom (n – 2) for the test variables and their transforms. Confidence intervals (95%-in parentheses) along with the associated probability are also shown. Shaded cells indicate correlations with p ≥ .05. A "-" preceding parentheses indicates all intervals were negative.

Suppression to X and Y was correlated as was suppression to each element and the compound. The X/XY and Y/XY correlations continued with the other element partialled out, $r(99) = .34$ and .46, respectively, ps ≤ .0003. The X/Y, X/XY, and Y/XY correlations did not differ from each other, ps ≥ .44. The X/Y correlation did not differ from the discriminators ($r = .61$) in the main text, $p = .49$. Both the X/XY and Y/XY correlations were stronger than those of the

discriminators in the main text, Z ≥ 2.93, $p \leq .003$, $Q \geq .41$, $CI_{95\%}\%Q = .11$ - .71. C was correlated with XY, accounting for 53% of the variance in responding to XY. The C/XY correlation was weaker than that of the discriminators in the main text, $Z = 9.29$, p ~= 0. None of these correlations differed from group No Ext, *p*s ≥ .82.

Extinction. Extinction was positively correlated with suppression to X and Y, and neither differed from those of the discriminators ($r = .31$ and .42) in the main text, *p*s ≥ .65. The correlation maintained with X partialled out, $r_{Ext/Y.X}$ (99) = .24, $p = .02$, $CI_{95\%}r = .05$ - .42, indicating that better learning of suppression was generally related to better extinction learning. Extinction was not correlated with the size of the XY-Y discrimination, where it was stronger in the discriminators in the main text, $Z = 3.74$, $p = .0002$, $Q = .57$, $CI_{95\%}\%Q = .27$-.87. A relationship between Extinction and XY-Y may have emerged when partialling Y and X out, $r(98)\ r_{Ext/X\text{-}Y.X.Y} = -.21$, $p = .03$, $CI_{95\%}r = -.4$ - -.02. In the non-discriminators, a better ability to learn extinction was related to a poorer ability to learn an element/compound discrimination. Extinction was correlated with C, $r_{Ext/C} = .197$, $p = .047$, $CI_{95\%}r = .003$ - .38. This correlation was greater than that of the discriminators, where the correlation was negative ($r = -.26$), $Z = 3.03$, $p = .0002$, $Q = .46$, $CI_{95\%}\%Q = .16$ - .76. Extinction remained correlated with C with both X and Y partialled out, $r(98)_{Ext/C.X.Y} = .21$, $p = .03$, $CI_{95\%}r = .01$ - .4, (X and Y were already removed from C, thus the partial correlation removed them from Extinction). Those who were better at learning extinction showed more suppression to C.

Renewal. Renewal correlated with both X and Y and did not differ from the discriminators in the main text, $p \geq .42$. Renewal did not correlate with the XY-Y discrimination, which was less than that of the discriminators in the main text, $Z = 3.21$, $p = .001$, $Q = .49$,

$CI_{95\%}$%Q = .19 - .79, and remained absent with both X and Y partialled out, $r(98)_{ren/XY\text{-}Y.X.Y}$ = .07, p = .51. Renewal tended to increase suppression to XY, alone, which was opposite to that of the discriminators, Z = 3.23, p = .001, Q = .49, $CI_{95\%}$%Q = .19 -.79. There was no correlation between Renewal and C, and that unreliable correlation did not differ from the discriminators in the main text, p = .10.

Combining Groups No Extinction and Ext B. In Group No Extinction and Ext B the correlations of X/Y, X/XY, Y/XY, C/XY did not differ between the groups. For simplicity in comparisons with group Ext A, these two groups were combined, as was done with the discriminators in the main text. The correlations of the groups combined were consistent with those of the groups individually, and are shown in Table 7.

Table 7.

Correlations among the test variables and their transforms in the Non-discriminators of Group No Ext and Ext B combined.

No Ext and Ext B					
DF = 205	X				
Y	$r = .55_{(.44\text{-}.63)}$ $p = 2 \times 10^{-17}$	Y			
XY	$r = .56_{(.46\text{-}.65)}$ $p = 1 \times 10^{-18}$	$r = .63_{(.53\text{-}.70)}$ $p = 3 \times 10^{-24}$	XY		
C	0	0	$r = .73_{(.66\text{-}.79)}$ $p = 5 \times 10^{-36}$	C	
XY – Y	$r = -.01_{(-.15\text{-}.12)}$ $p = .84$	$r = .44_{(.32\text{-}.54)}$ $p = 5 \times 10^{-11}$	$r = -.42_{-(.53\ -.30)}$ $p = 2 \times 10^{-10}$	$r = -.85_{-(.88\text{-}.80)}$ $p = 2 \times 10^{-58}$	XY – Y

Note. Table 7 shows the correlations and degrees of freedom (n – 2) for the test variables and their transforms. Confidence intervals (95%-in parentheses) along with the associated probability are also shown. Shaded cells indicate correlations with p ≥ .05. A "-" preceding parentheses indicates all intervals were negative.

Extinction in A. The correlations in Group Ext A are shown in Table 8. In group Ext A, unless otherwise noted, the degrees of freedom were 101. As X underwent extinction, we expected correlations with Y to decrease, as they did in the discriminators. X and Y were correlated, but did not differ from the groups not under the influence of extinction, $Z = .64$, $p = .52$. The correlation also did not differ from that of the discriminators ($r = .28$), $Z = 1.641$, $p = .10$, in the main text.

Table 8.

Correlations among the test variables and their transforms in the Non-discriminators of Group Ext A.

Ext A						
DF = 101	X					
Y	$r = .49_{(.35-.62)}$ $p = 1 \times 10^{-7}$	Y				
XY	$r = .51_{(.35-.64)}$ $p = 4 \times 10^{-8}$	$r = .66_{(.54-.76)}$ $p = 3 \times 10^{-14}$	XY			
C	0	0	$r = .72_{(.61-.8)}$ $p = 1 \times 10^{-17}$	C		
XY – Y	$r = -.01_{-(.21-.88)}$ $p = .89$	$r = .43_{(.26-.58)}$ $p = 5 \times 10^{-6}$	$r = -.39_{-(.54\ -.21)}$ $p = 4 \times 10^{-5}$	$r = -.86_{-(.91-.81)}$ $p = 5 \times 10^{-32}$	XY – Y	
Extinction	$r = -.03_{-(.22-.17)}$ $p = .79$	$r = .15_{(-.04-.33)}$ $p = .15$	$r = .2_{(.007\ -.38)}$ $p = .04$	$r = .17_{(-.02-.35)}$ $p = .07$	$r = -.06_{(-.24-.14)}$ $p = .57$	Extinction

Note. Table 8 shows the correlations and degrees of freedom (n – 2) for the test variables and their transforms. Confidence intervals (95%-in parentheses) along with the associated probability are also shown. Shaded cells indicate correlations with $p \geq .05$. A "-" preceding parentheses indicates all intervals were negative.

Suppression to X continued to be related to XY and it did not differ from the groups not under the influence of extinction, $p = .55$, nor from the discriminators in the main text, $p = .27$.

The X/XY correlation did not exceed the X/Y correlation, $p = .76$, and the X/XY correlation maintained with Y partialled out, $r(100) = .28$, $p = .004$.

Suppression to Y was related to XY, $r_{Y/XY} = .66$, $p = 3 \times 10^{-14}$, $CI_{95\%}r = .54$ -.76, and was not different from the groups not under the influence of extinction, $Z = .45$, $p = .66$. The correlation was maintained with X partialled out, $r(100) = .55$, $p = 2 \times 10^{-9.}$ The Y/XY correlation was stronger than the X/Y correlation, $Z = 2.31$, $p = .02$, $Q = .26$, $CI_{95\%}Q = .08$ - .44. The Y/XY correlation was stronger than the corresponding correlation in the discriminators in the main text, $Z = 2.35$, $p = .01$, $Q = .35$, $CI_{95\%}Q = .6$ - .64.

There was no correlation of suppression to X with the XY-Y discrimination which did not differ from the groups not under the influence of extinction, $Z = 0$, $p = 1$, and it did not differ from the discriminators, $p = .53$. The X/XY-Y correlation was reliable with Y partialled out $r(100) = -.33$, $p = 9 \times 10^{-7}$, where greater suppression to X predicted a weaker XY-Y discrimination.

C was correlated with XY, where greater suppression to C indicated greater suppression to XY, and that did not differ from the groups not under the influence of extinction, $p = .82$. The C/XY correlation was smaller than that of the discriminators, $Z = 2.8$, $Q = .41$, $CI_{95\%}\%Q = 12$ - .70. C predicted a smaller XY-Y discrimination, and that did not differ from the groups not under the influence of extinction, $p = .36$, and did not differ from the discriminators, $p = .36$.

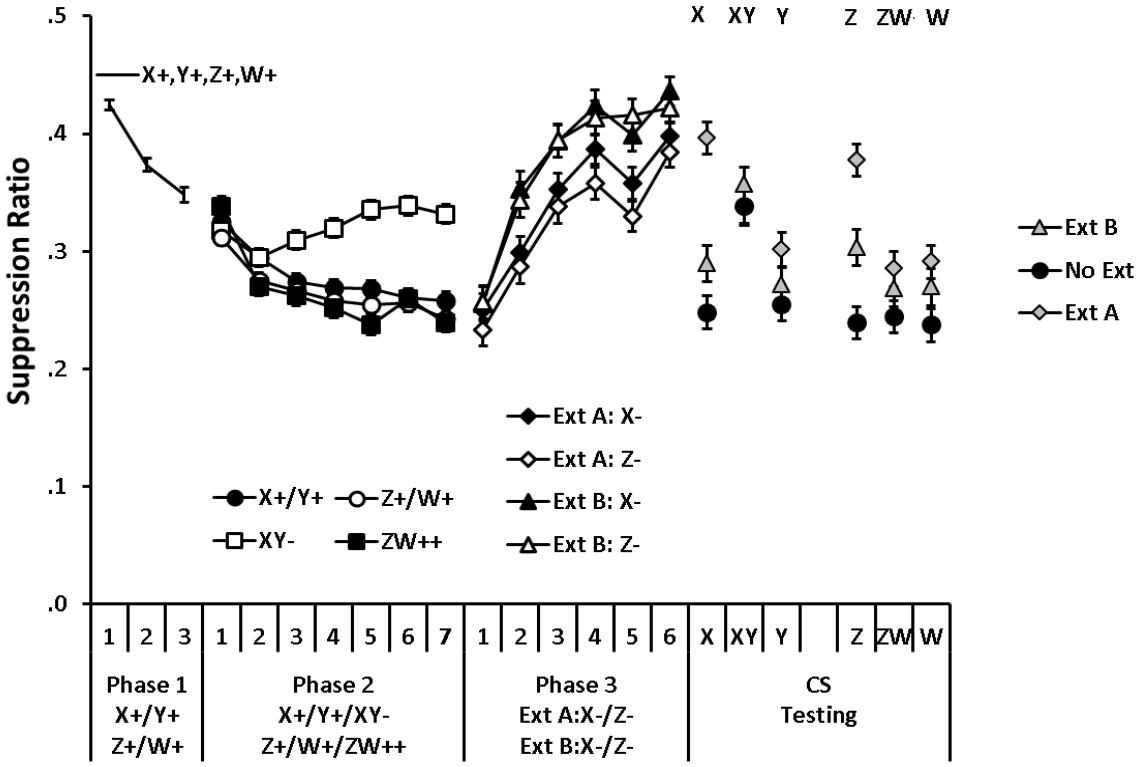
Extinction was unrelated to suppression to X or Y, but may have predicted more suppression to XY, and these correlations did not differ from the discriminators, $ps \geq .06$. Extinction was not related to the XY-Y discrimination nor to C, and neither correlation differed from the discriminators, $ps \geq .067$.

In the discriminators the X/XY and Y/XY correlations were weaker than the X/Y correlation in the groups not under the influence of extinction on the test. Extinction decreased the X/Y correlation and increased the X/XY and Y/XY correlations. In the non-discriminators correlations of X/XY and Y/XY did not differ from X/Y and were stronger than in the discriminators. Consistent with the lack of a discrimination, responding to the elements and compounds was more correlated. Extinction had no effect on the pattern of correlations compared to the groups not under the influence of extinction.

Training and Testing-All Subjects

Data from all participants (minus those excluded on absent ITI responding) throughout training and testing are shown in Supplement Figure 4.

Supplement Figure 4.



Note. Training and testing data for all participants. Vertical bars show the standard error of the mean. Above XY over CS Testing group Ext A is behind Group No Ext. Values are shown in Supplement Figure 2 below.

Phase 1 Initial conditioning

ITI response screening eliminated 2, 1, and 2 participants from groups Ext A, Ext B and No Extinction, respectively. Suppression to X, Y, Z, and W in the initial conditioning of phase 1 was analyzed with a CS x Group x Trials ANOVA. There was an effect of trials, $F(2, 1198) = 134.73$, $p = 1.7 \times 10^{-53}$, $MSE = 0.03$, $\eta^2_p = 0.18$, $CI_{95\%} = 0.15 - 0.22$, and no other effects, $ps \geq .43$.

Phase 2 Negative Patterning

ITI response screening eliminated 3, 1, and 4 people from groups Ext A, Ext B and No Extinction, respectively. Participants discriminated X and Y from XY, showing greater suppression to X or Y than to XY. However, when X and Y were separated into MinE and MaxE, the elements which produced the minimum suppression and maximum suppression respectively on a trial-by-trial basis, the discrimination between XY and MinE was minimal.

MinE vs MaxE vs XY. As described in the main text, we separated the elements X and Y on each trial into MinE and MaxE and compared those to the compound with a CS (MinE x MaxE x XY) x Group x Trials ANOVA. There was a CS x Trials interaction, $F(12, 7152) = 24.77$, $p = 3.0 \times 10^{-55}$, $MSE = 0.013$, $\eta^2_p = 0.04$, $CI_{95\%} = 0.03 - 0.05$. No other effects, not superseded by the interaction, were reliable, ps ≥ .197.

MinE was less than MaxE on every trial, $F(1, 598) \geq 113.26$, $p \leq 2.4 \times 10^{-24}$, $MSE = 0.014$, $\eta^2_p \geq 0.16$, $CI_{95\%} = 0.11 - 0.21$. Suppression to MinE was less than to XY on trials 1 – 3, $F(1, 598) \geq 8.17$, $p <= 0.004$, $MSE = 0.02$, $\eta^2_p \geq 0.013$, $CI_{95\%} = 0.0013 - 0.04$. There was no difference on trial 4, $F < 1$ or trial 7, $p = .14$. Suppression to XY was less than MinE on trials 5 and 6, $F(1, 598) \geq 11.53$, $p \leq 0.0007$, $MSE = 0.03$, $\eta^2_p \geq 0.02$, $CI_{95\%} = 0.003 - 0.05$. Over all the participants there was little, if any, discrimination between XY and the minimum response on a trial. Suppression to MaxE was greater than to XY on every trial $F(1, 598) \geq 60.88$, $p \leq 2.7 \times 10^{-14}$, $MSE = 0.02$, $\eta^2_p \geq 0.09$, $CI_{95\%} = 0.05 - 0.14$.

X and Y vs XY. A CS (X and Y average vs XY) x Trials x Group ANOVA revealed a CS x Trials interaction, $F(6, 3576) = 28.94$, $p = 5.3 \times 10^{-34}$, $MSE = 0.013$, $\eta^2_p = 0.05$, $CI_{95\%} = 0.03 - 0.06$. No other effects, not superseded by the interaction, were reliable, ps ≥ .37. With error bars

embedded within the data points, the patterns in Supplement Figure 1 are clear without further analysis.

Phase 2 Positive Patterning

MinE x MaxE x ZW. Z and W were separated into MinE and MaxE and compared to ZW with a CS x Trials ANOVA. There was a CS x Trials interaction, $F(12, 7152) = 14.23$, $p = 8.1 \times 10^{-30}$, $MSE = 0.011$, $\eta^2_p = 0.02$, $CI_{95\%} = 0.02 - 0.03$, with no other effects no already superseded by this interaction, $ps \geq .1$. Suppression to MinE was less than MaxE on every trial, $Fs(1, 598) \geq 71.8$, $p <= 1.9 \times 10^{-16}$, $MSE = 0.012$, $\eta^2_p \geq 0.11$, $CI_{95\%} = 0.07 - 0.16$. Suppression to ZW was greater than MinE on every trial, $Fs(1, 598) \geq 12.79$, $p \leq 0.0004$, $MSE = 0.02$, $\eta^2_p \geq 0.02$, $CI_{95\%} = 0.004 - 0.05$, and, less than MaxE on every trial, $Fs(1, 598) \geq 27.55$, $p <= 2.1 \times 10^{-7}$, $MSE = 0.012$, $\eta^2_p \geq 0.04$, $CI_{95\%} = 0.02 - 0.08$, except for trial 5, $p = .17$.

Z and W x ZW. The average of Z and W was compared to ZW with a CS x Trials x Group ANOVA. There was a small CS x Trials interaction, $F(6, 3576) = 5.37$, $p = 1.6 \times 10^{-5}$, $MSE = 0.01$, $\eta^2_p = 0.009$, $CI_{95\%} = 0.003 - 0.014$, and no other effects not already superseded by this interaction, $ps \geq .11$. On trial 1 there was less suppression to ZW than to the elements, $F(1, 598) = 15.96$, $p = 7.3 \times 10^{-5}$, $MSE = 0.013$, $\eta^2_p = 0.03$, $CI_{95\%} = 0.007 - 0.06$, while on Trial 5 there was more suppression to ZW than to the elements, $F(1, 598) = 8.6$, $p = 0.003$, $MSE = 0.01$, $\eta^2_p = 0.014$, $CI_{95\%} = 0.002 - 0.04$. There were no differences on any other trial, $ps \geq .29$.

Phase 3 Extinction

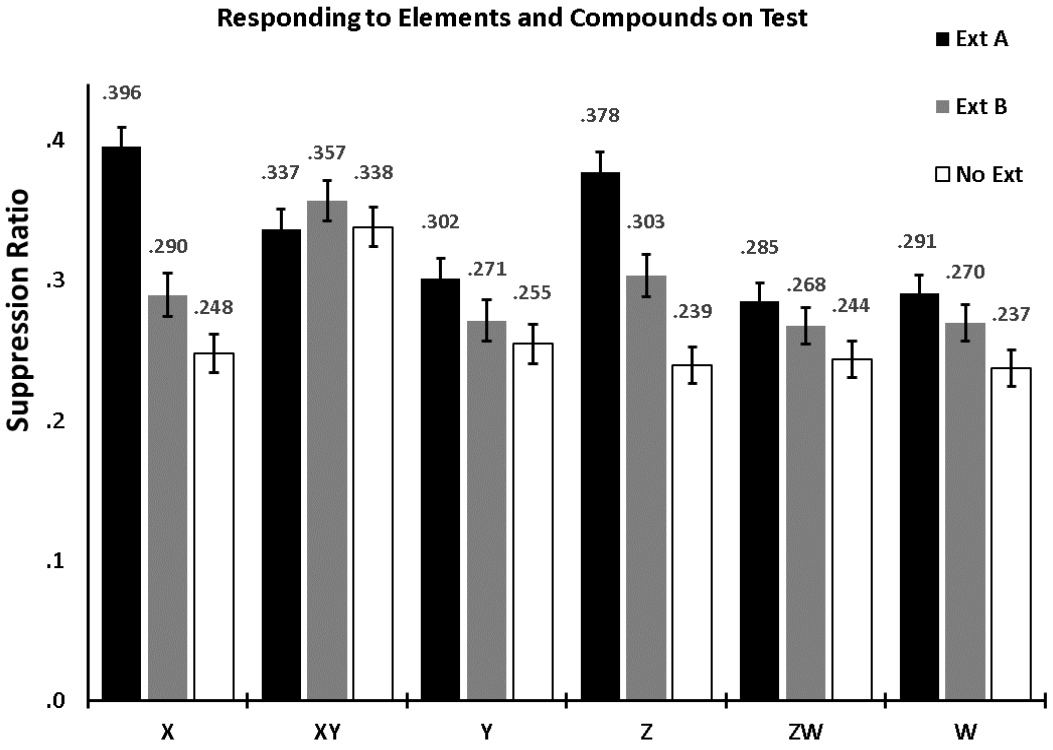
ITI response screening eliminated 5, 3, and 4 individuals from groups Ext A, Ext B and No Extinction, respectively. Suppression to X and Z in the groups undergoing extinction was analyzed with a CS x Context (Ext A vs Ext B) x Trials ANOVA. There were main effects of CS, $F(1,$

394) = 5.92, p = 0.02, MSE = 0.02, η^2_p = 0.015, $CI_{95\%}$ = 0.0005 - 0.05, Trials, F(5, 1970) = 102.82, p = 1.4 x 10^{-96}, MSE = 0.03, η^2_p = 0.21, $CI_{95\%}$ = 0.18 - 0.24, and Context, F(1, 394) = 11.66, p = 0.0007, MSE = 0.2, η^2_p = 0.03, $CI_{95\%}$ = 0.005 - 0.07. The CS x Context interaction approached significance, F(1, 394) = 3.53, p = 0.06, MSE = 0.02, η^2_p = 0.009, $CI_{95\%}$ = 2.5 x 10^{-7} - 0.04. Extinction took place overall more rapidly for X than Z, and was more rapid in Ext B than Ext A. The former effect was less apparent in Ext B.

Testing Negative Patterning

Data from the test trials only are shown in Supplement Figure 5. ITI response screening eliminated 16, 16, and 14 individuals from groups Ext A, Ext B and No Extinction, respectively.

Supplement Figure 5.



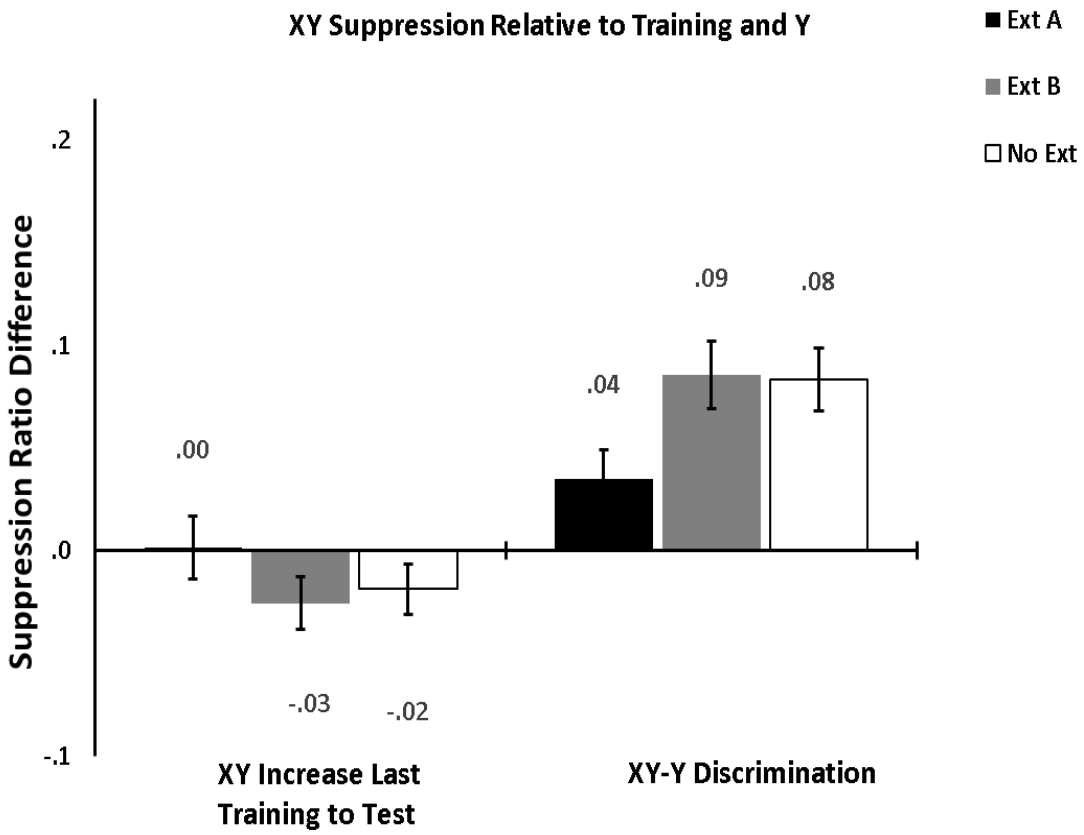
Note. Data from testing; All participants. Numbers represent the mean suppression to the indicated CS and Group. Error bars represent the standard error of the mean.

X, Y, XY Overall. ITI response screening eliminated 16, 16, and 14 participants from groups Ext A, Ext B, and No Extinction. A Group x CS (X, Y, XY) ANOVA of the test trials revealed effects of CS, $F(2, 1116) = 30.17$, $p = 1.7 \times 10^{-13}$, $MSE = 0.02$, $\eta^2_p = 0.05$, $CI_{95\%} = 0.03 – 0.08$, Group, $F(2, 558) = 8.31$, $p = 0.0003$, $MSE = 0.07$, $\eta^2_p = 0.03$, $CI_{95\%} = 0.007 – 0.06$, and Group x CS, $F(4, 1116) = 14.79$, $p = 8.9 \times 10^{-12}$, $MSE = 0.02$, $\eta^2_p = 0.05$, $CI_{95\%} = 0.03 – 0.07$.

Error terms for simple effects were derived as discussed in the main manuscript. The error for between-subject comparisons was .0384 (DF = 1208) and that for within-s comparisons was .0215 (DF = 1116).

Extinction of X. Extinction of X was effective. Suppression to X in Group Ext A was less than that of both groups No Extinction, $F = 54.13$, $p = 6 \text{ xo } 10^{-13}$, $\eta^2_p = .24$, $CI_{95\%} = .14 - .34$, and Ext B, $F = 27.37$, $p = 2.3 \times 10^{-7}$, $\eta^2_p = .14$, $CI_{95\%} = .06 - .24$. Renewal was incomplete as suppression to Ext B was less than No Extinction, $F = 4.11$, $p = .04$, $\eta^2_p = .01$, $CI_{95\%} = 2.7 \times 10^{-7} - .04$.

Supplement Figure 6.



Note: Suppression increase to XY from the last training trial to test shown at left. Differences in suppression to XY and Y on test shown at right; All participants.

Extinction of X on Y. Group No Extinction differed from group Ext A, $F = 5.41$, $p = .02$, $\eta^2_p = .01$, $CI_{95\%} = .0002 - .05$, but not from Ext B, $F = 2.21$, p = .13. Ext B and No extinction did not differ, $F < 1$. There was some weak generalized extinction in group No Extinction.

Extinction of X on XY. There were no group differences in suppression to XY, Fs < 1.

Increase in suppression to XY. A Group x Trial ANOVA comparing the last trial of training with XY to the test revealed no effects, ps ≤ .07 (Trial). The increase in suppression to XY and the Y/XY discrimination are shown in Supplement Figure 6.

Extinction of X on X/XY Discrimination. The X/XY discrimination was significant in all groups, Fs ≥ 15.6, ps < 8.3 x 10^{-5}, $\eta^2_p \geq .08$, $CI_{95\%} = .02 - .16$, though it was reversed in Group Ext A with more suppression to XY than to X.

Extinction of X on the Y/XY Discrimination. The Y/XY discrimination was significant in all groups, Fs ≥ 5.52, ps ≤ .02, $\eta^2_p \geq .03$, $CI_{95\%} = .0004 - .09$. The size of the discrimination did not differ between groups No Extinction and Ext B, $F < 1$, and the discriminations in both groups were larger than in group Ext A, Fs ≥ 10.3, ps ≤ .001, $\eta^2_p \geq .03$, $CI_{95\%} = .004 - .07$.

Testing Positive Patterning

Z, W, ZW Overall. The CS x Group ANOVA indicated significant effects of CS, $F(2, 1116) = 20.34$, $p = 2.1 \times 10^{-9}$, $MSE = 0.02$, $\eta^2_p = 0.04$, $CI_{95\%} = 0.02 - 0.06$, Group, $F(2, 558) = 9.98$, $p = 5.5 \times 10^{-5}$, $MSE = 0.09$, $\eta^2_p = 0.03$, $CI_{95\%} = 0.01 - 0.07$, and the interaction, $F(4, 1116) = 8.74$, $p = 6.0 \times 10^{-7}$, $MSE = 0.02$, $\eta^2_p = 0.03$, $CI_{95\%} = 0.012 - 0.05$. The error term derived for simple effects involving between-subject differences was .039 (DF = 965), and that for within-subject effects was .015 (DF = 1116).

Extinction on Z. Extinction of Z was effective as suppression in Group Ext A was less than that of both groups Ext B and No Ext, Fs ≥ 13.1, ps ≤ .0003, η^2_p ≥ .03, $CI_{95\%}$ = .007 - .08. Renewal was incomplete as groups Ext B and No Ext differed, F =9.63, p = .001, η^2_p = .03, $CI_{95\%}$ = .004 - .07.

Extinction of Z on W. Extinction of Z reduced suppression to W in Group Ext A relative to No Extinction, F = 7.12, p = .008, η^2_p = .02, $CI_{95\%}$ = .001 - .06. Group Ext B differed from neither of the other groups, Fs ≤ 2.53, ps ≥ .11.

Extinction of Z on ZW. Extinction of Z in Group Ext A reduced suppression to ZW relative to No Extinction, F = 4.08, p = .04, η^2_p = .01, $CI_{95\%}$ = 2.5 x 10^{-7} - .04. Group Ext B differed from neither of the other groups, Fs ≤ 1.34, ps ≥ .25.

Correlations

No Extinction. The correlations among the test variables and transforms in this group are shown in Table 9. Suppression to X and Y were positively correlated with each other and with XY. The X/XY correlation was no longer reliable with Y partialled out, r(186) = .09, p = .22, but the Y/XY correlation continued, r(186) = .29, p = 6 x 10^{-5}. The X/XY and Y/XY correlations were reliable and both were less than the X/Y correlation, ps ≤ .008, Q ≥ .25, $CI_{95\%}$%Q = .07 - .43. As this group received equal treatment of X and Y, the correlations of X/XY and Y/XY should not differ, and they did not, p = .1.

Suppression to X correlated with the size of the XY-Y discrimination. Y was correlated with both X and the XY-Y discrimination, whose calculation involved Y, so the X/XY-Y relationship was re-examined with a partial correlation of X/XY-Y.Y (with suppression to Y removed) and the XY-Y discrimination became unreliable, r(186) = .09, p = .21. The variable C (XY with X and Y removed) remained correlated strongly with XY explaining 83% of the response to XY. The

variable C, was negatively correlated with the XY-Y discrimination, where greater suppression to C predicted less discrimination.

Table 9.

Correlations among the test variables and transforms in Group No Ext.

No Extinction					
DF = 187	X				
Y	$r = .59_{(.49 - .67)}$ $p = 4 \times 10^{-19}$	Y			
XY	$r = .30_{(.16- .43)}$ $p = 2 \times 10^{-5}$	$r = .40_{(.28 - .52)}$ $p = 9 \times 10^{-10}$	XY		
C	0	0	$r = .91_{(.88 -.93)}$ $p = 4 \times 10^{-74}$	C	
XY – Y	$r = .25_{(.11-.38)}$ $p = .0004$	$r = .61_{(.46-.73)}$ $p = 5 \times 10^{-10}$	$r = -.56_{-(.65 - 45)}$ $p = 7 \times 10^{-17}$	$r = -.84_{-(.88-.79)}$ $p = 7 \times 10^{-52}$	XY – Y

Note. Table 9 shows the correlations and degrees of freedom (n – 2) for the test variables and their transforms. Confidence intervals (95%-in parentheses) along with the associated probability are also shown. Shaded cells indicate correlations with p ≥ .05. A "-" preceding parentheses indicates all intervals were negative.

Extinction in B. The correlations among the test variables and transforms in this group are shown in Table 10. As X underwent renewal in this group, we would expect similar correlations to those of group No Extinction, which is reflected in the two tables. Suppression to X and Y were positively correlated with each other and with XY. The X/XY correlation and the Y/XY correlations were not different, $p \geq .65$ and remained with the other element partialled out, $r(177) = .16$ & $.22$, respectively, $ps \leq .03$. The correlations of the elements with the compounds both were weaker than the correlation of the elements with each other, $Z \geq 3.01$, ps

≤ .003, $Q \geq .28$, $CI_{95\%}$%Q = .1 - .46. None of these three correlations differed from the corresponding correlation in group No Extinction, p ≥ .66.

Table 10.

Correlations among the test variables and transforms in Group Ext B.

Ext B						
DF = 178	X					
Y	$r = .58_{(.47-.66)}$ $p = 2 \times 10^{-17}$	Y				
XY	$r = .33_{(-.2 - .46)}$ $p = 4 \times 10^{-6}$	$r = .36_{(.23-.48)}$ $p = 5 \times 10^{-7}$	XY			
C	0	0	$r = .92_{(.89 - .94)}$ $p = 5 \times 10^{-74}$	C		
XY – Y	$r = .22_{(.08-.36)}$ $p = .002$	$r = .58_{(.47-.67)}$ $p = 1 \times 10^{-17}$	$r = -.55_{(-.64 - -.44)}$ $p = 2 \times 10^{-15}$	$r = -.8_{(-.85-.74)}$ $p = 6 \times 10^{-42}$	XY – Y	
Extinction	$r = .34_{(.20 - .46)}$ $p = 3 \times 10^{-6}$	$r = .41_{(.28-.52)}$ $p = 2 \times 10^{-8}$	$r = .13_{(-.01 - .27)}$ $p = .07$	$r = -.03_{(-.18-.11)}$ $p = .64$	$r = .24_{(.1-.39)}$ $p = .0009$	Extinction
Renewal	$r = .77_{(.71-.82)}$ $p = 3 \times 10^{-37}$	$r = .38_{(.25-.50)}$ $p = 1 \times 10^{-7}$	$r = .07_{(-.07-.21)}$ $p = .35$	$r = -.19_{(-.32-.04)}$ $p = .01$	$r = .28_{(.14-.41)}$ $p = .0001$	$r = .62_{(.52-.70)}$ $p = 2 \times 10^{-20}$

Note. Table 10 shows the correlations and degrees of freedom (n – 2) for the test variables and their transforms. Confidence intervals (95%-in parentheses) along with the associated probability are also shown. Shaded cells indicate correlations with p ≥ .05. A "-" preceding parentheses indicates all intervals were negative.

Suppression to X correlated with the size of the XY-Y discrimination. Y was correlated with both X and the discrimination, whose calculation involved Y, so the X/XY-Y relationship was re-examined with a partial correlation of X/XY-Y.Y (with suppression to Y removed) and there was a negative relationship between responding to X and the size of the XY-Y discrimination, $r(176) = -.16$, $p = .029$, $CI_{95\%}r = -.3 - -.01$, where stronger suppression to X indicated a weaker XY-Y discrimination. The X/XY-Y discrimination did not differ between Groups No Ext and Ext A, *p*s ≥ .66. The variable C correlated strongly with XY explaining 84% of the response to XY. C was

negatively correlated with the XY-Y discrimination, where greater suppression to C predicted less discrimination. Neither of these final two correlations differed from group No Ext, *p*s ≥ .26.

Extinction. As Ext B underwent renewal on test and was not under the influence of extinction, correlations of Extinction with the variables are an index of the extent to which learning extinction relates to the learning involved with those variables. Extinction was positively correlated with suppression to X where those who showed strong suppression (renewal) had shown good extinction. Extinction was also positively correlated with suppression to Y, even with X partialled out, $r_{Ext/Y.X}$ (177) = .27, p = .0002, $CI_{95\%}r$ = .13 - .40, indicating that good learning of suppression was generally related to good extinction learning. Extinction was correlated with the size of the XY-Y discrimination, but disappeared with both Y and X partialled out, $r(176)$ $r_{Ext/X-Y.X.Y}$ = .04, p = .6. Extinction was not correlated with C.

Renewal. Renewal correlated with both X and Y. Renewal correlated with the XY-Y discrimination, and persisted with both X and Y partialled out, $r(176)$ $_{ren/XY-Y.X.Y}$ = .3, $p = 5 \times 10^{-5}$, $CI_{95\%}r$ = .16 - .42. Greater renewal was associated with a stronger discrimination. There was a correlation between Renewal and C, where greater renewal predicted less suppression to C.

Combining Groups No Extinction and Ext B. Comparisons between groups on the correlations shown in Table 4 with the corresponding correlations in Table 5showed no differences on any correlation *p*s ≥ .52. For simplicity these two groups were combined for comparisons with group Ext A involving variables that all groups share.

The correlations of the No Ext and Ext B groups combined were consistent with those of the groups individually (see Table 7). The X/XY and Y/XY correlations did not differ, p = .15 and both were smaller than the X/Y correlation, $Z \geq 4.01$, $p \leq 6 \times 10^{-5}$, Q = .26, $CI_{95\%}\%Q$ = .13 - .39. Both

the X/XY and Y/XY correlations were reliable with the other element partialled out, $r(366) = .13$ and .26, respectively, ps ≤ .01.

Table 11.

Correlations among the test variables and transforms in Group No Ext and Ext B combined.

No Ext and Ext B combined					
DF = 367	X				
Y	$r = .58_{(.51-.65)}$ $p = 9 \times 10^{-35}$	Y			
XY	$r = .32_{(.22-.41)}$ $p = 2 \times 10^{-10}$	$r = .38_{(.29-.47)}$ $p = 2 \times 10^{-14}$	XY		
C	0	0	$r = .91_{(.9-.93)}$ $p = 4 \times 10^{-147}$	C	
XY – Y	$r = .24_{(.14-.33)}$ $p = 4 \times 10^{-6}$	$r = .56_{(.48-.62)}$ $p = 2 \times 10^{-31}$	$r = -.55_{-(.61-.48)}$ $p = 7 \times 10^{-31}$	$r = -.82_{-(.85-.79)}$ $p = 2 \times 10^{-92}$	XY – Y

Note. Table 11 shows the correlations and degrees of freedom (n – 2) for the test variables and their transforms. Confidence intervals (95%-in parentheses) along with the associated probability are also shown. Shaded cells indicate correlations with p ≥ .05. A "-" preceding parentheses indicates all intervals were negative.

Extinction in A: X/Y. In group Ext A, unless otherwise noted, the degrees of freedom were 190. As X underwent extinction, we would expect correlations with Y to decrease. The X/Y correlation was reliable and was significantly less than in the groups not under the influence of extinction, $Z = 2.93$, $p = .003$, $Q = .36$, $CI_{95\%}Q = .08$-.44.

Table 12.

Correlations among the test variables and transforms in Group Ext A.

Ext A						
DF = 190	X					
Y	$r = .39_{(.26-.50)}$ $p = 1 \times 10^{-8}$	Y				
XY	$r = .45_{(.33-.56)}$ $p = 4 \times 10^{-11}$	$r = .54_{(.43-.63)}$ $p = 1 \times 10^{-15}$	XY			
C	0	0	$r = .80_{(.74-.85)}$ $p = 3 \times 10^{-44}$	C		
XY – Y	$r = -.07_{(-.21-.07)}$ $p = .33$	$r = .49_{(.37-.59)}$ $p = 1 \times 10^{-12}$	$r = -.48_{-(.58-.36)}$ $p = 2 \times 10^{-12}$	$r = -.82_{-(.87-.78)}$ $p = 8 \times 10^{-50}$	XY – Y	
Extinction	$r = -.15_{-(.29-.01)}$ $p = .039$	$r = .28_{(.14-.40)}$ $p = .0001$	$r = .15_{(-.005-.23)}$ $p = .04$	$r = .09_{(-.17-.1)}$ $p = .21$	$r = .14_{(-.005-.13)}$ $p = .06$	Extinction

Note. Table 12 shows the correlations and degrees of freedom (n – 2) for the test variables and their transforms. Confidence intervals (95%-in parentheses) along with the associated probability are also shown. Shaded cells indicate correlations with p ≥ .05. A "-" preceding parentheses indicates all intervals were negative.

Extinction in A: X/XY and Y/XY. Suppression to X in Ext A was related to XY (also with Y partialled out, $r(189) = .31$, $p = 8 \times 10^{-9}$), and it was not different than that of the groups not under the influence of extinction, $Z = 1.75$, $p = .08$. The X/XY correlation did not exceed the X/Y correlation, $p = .27$. Suppression to Y was related to XY (also with X partialled out, $r(189) = .44$, $p = 3 \times 10^{-10}$), and it was greater than that of the groups not under the influence of extinction, $Z = 2.15$, $p = .03$, $Q = .19$, $CI_{95\%}Q = .02$ - .36. The Y/XY correlation did exceed the X/Y correlation, $Z = 2.33$, $p = .02$, $Q = -.08$ - .24.

Extinction in A: XY-Y. There was still a discrimination between XY and Y in group Extinction, thus, "C" should still be intact. Extinction may have weakly predicted stronger suppression to XY, but had no relationship to C. Responding to X alone was unrelated to the XY-Y discrimination, but Y was related by way of participating in its calculation. Partialling out the level of response to X and Y removed the Ext/XY-Y correlation, $r(188) = -.1$, $p = .17$.

C in group Extinction A was correlated with XY, but was less so than in the groups not under the influence of extinction, $Z = 5.12$, $p = 3 \times 10^{-7}$, $Q = .45$, $CI_{95\%}Q = .28$ -.63. Extinction of X increased the variance in XY explained by X and Y (the increase was only significant with XY/Y) but, overall, there was a decrease the variance explained by C.

Unlike the groups not under the influence of extinction, suppression to X was under the influence of extinction, and negatively correlated with extinction where greater extinction predicted less suppression compared to group Ext B, $Z = 4.82$, $p = 1 \times 10^{-6}$, $Q = .5$, $CI_{95\%}Q = .3$ - .71. As with group Ext B, Extinction was correlated with suppression to Y, and did not differ from Ext B, $p = .17$, again indicating that learning capacities for conditioning and extinction are related. Better Extinction did not predict a stronger XY-Y discrimination. With X under the influence of extinction on test, Extinction did not predict the suppression controlled by C.

All Participants Summary

With all participants (minus those who responded poorly in the ITI where suppression ratios could not be accurately estimated), suppression was acquired to the elements. Negative patterning was learned where XY produced less suppression than the elements. Positive patterning was not evident as summation; responding to ZW was equivalent to Z and W. Extinction of X and Z occurred more rapidly in Context B than in Context A where they were trained, and the analysis indicated that extinction of X was more rapid than extinction of Z, though, in the sample extinguished in Context B, there was no apparent effect of X vs. Z. On test, extinction was effective in reducing suppression to X, which partially renewed when extinction had been in a different context. Extinction of X produced some generalization to Y and reduced suppression to Y.

There was no directly observable effect of extinction of X on the XY compound. Suppression to XY did not vary across the groups. Nevertheless, suppression to XY was greater than suppression to X, and extinction weakened the Y/XY discrimination. Those results suggests that something about XY changed. A change in the representation of X to X' would disrupt the XY configural cue (xCy → x'C'y), leading to an increase in responding to XY. However, that increase would be limited to the excitatory potential controlled by X' and Y. As both responding to X' and Y decreased, the decrease in the excitatory potential of these stimuli, Y in particular, might offset decreases in the inhibitory potential of N. As the X/XY discrimination had been learned, suppression to XY would not be expected to *exceed* suppression to X without an alteration of the configural cue.

Extinction with Z generalized somewhat to W, and led to a slight decrease in the response to ZW. However, the response to ZW was not greater than to W, and was only greater than Z in Group Ext A where Z was under the influence of extinction.

With respect to the correlations among the negative patterning stimuli, the elements were correlated with each other (X/Y), and extinction decreased that correlation. The elements were correlated with the compound and extinction of X significantly increased the correlation of Y with the compound (the increase with X was $p = .08$). The degree of extinction that occurred in the extinction phase correlated negatively with suppression to X, where more extinction predicted less suppression, and correlated positively with suppression to Y. Those undergoing a greater degree of extinction with X showed better suppression to Y. Renewal predicted greater inhibitory control by C (XY with X and Y partialled out) and a larger XY-Y discrimination, though renewal was not directly related to XY alone.