**Statistical Analyses**

Tables S1 and Table S2 shows the results of the statistical analysis of target and alternative responding, respectively. Target-response analyses were presented in detail in the main text. The following section includes a detailed summary of alternative-response analyses.

Three-way interactions between Time, Phase, and Group indicated differences in the interaction effect between Time and Phase (3 and 4 versus 2) in Groups Low, Med, and High compared to Group None (*p*s<.047). There were also differences in the interaction effect between Time and Phase 1 (relative to Phase 2) in Group High when compared with Group None (*p*=.032). To further evaluate these interactions, we conducted post hoc comparisons of responding at specific time points in each phase.

Results of post hoc comparisons confirmed that responding increased within each group from the last min of Phase 1 to the last min of Phase 2 (*t*s>14.23, *p*s<.001); that is, responding increased with alternative reinforcement. From the last min of Phase 2 to the first min of Phase 3, there were significant decreases in responding for all groups (*t*s>7.81, *p*s<.001) except Group None (*p*=.240). This suggests that alternative responding decreased when maintaining alternative reinforcement and introducing a low-, med-, or high-magnitude response cost for responses on the alternative button. Finally, from the last min of Phase 3 to the first min of Phase 4, removal of alternative reinforcement produced significant decreases in responding for Group None (*t*[352.00]=9.65, *p*<.001) but no other groups (*p*s>.161). This is a function of low levels of responding at the end of Phase 3 in Groups Low, Med, and High compared to Group None.

We next examined differences in responding among groups. Despite identical arranging identical contingencies among groups across the first two phases, the interaction effect between Time, Phase (1), and Group (High) indicated differences in response patterns in Phase 1 (relative to Phase 2) in Group High versus None. Nevertheless, differences in responding among groups were not significant by the last min of Phase 1 or Phase 2 (*p*s=1.00). Thus, consistent with our expectations, groups responded at similar levels by the end of each phase with identical contingencies in place.

During the first min of Phase 3, Group None responded at higher levels than Groups Low, Med, and High (*t*s>6.02, *p*s<.001), Group Low responded at higher levels than Groups Med and High (*t*s>7.01, *p*s<.032), and Groups Med and High responded at similar levels (*p*=.858). These results suggest that response costs produced decreases in alternative responding, and that those decreases were generally a function of response-cost magnitude: response costs > 320 points reduced responding more than a 100-point response cost.

Finally, in the first min of Phase 4, Group None continued to respond at a higher rate than the other groups (*t*s>5.82, *p*s<.001). No other between-group comparisons were significant (*p*s=1.00). However, all groups responded at similar rates by the end of that phase (*p*s>.446). Thus, responding decreased to similar levels with removal of alternative reinforcement.

**Table S1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Factor** | **β (SE)** | **df** | ***t*** | ***p*** |
| Intercept | 3.36 (0.87) | 1633.90 | -3.88\*\*\* | <.001 |
| Time | -4.22 (0.36) | 2019.51 | -11.71\*\*\* | <.001 |
| Phase (1) | 53.04 (2.74) | 317.44 | 19.36\*\*\* | <.001 |
| Phase (3) | 4.23 (2.01) | 322.05 | 2.10\* | .036 |
| Phase (4) | 10.76 (1.73) | 349.66 | 6.23\*\*\* | <.001 |
| Group (Low) | 0.62 (1.23) | 1633.89 | 0.50 | .615 |
| Group (Med) | 1.44 (1.21) | 1633.89 | 1.19 | .234 |
| Group (High) | 1.25 (1.27) | 1633.89 | 0.98 | .326 |
| Time\*Phase (1) | 5.67 (0.48) | 3957.90 | 11.86\*\*\* | <.001 |
| Time\*Phase (3) | 4.12 (0.48) | 3957.90 | 8**.**62\*\*\* | <.001 |
| Time\*Phase (4) | 3.82 (0.48) | 3957.90 | 7.99\*\*\* | <.001 |
| Time\*Group (Low) | -0.13 (0.51) | 2019.49 | -0.26 | .793 |
| Time\*Group (Med) | 0.61 (0.50) | 2019.49 | 1.21 | .227 |
| Time\*Group (High) | 0.29 (0.53) | 2019.49 | 0.56 | .579 |
| Phase (1)\*Group (Low) | -2.96 (3.91) | 317.44 | -0.76 | .449 |
| Phase (3)\*Group (Low) | 5.33 (2.87) | 322.05 | 1.86 | .064 |
| Phase (4)\*Group (Low) | 0.51 (2.46) | 349.66 | 0.21 | .837 |
| Phase (1)\*Group (Med) | -4.37 (3.83) | 317.44 | -1.14 | .255 |
| Phase (3)\*Group (Med) | 7.82 (2.81) | 322.05 | 2.78\*\* | .006 |
| Phase (4)\*Group (Med) | -3.05 (2.41) | 349.66 | -1.27 | .206 |
| Phase (1)\*Group (High) | -5.47 (4.01) | 317.44 | -1.36 | .173 |
| Phase (3)\*Group (High) | 12.06 (2.94) | 322.05 | 4.10\*\*\* | <.001 |
| Phase (4)\*Group (High) | 2.73 (2.53) | 349.66 | 1.08 | .280 |
| Time\*Phase (1)\*Group (Low) | 0.62 (0.68) | 3957.89 | 0.92 | .359 |
| Time\*Phase (3)\*Group (Low) | -0.33 (0.68) | 3957.89 | -0.49 | .627 |
| Time\*Phase (4)\*Group (Low) | 0.46 (0.68) | 3957.89 | 0.68 | .500 |
| Time\*Phase (1)\*Group (Med) | -0.92 (0.67) | 3957.89 | -1.38 | .167 |
| Time\*Phase (3)\*Group (Med) | -1.27 (0.67) | 3957.89 | -1.89 | .059 |
| Time\*Phase (4)\*Group (Med) | 0.82 (0.67) | 3957.89 | 1.23 | .219 |
| Time\*Phase (1)\*Group (High) | 0.26 (0.70) | 3957.89 | 0.37 | .708 |
| Time\*Phase (3)\*Group (High) | -0.98 (0.70) | 3957.89 | -1.41 | .160 |
| Time\*Phase (4)\*Group (High) | -1.14 (0.70) | 3957.89 | -1.62 | .105 |

*Target Responding: Results of Linear Mixed-Effects Regression*

*Note*. Group (None) and Phase (2) factors served as individual contrasts. \*\*\**p*<.001; \*\**p*<.01; \**p*<.05.

**Table S2**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Factor** | **β (SE)** | **df** | ***t*** | ***p*** |
| Intercept | 47.57 (2.94) | 271.24 | 16.20\*\*\* | <.001 |
| Time | 2.45 (0.40) | 1923.85 | 6.19\*\*\* | <.001 |
| Phase (1) | -46.87 (2.98) | 322.71 | -15.74\*\*\* | <.001 |
| Phase (3) | -3.96 (3.37) | 271.71 | -1.18 | .240 |
| Phase (4) | -22.65 (3.07) | 277.76 | -7.38\*\*\* | <.001 |
| Group (Low) | 2.88 (4.19) | 271.24 | 0.69 | .493 |
| Group (Med) | 2.36 (4.11) | 271.24 | 0.57 | .567 |
| Group (High) | -1.41 (4.30) | 271.24 | -0.33 | .743 |
| Time\*Phase (1) | -3.13 (0.53) | 3968.03 | -5.86\*\*\* | <.001 |
| Time\*Phase (3) | -2.65 (0.53) | 3968.03 | -4.96\*\*\* | <.001 |
| Time\*Phase (4) | -6.31 (0.53) | 3968.03 | -11.80\*\*\* | <.001 |
| Time\*Group (Low) | 1.64 (0.56) | 1923.85 | 2.91\*\* | .004 |
| Time\*Group (Med) | 1.14 (0.55) | 1923.85 | 2.06\* | .040 |
| Time\*Group (High) | 1.08 (0.58) | 1923.85 | 1.87 | .061 |
| Phase (1)\*Group (Low) | -1.79 (4.24) | 322.72 | -0.42 | .673 |
| Phase (3)\*Group (Low) | -22.74 (4.80) | 271.71 | -4.74\*\*\* | <.001 |
| Phase (4)\*Group (Low) | -17.72 (4.37) | 277.76 | -4.05\*\*\* | <.001 |
| Phase (1)\*Group (Med) | -2.68 (4.16) | 322.72 | -0.64 | .520 |
| Phase (3)\*Group (Med) | -29.24 (4.71) | 271.71 | -6.21\*\*\* | <.001 |
| Phase (4)\*Group (Med) | -18.41 (4.29) | 277.76 | -4.29\*\*\* | <.001 |
| Phase (1)\*Group (High) | 1.58 (4.36) | 322.72 | 0.36 | .718 |
| Phase (3)\*Group (High) | -26.07 (4.93) | 271.71 | -5.29\*\*\* | <.001 |
| Phase (4)\*Group (High) | -14.05 (4.49) | 277.76 | -3.13\*\* | .002 |
| Time\*Phase (1)\*Group (Low) | -1.48 (0.76) | 3968.03 | -1.94 | .053 |
| Time\*Phase (3)\*Group (Low) | -4.34 (0.76) | 3968.03 | -5.70\*\*\* | <.001 |
| Time\*Phase (4)\*Group (Low) | 1.52 (0.76) | 3968.03 | 1.99\* | .047 |
| Time\*Phase (1)\*Group (Med) | -1.02 (0.75) | 3968.03 | -1.37 | .171 |
| Time\*Phase (3)\*Group (Med) | -3.54 (0.75) | 3968.03 | -4.74\*\*\* | <.001 |
| Time\*Phase (4)\*Group (Med) | 2.20 (0.75) | 3968.03 | 2.95\*\* | .003 |
| Time\*Phase (1)\*Group (High) | -1.67 (0.78) | 3968.03 | -2.14\* | .032 |
| Time\*Phase (3)\*Group (High) | -1.88 (0.78) | 3968.03 | -2.40\* | .016 |
| Time\*Phase (4)\*Group (High) | 3.49 (0.78) | 3968.03 | 4.46\*\*\* | <.001 |

*Alternative Responding: Results of Linear Mixed-Effects Regression*

*Note*. Group (None) and Phase (2) factors served as individual contrasts. \*\*\**p*<.001; \*\**p*<.001; \**p*<.01.