The supplementary materials include the following sections:

(a) A meta-analysis pooling the contrasts ($Context_3$ VS. $Context_0$) we used throughout the study to test the effect of the accumulation of action-effects on the most recent trials (N-4 through N-2), given the outcome of the last action (i.e., Prior, trial N-1). For experiments that included attention probes, we compared the two modes of analysis. The first was the amended preprocessing implemented in Hemed et al., (2023), where we removed the trials immediately following attention probes. The second mode of analysis did not mitigate the switching costs generated by the attention probes implemented in Hemed et al. (2020).

(b) Experiments 3-4 consists of the reanalysis of the data from the two experiments in our previous paper (Hemed et al., 2020),

(c) Experiment 5 consists of a previously unpublished replication of Experiment 2 in the 2020 paper.

Meta-Analysis

Below we report a meta-analysis on the effects of the contrasts we included in each experiment to examine the dynamic influence of own-action effects on reinforcement, based on data from 1,067 participants who performed the task. This was done to enable readers to directly compare the effects of the switch costs generated by the attention probes on the results of the new experiments to the uncorrected results of the experiments that included probes (Experiments 3-5). It also enables readers to directly assess the efficacy of the method used by Hemed et al. (2023) to minimize the influence of switching back from attention probe trials to the task trials by comparing the corrected results of the experiments that included probes to the results of the current studies.

The pooled effect sizes and confidence intervals in the meta-analysis were calculated using a standard inverse-variance weighting method (Lee et al., 2016). The inverse variance-weighted average effect size is calculated as follows:

$$\hat{y} = \frac{\sum_i y_i / \sigma_i^2}{\sum_i 1/\sigma_i^2}$$

where the pooled effect size ($\hat{y}$) is found by summing (Σ) the effect sizes (y_i) from each *i*-th experiment, divided by the variance in the *i*-th experiment (σ_i^2), and then divided by the sum of the inverse-variance ($1/\sigma_i^2$). This calculation assigns a higher proportional weight to studies with lower variance, and vice-versa. This approach also provides methods for calculating the 95% confidence interval and p-values associated with the effect size. The 95% confidence interval is calculated as follows:

$$\pm 1.96 * \sqrt{\sum_i 1/\sigma_i^2}$$

i.e., 1.96 times the standard deviation of the inverse-variance weights. The p-value of the two-tailed significance test was calculated by comparing the absolute values of the Z-score (i.e., the inverse-variance weighted average divided by standard deviation, see above), to the standard normal cumulative distribution. More information on the method we chose is available elsewhere (see Lee et al., 2016; Sánchez-Meca & Marín-Martínez, 2008).

First, we examined the effect of change in RSP when participants received three action-effect occurrences on trials N-4 through N-2 (i.e., $Context_3$), vs. no action-effect occurrences ($Context_0$), given that they also received an action-effect on trial N-1 ($Prior_1$). Detailed results, including the significance and confidence intervals, are shown in Figure S1 below. We found a small to medium facilitation effect in response times for both the 5- and 10- trial cycle duration

groups. That is, for experiments that did not include attention probes (Cohen's d = -0.32, p < .001 and -0.39, p < .001 for the 5- and 10- trial groups; Figure S1 top panel), or did include attention probes but the trials immediately following them were filtered out (Cohen's d = -0.54, p < .001 and -0.38 p = 0.005; Figure S1, middle panel); however, larger effect sizes were observed if the trials immediately following the attention probes were not filtered out (Cohen's d = -0.73, p < .001 and -0.69, p < .001; Figure S1, bottom panel). Thus, although the results of the amended preprocessing method (Figure S1, middle panel) were in greater agreement with the results of Experiments 1-2, our findings did *not* originate from the presence of trials immediately following attention probe trials, or the confounded pre-processing. This can be inferred from the overlap of the confidence intervals of the pooled effect sizes on the top panel and bottom panels, both for the 5-trial ([-0.50, -0.14] and [-1.00, -0.46], for the top and bottom panels, respectively) groups and the 10-trial groups ([-0.56, -0.22] and [-0.91, -0.47], for the top and bottom panels, respectively).

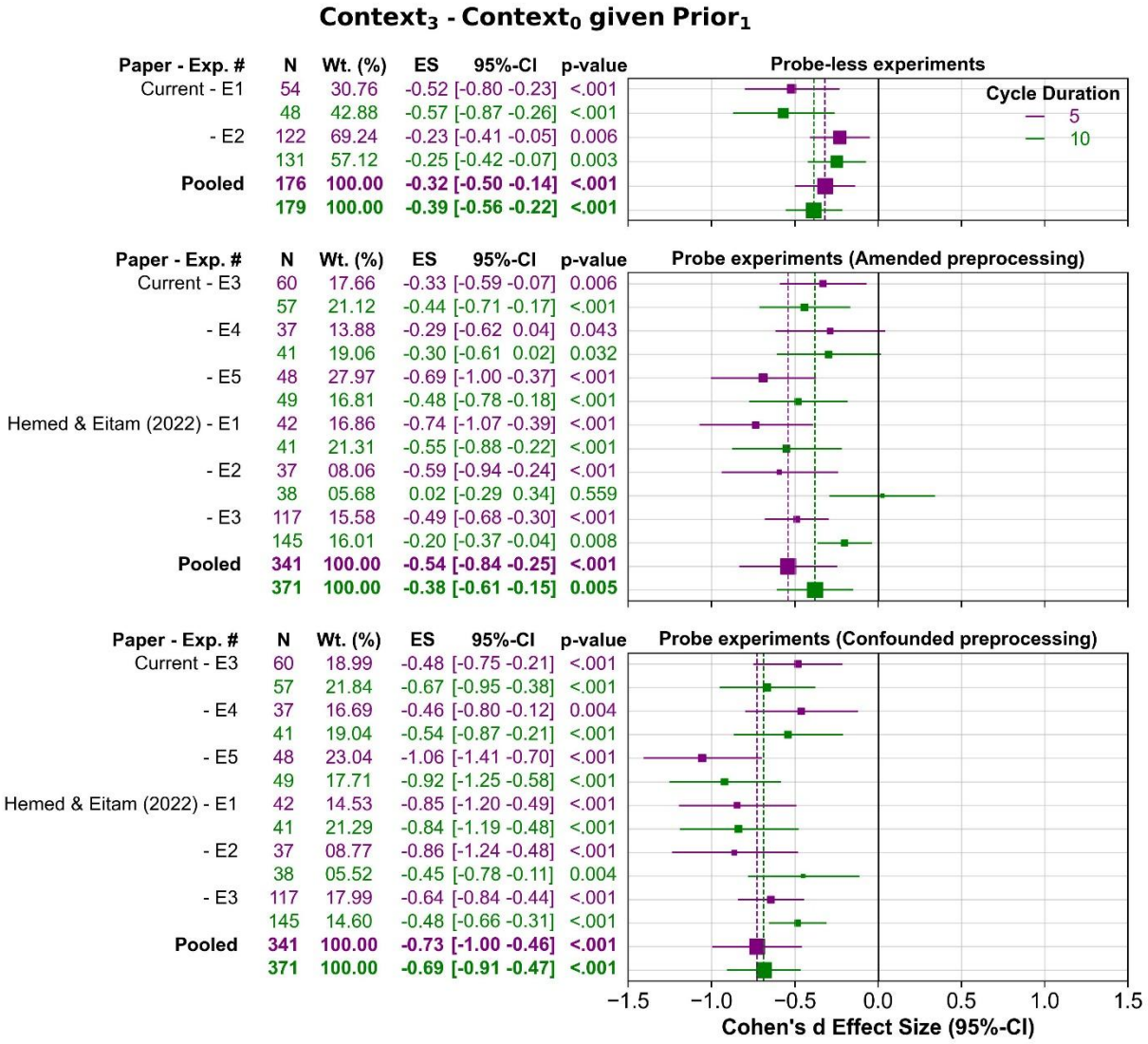


Figure S1: Meta-analysis of the modulating effect of context (Context3 – Context0) on response speed when experiencing predictable own-action effects (Prior1). A similar pattern of results was observed regardless of the presence of attention probes (top vs. either middle or bottom panels) or when removing trials which immediately followed the attention probes (Middle vs. bottom panels), thus validating the method proposed in Hemed et al. (2023). Leftward (negative) values denote a decrease in response time (i.e. faster responding). Vertical dashed lines denote the average effect size across all experiments, for the 5- and 10-trial groups.

Next, we examined the effect of change in RSP when participants have received three action-effect occurrences on trials N-4 through N-2 (i.e., $Context_3$), vs. no action-effect occurrences ($Context_0$), in the case where they were also received an action-effect on trial N-1 ($Prior_0$). The results are shown in Figure S2 below. The results of experiments including the attention probes, when trials immediately following the probes were not removed (i.e., the confounded pre-processing method), indicated a significant medium-sized effect of a drop in response speed in the 10-trial group (Cohen's d = 0.59, p <. 001), but not in the 5-trial group (Cohen's d = 0.03, p = 0.751); see Figure S2, bottom panel. When data from these experiments were analyzed using the amended pre-processing method proposed here (Figure S2, middle panel), there was no evidence for the drop in response speed for either the 5-trial (Cohen's d = 0.18, p = 0.084) or the 10-trial groups (Cohen's d = -0.07, p = 0.855). This pattern of results was corroborated by the results of Experiments 1-2, which did not include attention probes (Figure S2, top panel) where here as well there was no evidence for a reduction in response speed in either the 5-trial (Cohen's d = -0.03, p = 0.757) or the 10-trial group (Cohen's d = 0.02, p = 0.824).

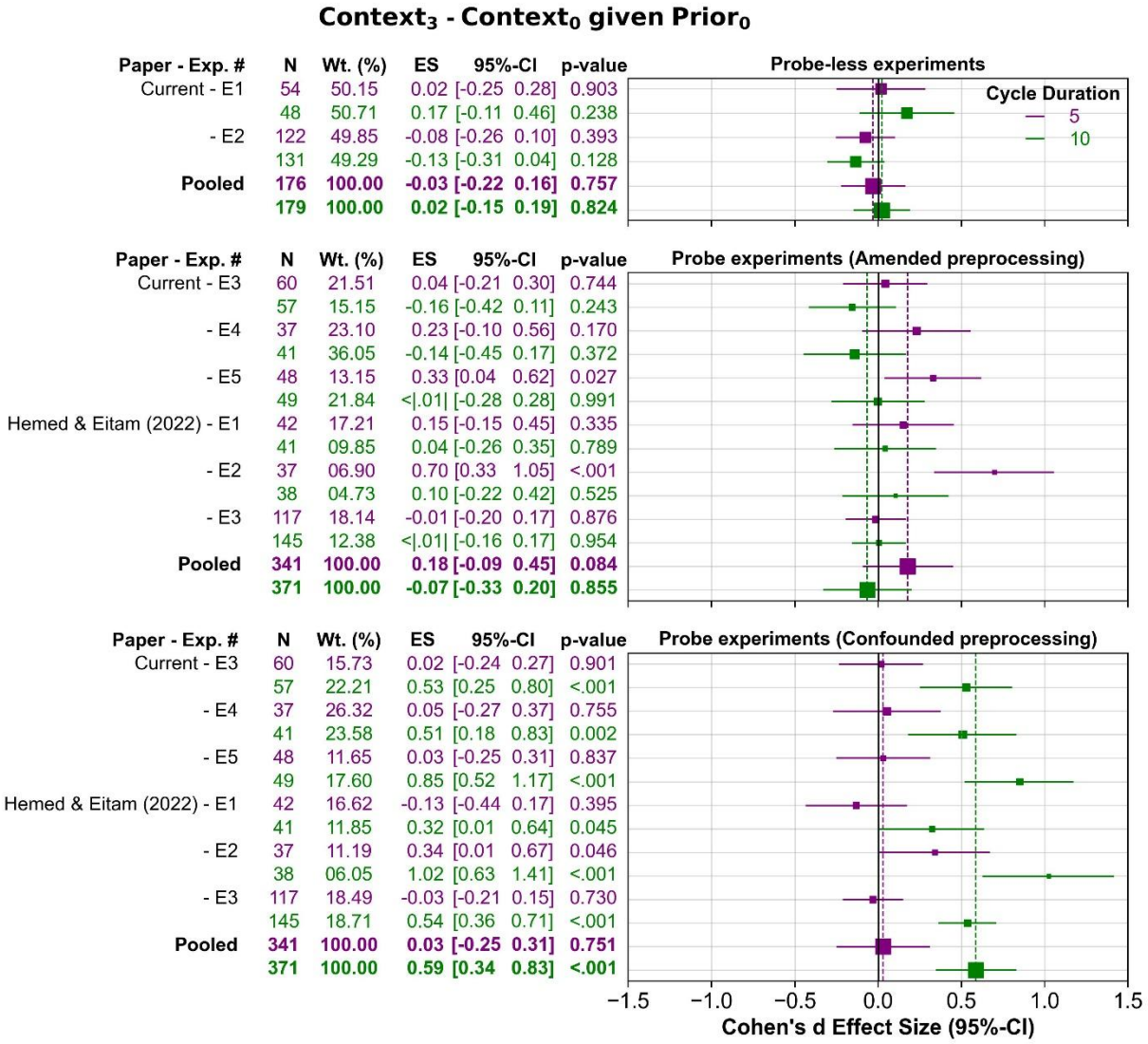


Figure S2: Meta-analysis demonstrating the null effect of context ($Context_3$ – $Context_0$) on response speed, following immediate lack of predictable own-action effects ($Prior_0$). The difference between the 5-trial group and 10-trial group (bottom panel) originated from a confound of task switching caused by the method of analysis used in our previous paper (Hemed et al., 2020). There was no difference when there were no attention probes (top panel) or when the trials immediately following the attention probes were removed from the data (middle panel). Rightward (positive) values denote increases in response time (i.e. slower responding). Vertical dashed lines denote the average effect size across all experiments, for the 5- and 10- trial Cycle-Duration group.

Experiment 3 –Re-analysis of Experiment 1 in Hemed et al., 2020

Methods

Transparency and Openness

The data reported in this experiment were originally reported as Experiment 1 in Hemed et al. (2020). For more information, see that paper (Hemed et al., 2023). Thus, although the experiment was previously pre-registered on OSF (https://osf.io/b6c9a/wiki/home/), the analysis described here was the one described in the main text. Experiment materials are available upon request.

Participants

A total of 127 participants were recruited via the Psychology department's online registration system. Data from two participants (in the pre-registered sample) were lost due to technical problems and two additional subjects were run instead. Demographic data from one participant were not collected. Participants' gender demographics were collected using a radio-button style question included in the demographic questionnaire, under the prompt 'My Sex is –.' Participants could choose from a dropdown list indicating *Female* and *Male* or skip the question (by calling the research assistant for assistance). On the 5-trial group, there were 63 participants, aged 19 to 35 (M = 24.79, SD = 3.50). Of these, 48 responded Female, and 15 responded Male. On the 10-trial group, there were 63 participants, aged 18 to 44 (M = 24.65, SD = 5.29). Of these, 50 responded Female and 13 responded Male. Information about race, religion, ethnicity was not collected.

Apparatus and Design

Details regarding the setup of this experiment has been reported in great detail elsewhere (see Hemed et al., 2020; Experiment 1). Generally, the design was identical to the one described in Experiment 1 in the main text, except for the following changes.

(a) The experiment consisted of 440 trials in total, in a single block. There was no training block.

(b) Besides the task trials, 16% (70/440 trials) of the trials were surprise probe trials intended to discourage subjects from counting trials throughout the experiment and becoming aware of the Action-Effect and No-Effect cycles. The probes consisted of a large yellow triangle that appeared in the center of the visual workspace. Participants were instructed to respond by tapping the spacebar (for a similar strategy see, Karsh & Eitam, 2015a), which was not one of the keys used on the task trials. The duration of the task and probe trials were the same (SOA 1550ms); however, the response window for the probe trials was 1000ms (i.e., ITI of 550ms). The probe did not move down the screen, unlike for the imperative cues (discs). Responding to the probe did not elicit any feedback (i.e., action-effect), regardless of the type of current cycle.

(c) The experiment was conducted in person, rather than online.

Results

Data Preparation and Screening

The data specified below refer solely to the task trials, and exclude the probe trials (16.6% of the raw data). Note that data from a participant or a specific trial can be invalid for more than one

reason. We removed task trials with incorrect (3.95%) or missing (1.39%) responses, as well as task trials with extremely fast (RT < 100, 1.42%) or slow RTs (RT > 750, 0.76%). Next, we removed the data from a total of 10 participants (7.87% out of 127) whose accuracy on the task trials was below < 80% (N = 4), of whose accuracy on the attentional probe trials was below < 50% (N = 3), or where fewer than 80% of the trials were valid in terms of either RT, accuracy or both (N = 7). In total, 11.40% of the task trials were removed, by filtering whole participants' data or individual trials.

Note that we did not analyze trials that followed the attention probes or task trials that followed trials that did not contain correct responses, to avoid post-error slowing and task-switching costs (see above).

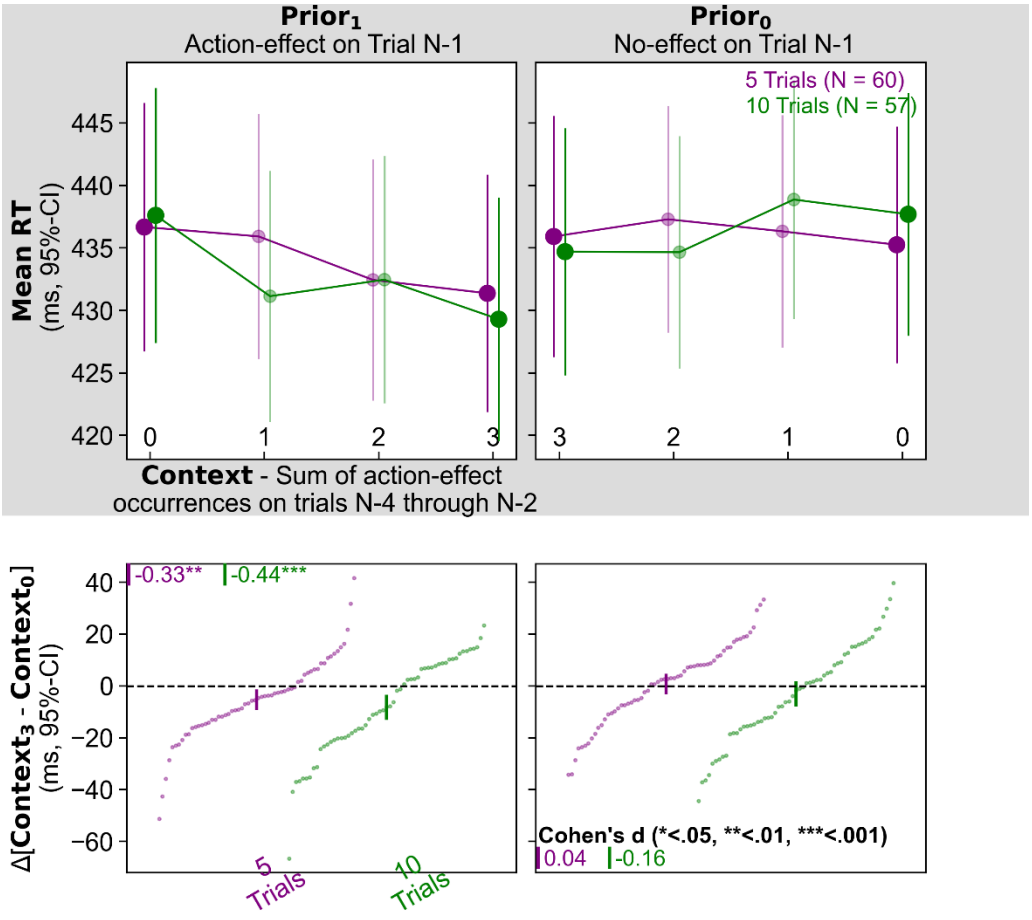
Analysis

The data and results of our analysis are shown in Figure S3. The statistical effect of the action-effect on trial N-1 (*Prior*) on response time was significant [F(1, 115) = 10.11, p = 0.002, Partial Eta-Sq. = 0.08], thus constituting a replication of the basic facilitation effect found previously with our paradigm (Eitam et al., 2013; Hemed et al., 2022; Karsh et al., 2016, 2020; Tanaka et al., 2021). *Context* - the number of recent action-effect occurrences was also significant [F(3, 324) = 3.68, p = 0.014, Partial Eta-Sq. = 0.03] , but Cycle-Duration [F(1, 115) = 0.01, p = 0.927, Partial Eta-Sq. < 0.01] had no significant influence on response time. *Prior* and *Context* interacted [F(3, 341) = 2.64, p = 0.050, Partial Eta-Sq. = 0.02], and there was no interaction between *Prior* and *Cycle-Duration* [F(1, 115) = 0.88, p = 0.349, Partial Eta-Sq. = 0.01] or *Context* and Cycle-Duration [F(3, 324) = 0.74, p = 0.523, Partial Eta-Sq. = 0.01]. Additionally, there was no significant 3-way interaction [F(3, 341) = 1.80, p = 0.147, Partial Eta-Sq. = 0.01].

We then conducted the pairwise contrasts used in Experiments 1 and 2, where we examined the contrast of [$Context_3$ – $Context_0$] separately depending on whether the trial followed an action-effect or not ($Prior_0$ and $Prior_1$), and separately for the 5- and 10-trial groups.

When keeping the action-effect on trial N-1 at 1 (i.e., when only considering trials for which an action-effect was given on the immediately preceding response), an uninterrupted streak of 3 previous responses that were followed by action-effect ($Context_3$) facilitated responding compared to an uninterrupted streak of responses that were not followed by feedback ($Context_0$) that significantly facilitated response speed for both the 5-trial Cycle Duration group [-5.30 MS (15.83); $t(59) = -2.57$, $p = 0.006$, Cohen's $d = -0.33$, (-0.59, -0.07), $BF_{1:0} = 5.6963$] and the 10-trial group [-8.31 MS (18.62); $t(56) = -3.34$, $p < 0.001$, Cohen's $d = -0.44$, (-0.71, -0.17), $BF_{1:0} = 38.1150$].

Conversely, when keeping the action-effect on trial N-1 at 0 we found that a streak of previous action-effect trials ($Context_3$) compared to after a previous streak of No-Effect trials ($Context_0$) did not significantly slow down response speed for the 5-Trial Cycle Duration group [0.66 MS (15.57); $t(59) = 0.33$, $p = 0.744$, Cohen's $d = 0.04$, (-0.21, 0.30), $BF_{1:0} = .1487$], or the 10-Trial group [-2.99 MS (18.99); $t(56) = -1.18$, $p = 0.243$, Cohen's $d = -0.16$, (-0.42, 0.11), $BF_{1:0} = .2793$].



172

173 **Figure S3, Experiment 3. Previous behavior-contingent occurrences (*Context*) affect**
174 **(facilitate) response speed only if the immediately previous behavior (Prior) led to a fully**
175 **predictable action-effect; the frequency at which fully predictable and contingent action-**
176 **effects waxed or waned (Cycle Duration) did not influence these dynamics. Top panel – Mean**
177 **response time by Prior (left vs. right panels), Context (X-axis) and Cycle Duration (Separate**
178 **colors). Bottom panel – difference in response time (RT-Context$_3$ minus RT-Context$_0$).**
179 **Negative values denote faster response speeds when behavior-contingent and fully**
180 **predictable action-effects accumulated (Context$_3$) vs. no such action-effects in recent trials**
181 **(Context$_0$). Vertical line denotes 95% confidence intervals centered on the group means.**
182 **Scatter indicates individual means for the difference in response times. Digits indicate**
183 **Cohen's-d values for the difference, and significance (* < .05, ** <.01, ***<.001).**

Experiment 4 –Re-analysis of Experiment 2 in Hemed et al., 2020

Methods

Transparency and Openness

As in Experiment 3, the method used in Experiment 4 is detailed elsewhere (see Hemed et al., 2020; Experiment 2). Although the experiment was previously pre-registered on OSF (https://osf.io/b6c9a/wiki/home/), the analysis described here was conducted in line with the analysis in the main text.

Participants

A total of 80 naïve participants were recruited via the Psychology department's online registration system. One participant failed to provide demographic data. Participants' gender were collected using a radio-button style question included in the demographic questionnaire, under the prompt 'My gender is-' where they selected from a dropdown list including *Female* and *Male* or skipped the question (by calling the research assistant). In the 5-trial group, there were 40 participants, aged 20 to 37 (M = 26.65, SD = 4.37). Of these, 22 responded Male and 18 responded Female. In the 10-trial group, there were 39 participants, aged 20 to 34 (M = 24.54, SD = 2.79). Of these, 29 responded Female, and 10 responded Male. Information about race, religion, ethnicity was not collected.

Apparatus

See Experiment 3.

Design

We briefly describe Experiment 4, since the full details are available elsewhere (Hemed et al., 2020; Experiment 2). Experiment 4 was an exact replication of Experiment 3, except that it utilized the spatial perturbation method, as in Experiment 2 (see main text). Thus, instead of No-Effect cycles, we used Spatial-Perturbation cycles. On these cycles, the white disc appeared at a random (and hence, was unpredictable) location relative to the location of the cue. The center-to-center distance between the cue and the effect was randomly selected on each trial (sampled from a continuous uniform distribution ranging from 0.7 to 2.8, representing the distance in degrees of visual angle). The action-effect was displaced at a random angle relative to the cue (sampled from a continuous uniform distribution ranging from 0 to 359).

Results

Data preparation and screening

The results specified below refer solely to the task trials that excluded all probe trials (16.6% of the raw data). Note that data from a participant or a specific trial could be invalid for more than one reason. We removed task trials with incorrect (7.27%) or missing (0.30%) responses, as well as task trials with extremely fast (RT < 100, 0.09%) or slow RTs (RT > 750, 0.81%). Next, we removed the data from a total of 2 participants (2.50% out of 80) whose accuracy on the task trials was below < 80% (N = 1), or whose accuracy on the attention probe trials was below < 50% (N = 0), or where fewer than 80% of the trials were valid in terms of either RT, accuracy or both (N =

1). In total, 9.99% of the task trials were removed, by filtering whole participants' data or individual trials.

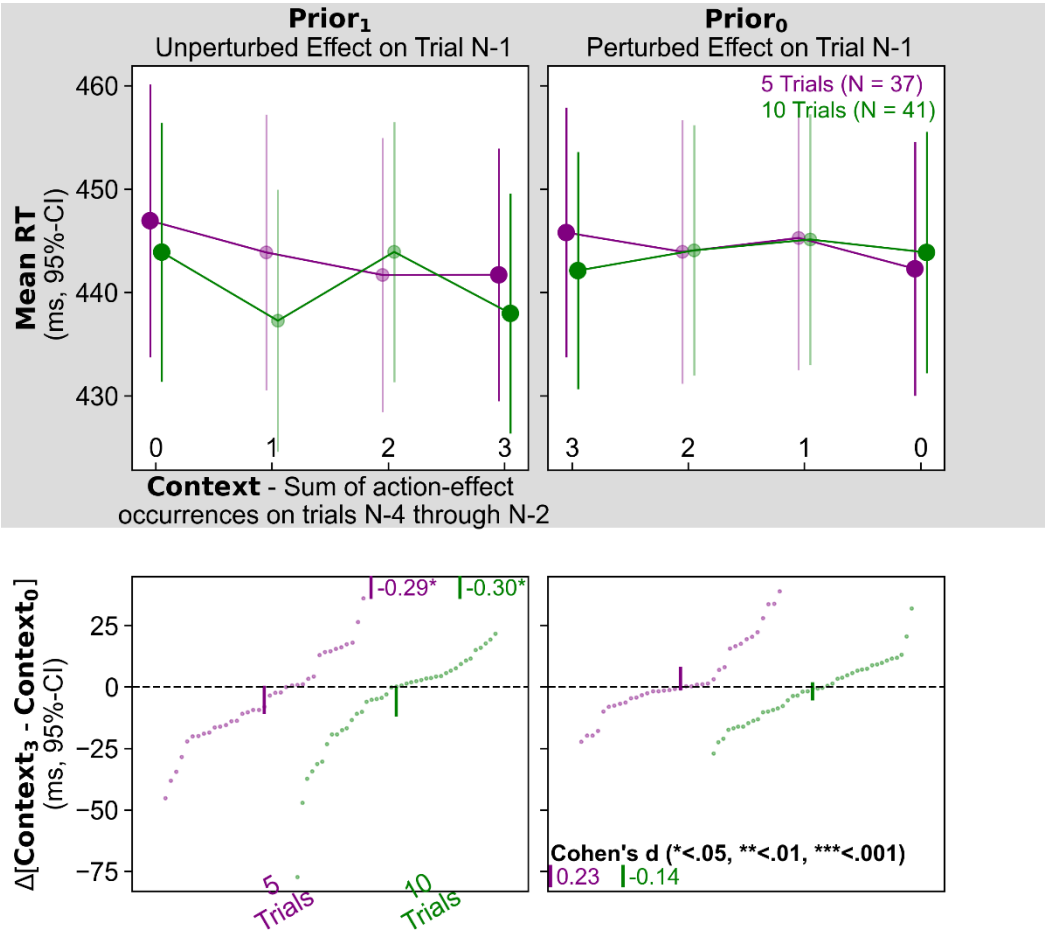
Analysis

The data and results of our analysis are shown in Figure S4. The effect of the spatially predictable action-effect on trial N-1 (*Prior*) on response time was significant [F(1, 76) = 3.64, p = 0.060, Partial Eta-Sq. = 0.05], but not the effects for *Context* [F(3, 216) = 1.05, p = 0.368, Partial Eta-Sq. = 0.01] and *Cycle Duration* [F(1, 76) = 0.04, p = 0.845, Partial Eta-Sq. < 0.01]. The key *Prior* X *Context* interaction [F(3, 216) = 3.03, p = 0.033, Partial Eta-Sq. = 0.04] was significant, but the *Prior X Cycle Duration* interaction [F(1, 76) = 1.29, p = 0.260, Partial Eta-Sq. = 0.02] and the *Context* X *Cycle-Duration* [F(3, 216) = 1.45, p = 0.230, Partial Eta-Sq. = 0.02], as well as the 3-way interaction [F(3, 216) = 1.15, p = 0.327, Partial Eta-Sq. = 0.01] were not.

We then looked at the effect of accumulating action-effects by contrasting trials that followed an effect ($Prior_1$) after an uninterrupted streak of three previous responses that were followed by an action-effect ($Context_3$), compared to trials that followed an uninterrupted streak of responses that were not followed by action-effects ($Context_0$). We found that accumulating action-effect occurrences significantly facilitated response speed for both the 5-Trial [-5.24 MS (17.86); t(36) = -1.76, p = 0.043, Cohen's d = -0.29, (-0.62, 0.04), BF1:0 = 1.3592] and the 10-trial groups [-5.92 MS (19.60); t(40) = -1.91, p = 0.032, Cohen's d = -0.30, (-0.61, 0.02), BF1:0 = 1.6949, although neither Bayes factor was conclusive.

Conversely, the response time of trials that were not immediately preceded by a response that had an effect ($Prior_0$) were not modulated by either a streak of previous responses that led to effects ($Context_3$) or a streak that did not lead to any effect ($Context_0$). This was true for both the

5-trial group [note that if anything, responses were slowed down by the effect context; 3.50 MS (15.02); t(36) = 1.40, p = 0.170, Cohen's d = 0.23, (-0.10, 0.56), BF1:0 = 0.4328] and the 10-trial group [-1.76 MS (12.31); t(40) = -0.90, p = 0.372, Cohen's d = -0.14, (-0.45, 0.17), BF1:0 = 0.2469], with substantial support for the null hypothesis only for the latter.



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251 **Figure S4, Experiment 4. Previous spatially-predictable action-effect occurrences (*Context*)**
252 **affect (facilitate) response speed only if a spatially-predictable action-effect occurred on Trial**
253 **N-1 (*Prior*); the relative frequency of feedback alteration (*Cycle-Duration*) did not affect**
254 **response speed. Top panel – Mean response time by Prior (left vs. right panels), Context (X-**
255 **axis) and Cycle Duration (Separate colors). Bottom panel – difference in response time (RT-**
256 **Context$_3$ minus RT-Context$_0$). Negative values denote faster response speeds when action-**
257 **effect occurrences accumulate (Context$_3$) vs. spatially-perturbed action-effect occurrences in**
258 **recent trials (Context$_0$). Vertical line denotes 95% confidence intervals centered on the group**
259 **means. Scatter indicates individual means for the difference in response times. Digits indicate**
260 **Cohen's-d values for the difference, and significance (* < .05, ** <.01, ***<.001).**
261

Discussion

Experiment 4 largely corroborated the pattern observed in Experiments 1-3 using contrast analysis, although the ANOVAs were less clear-cut (e.g., a less pronounced effect of *Prior*). Note that the although the Bayes factors were inconclusive, which warrants the sampling of more participants, this is a re-analysis of Experiment 2 from Hemed et al. (2020) so that we relied on the additional (new) data from Experiments 3 and 5 for further evidence.

Overall, the contribution of Experiment 4 is theoretically important since it confirmed that reinforcement was driven by sensorimotor predictability rather than by the lack of a performance error signal (see above).

Experiment 5

Experiment 5 was conducted online due to COVID-19 restrictions. The experiment's main goal was to validate the collection of behavioral data online by attempting to replicate our previous findings (Hemed et al., 2020; Experiment 2). Given that this was our first attempt to replicate our findings in an online setting, we changed several parameters in the experiment.

Methods

Transparency and Openness

This experiment was conducted after publishing our 2020 article but prior to the discovery of the confound specified above, and was not pre-registered. Materials are available upon request.

Participants

We recruited 104 participants (excluding three participants whose experimental session crashed). Participants' gender demographics were collected using the radio-button style question included in the demographic questionnaire, under the prompt 'My gender is –' and were asked to select *Female* or *Male*. In the 5-trial group, there were 51 participants, aged 19 and 35 (M = 24.55, SD = 3.40). Of there , 35 responded Female and 16 responded Male. In the 10-trial group, there were 53 participants, aged 20 and 42 (M = 25.00, SD = 4.69). Of these , 38 responded Female and 15 responded Male. Information about race, religion, ethnicity was not collected .

Apparatus, Design and Procedure

The experiment was programmed using PsychoPy3. To gather more data from each participant, the participants performed 660 trials in a single block, 16% (105) of which were attention probes. To test whether the participants needed more time to respond in the online setting, we also increased the response window duration to 1250MS, for both the probe and task trials.

Participants were recruited via the Psychology department's SONA system, scheduled a Zoom meeting with the experimenter, were sent the participation link during the conversation, and did the experiment under the supervision of the experimenter. Then they filled out the demographics, were debriefed and completed the Sense of Agency scale (Tapal et al., 2017) using Google Forms.

Results

Data preparation and screening

The data below refer solely to the task trials, excluding all probe trials (16.6% of the raw data). Note that data from a participant or a specific trial could be invalid for more than one reason. We removed task trials with incorrect (7.64%) or missing (0.20%) responses, as well as task trials with extremely fast (RT < 100, 0.15%) or slow RTs (RT > 1150, 1.03%). Next, we removed the data

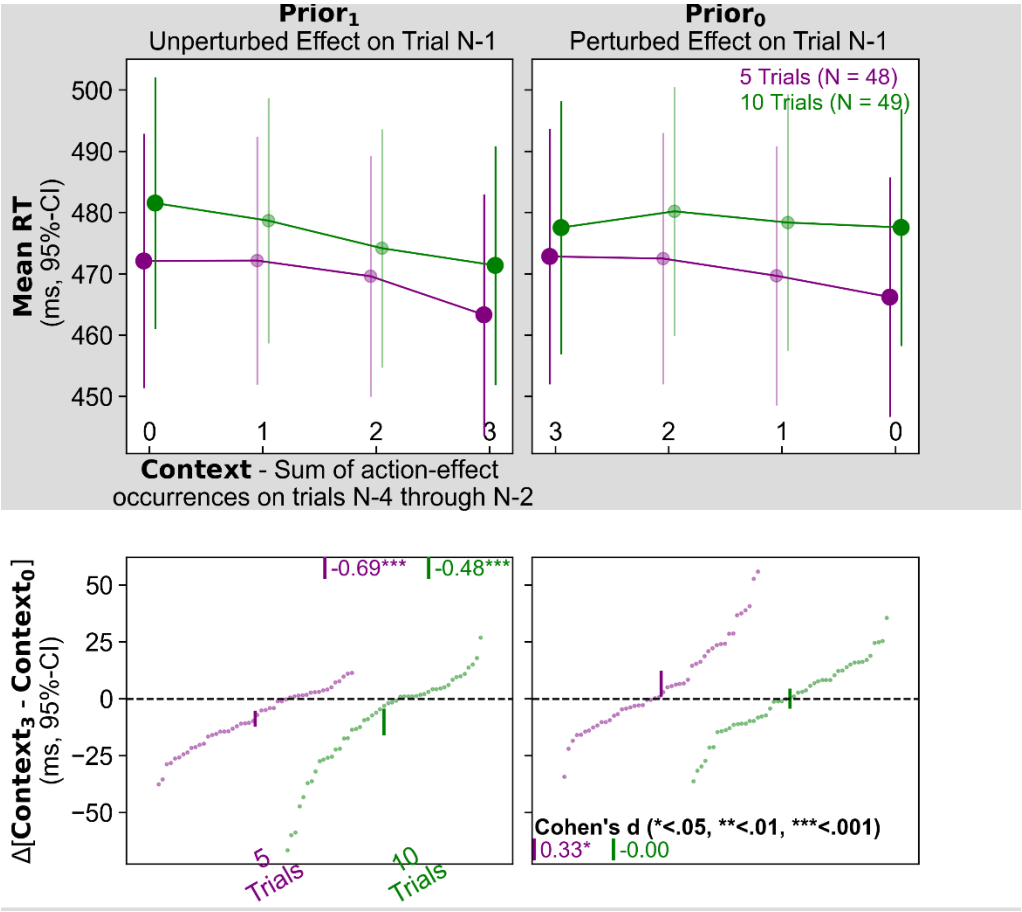
from a total of 7 participants (6.73% out of 104) whose accuracy on task trials was below < 80% (N = 3), whose accuracy on attentional probe trials was below < 50% (N = 1), or where fewer than 80% of the trials were valid in terms of either RT, accuracy or both (N = 7). In total, 13.38% of the task trials were removed by filtering whole participants' data or individual trials.

Analysis

The data and results of our analysis are shown in Figure S5.The effect of the spatially predictable action-effect on trial N-1 (*Prior*) on response time was not significant [F(1, 95) = 1.26, p = 0.264, Partial Eta-Sq. = 0.01]; the same was true for the effect of Cycle Duration [F(1, 95) = 0.29, p = 0.590, Partial Eta-Sq. < 0.01], and the effect of *Context* [F(3, 270) = 2.59, p = 0.056, Partial Eta-Sq. = 0.03]. The key interaction between *Prior* and *Context* [F(3, 278) = 8.71, p = 0.001 was significant, Partial Eta-Sq. = 0.08], but not the *Prior* X *Cycle Duration* [F(1, 95) = 0.13, p = 0.716, Partial Eta-Sq. < 0.01], or *Context* X *Cycle-Duration* [F(3, 270) = 0.99, p = 0.397, Partial Eta-Sq. = 0.01], or the 3-way interaction [F(3, 278) = 0.57, p = 0.632, Partial Eta-Sq. = 0.01].

Next, we looked at the two different contrasts. First, we found that speed of responding *following* a response that led to a spatially-predictable effect ($Prior_1$) after a streak of spatially-predictable effect trials ($Context_3$) was faster than the speed of responding following a response that led to a spatially predictable effect that appeared *after* a streak of spatially-unpredictable effect trials ($Context_0$). This held for both the 5-trial [-8.79 MS (12.58); t(47) = -4.79, p < 0.001, Cohen's d = -0.69, (-1.00, -0.37), BF1:0 = 2367.0834] and 10-trial groups [-10.17 MS (20.87); t(48) = -3.38, p < 0.001, Cohen's d = -0.48, (-0.78, -0.18), BF1:0 = 40.7823], with substantial Bayesian support for both.

Finally, (and as in the original 2020 publication) we found that when a response led to a spatially-unpredictable effect on the previous trial ($Prior_0$), a streak of spatially-predictable action-effect trials ($Context_3$) significantly slowed down the response speed compared to a streak of spatially-unpredictable action-effect trials ($Context_0$) for the 5-trial group [6.63 MS (19.91); t(47) = 2.28, p = 0.027, Cohen's d = 0.33, (0.04, 0.62), BF1:0 = 1.6497] but not for the 10 trial group [-0.03 MS (15.82); t(48) = -0.01, p = 0.991, Cohen's d = -0.00, (-0.28, 0.28), BF1:0 = 0.1553], with inconclusive support for the alternative hypothesis for the former, and substantial support for the null hypothesis only for the latter.



335

336 **Figure S5, Experiment 5. Previous spatially-predictable action-effect occurrences (Context)**
337 **affect (facilitate) response speed only if a spatially-predictable action-effect occurred on Trial**
338 **N-1 (Prior); however the frequency at which predictable and unpredictable contingent**
339 **action-effects waxed or waned (Cycle Duration) did not affect response speed. Top panel –**
340 **Mean response time by Prior (left vs. right panels), Context (X-axis) and Cycle Duration**
341 **(Separate colors). Bottom panel – difference in response time (RT-Context3 minus RT-**
342 **Context0). Negative values denote faster response speed when action-effect occurrences**
343 **accumulate (Context3) vs. Spatially-perturbed action-effect occurrences in recent trials**
344 **(Context0). Vertical line denotes the 95% confidence intervals centered on the group means.**
345 **Scatter indicates individual means of the difference in response time. Digits indicate Cohen's-**
346 **d values for the difference, and significance (* < .05, ** <.01, ***<.001).**
347

Discussion

Experiment 5 once again largely replicated the pattern found in previous experiments, although the ANOVA model provided a pattern of results that was less clear-cut. Compared to Experiment 4, which utilized the same spatial-perturbation manipulation, the effect size was larger and support from the Bayes factors was greater. In terms of the ANOVA, there was no main effect for *Prior*, potentially because the influence of the *Context* factor introduced more variability, as did its interaction with the value of *Prior*.

References

Hemed, E., Bakbani-Elkayam, S., Teodorescu, A. R., Yona, L., & Eitam, B. (2020). Evaluation of an action's effectiveness by the motor system in a dynamic environment. *Journal of Experimental Psychology: General*, *149*(5), 935–948. https://doi.org/10.1037/xge0000692

Hemed, E., Elkayam, S. B., Teodorescu, A. R., Yona, L., & Eitam, B. (2023). Clarification to Hemed et al. (2020). *Journal of Experimental Psychology: General*, *152*(3). https://doi.org/10.1037/xge0001394

Lee, C. H., Cook, S., Lee, J. S., & Han, B. (2016). Comparison of two meta-analysis methods: Inverse-variance-weighted average and weighted sum of Z-scores. *Genomics & Informatics*, *14*(4), 173.

Sánchez-Meca, J., & Marín-Martínez, F. (2008). Confidence intervals for the overall effect size in random-effects meta-analysis. *Psychological Methods*, *13*(1), 31.