

Repeated practice and feedback have minimal impact on the bat-and-ball problem



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The bat-and-ball problem is notorious for cueing a heuristic response that conflicts with logic. In a series of experiments where participants solved bat-and-ball items in a two-response paradigm, we investigated whether learning to avoid this bias was possible using repetition or minimal feedback, along with the nature of any potential learning. Although most participants stayed biased, some of them were able to overcome their initial bias and solve the conflict items seemingly intuitively while also benefitting from feedback.

Objectives

“A bat and a ball cost \$1.10 in total. The bat costs \$1.00 **more than** the ball. How much does the ball cost?”

Most people are biased when answering the bat-and-ball problem[1] because it cues an incorrect heuristic response (10 cents) that conflicts with logic (5 cents).

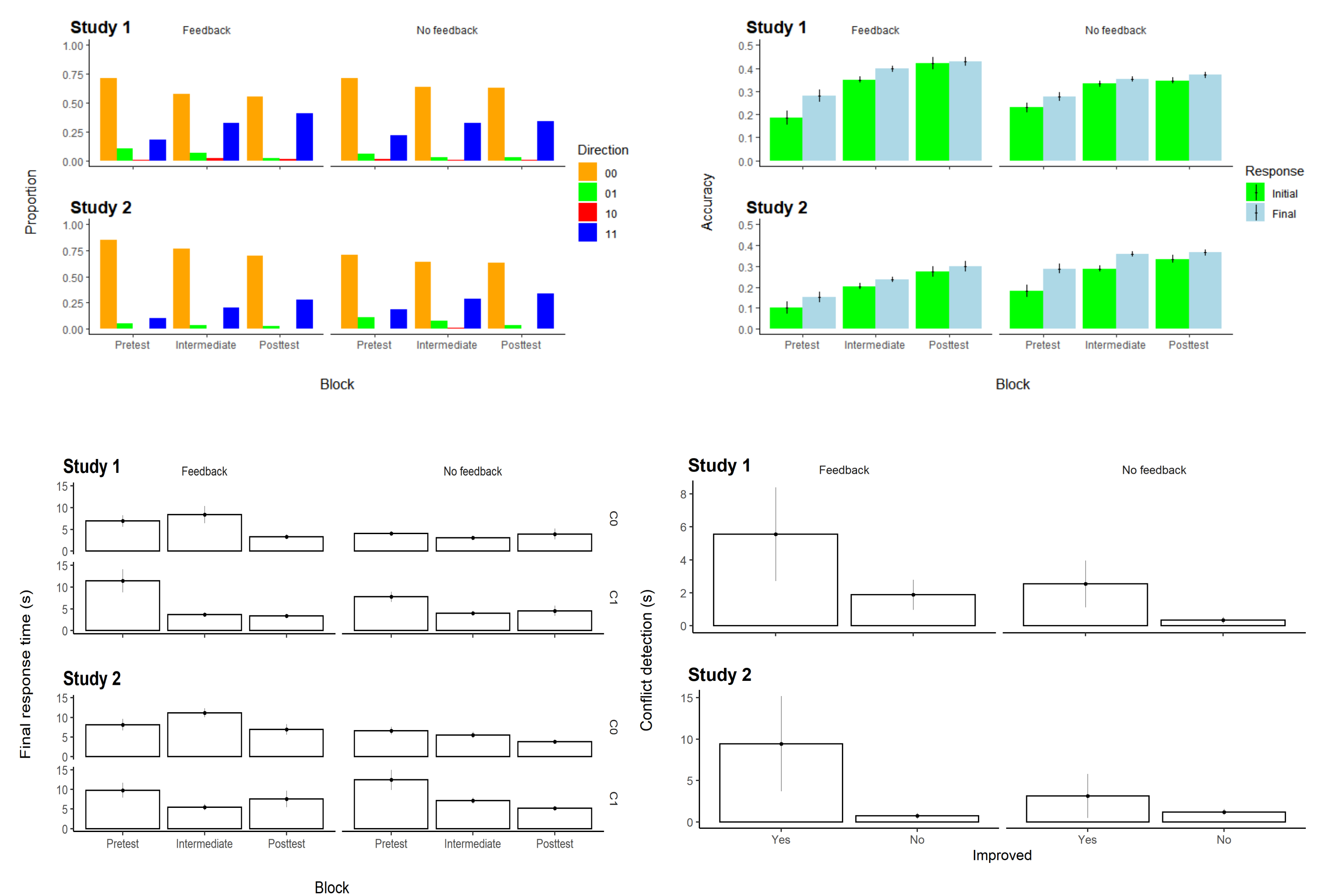
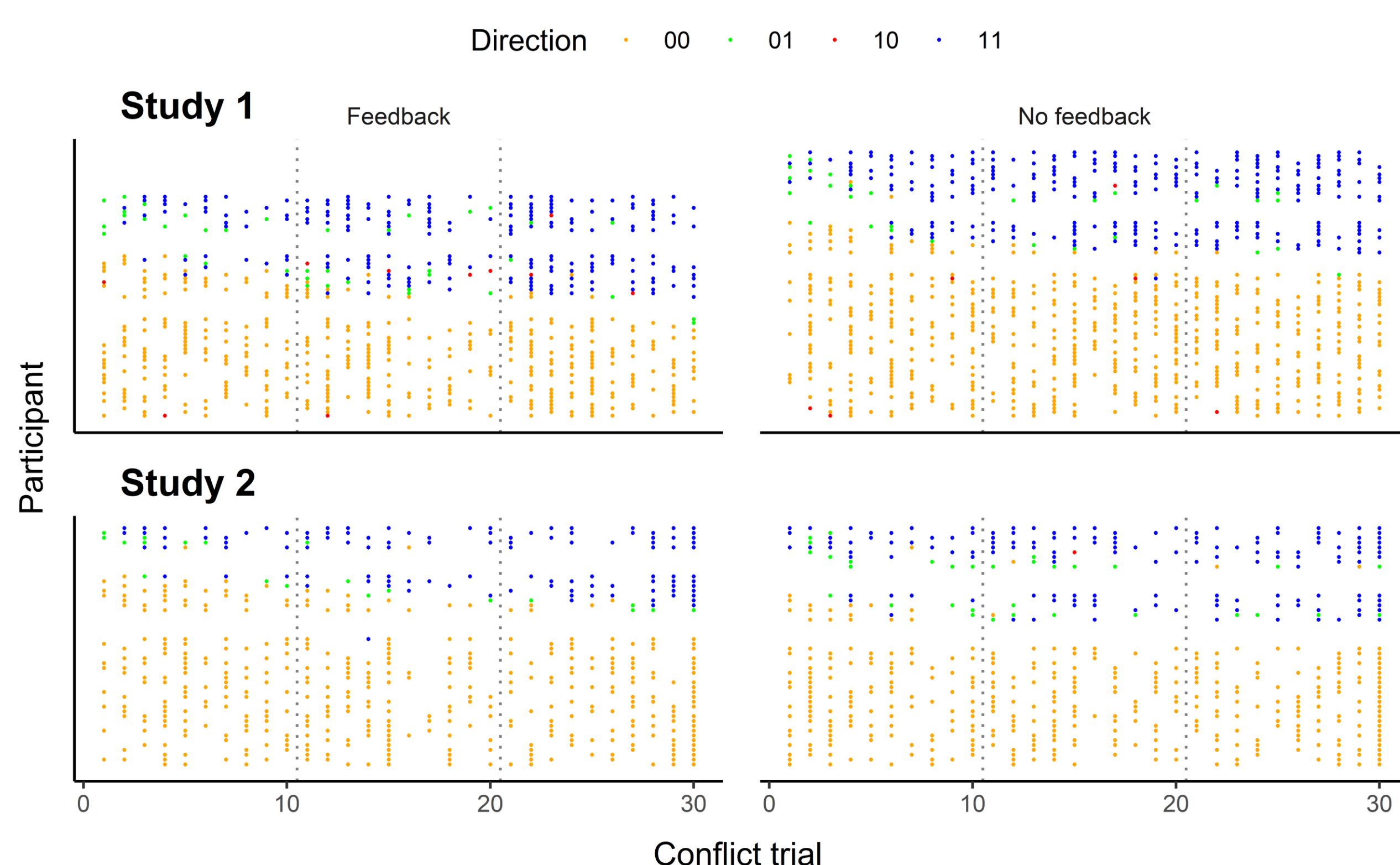
- Test the robustness of biased responding with extensive repetition of variants.
- Test the robustness of biased responding with minimal feedback.
- Investigate the nature of any potential learning (intuition or deliberation).

Methods

| | Study 0 | Study 1 | Study 2 |
|--------------|-----------------------------|-----------------------------|-----------------------------|
| Design | Repetition – MCQ | Feedback – MCQ | Feedback – free response |
| Items | 50 conflict, 50 no-conflict | 15 conflict, 15 no-conflict | 15 conflict, 15 no-conflict |
| Conditions | No-feedback only | Feedback only | Feedback vs no-feedback |
| Participants | 62 | 50 | 80 |

Two-response paradigm[2]: **initial response** under deadline and cognitive load followed by **final response** => 4 types of trials[3]: 00 (initial incorrect & final incorrect), 01, 10 and 11.

Results



Discussion

Overall limited impact of repetition on performance

Rare but not trivial learning:

- need for discrimination between conflict and no-conflict versions;
- different quantities (and correct answers) between items;
- spontaneous setting, i.e. no feedback or instruction given;
- learning was stable and led to intuitive correct responses.

No significant impact of feedback on performance...

Still, people process negative feedback:

- Increased response latencies
- Increased conflict detection effect

Feedback could be more effective for those who already detect the conflict

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