

#4010 Evidence of Task-Triggered Retrieval of the Previous Response: A Binding Perspective on Response-Repetition Benefits in Task Switching



BINDING AND RETRIEVAL
IN ACTION CONTROL

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poster <https://github.com/ele-ben/Posters>

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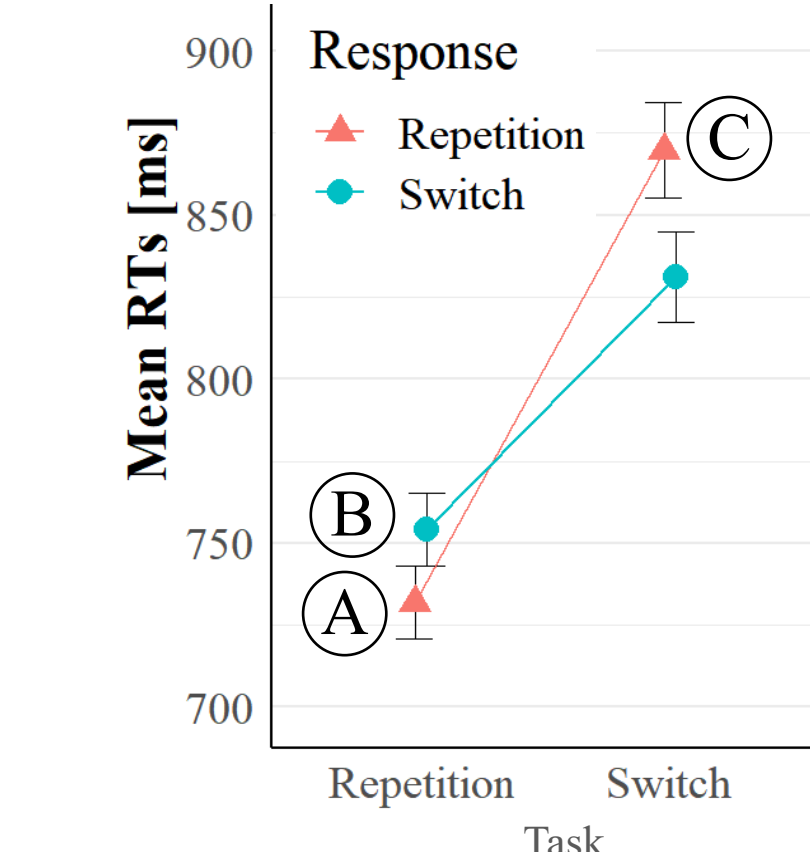
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Switching Between Tasks

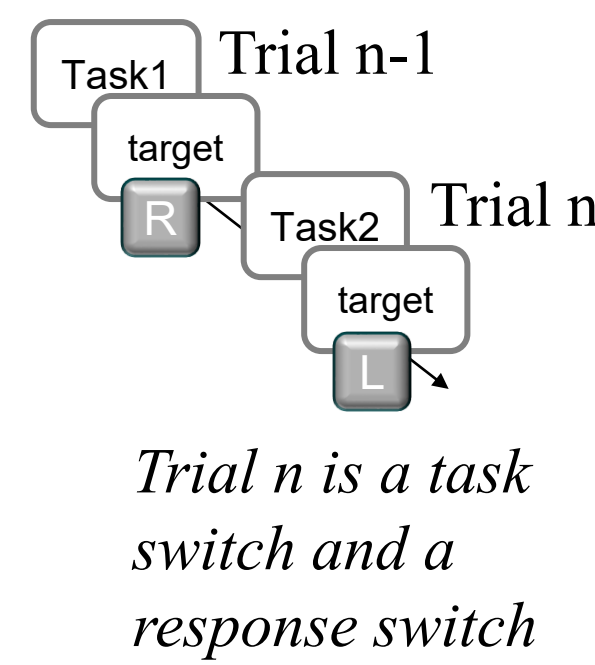
Task switching emulates the complex requirements of humans interactions with their context.

Better performance in task repetitions than switches.

The Response Repetition (RR) effect:



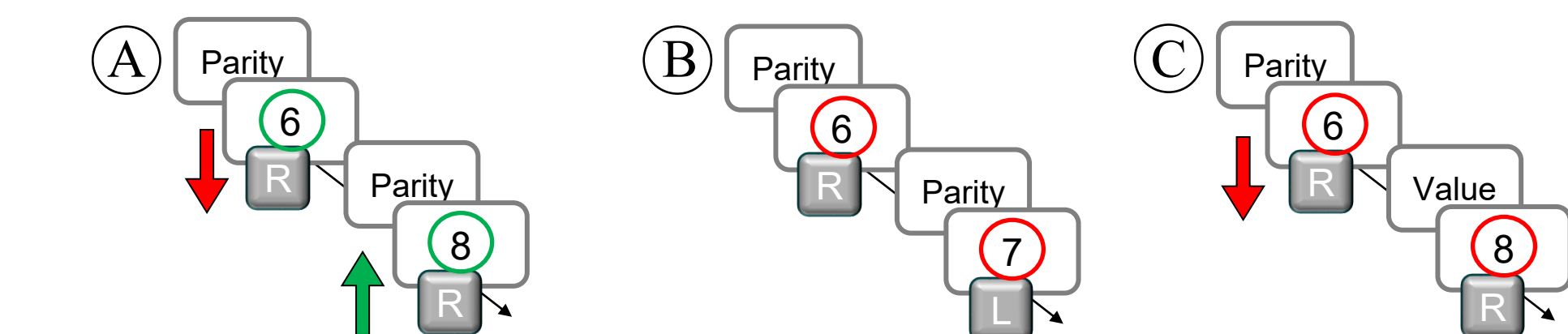
- When the task switches, better performance in response switches than repetitions (C).
- When the task repeats, better performance in response repetitions (A) than switches (B).



Investigating the RR effect in task switching can elucidate how people prepare and perform their goal-oriented actions in a multitasking setting.

Alternative Accounts for the RR Effect

1) **Response inhibition + priming account** (Druey, 2014; Hübner & Druey, 2006);

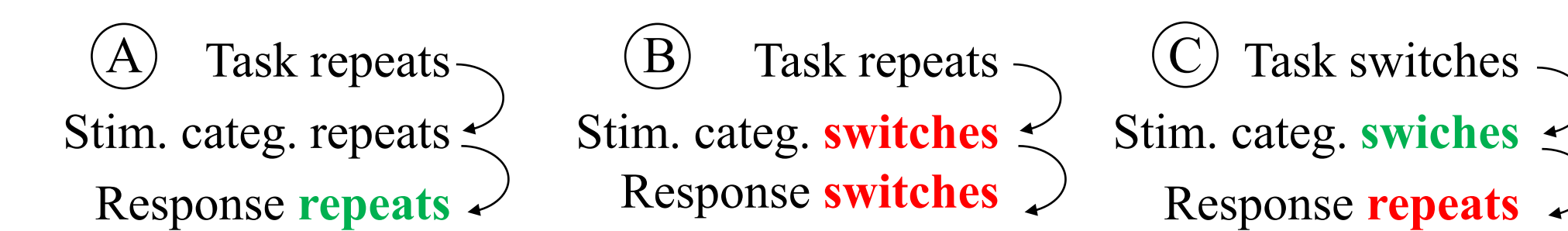


The n-1 response was inhibited; inhibition counteracted by priming from stimulus category repetition (even → even).

No inhibition of the n response, neither priming (even → odd).

The n response was inhibited; but no priming (even → >5).

2) **Reconfiguration account** (Kleinsorge, 1999). Task components organized hierarchically: Task, Stimulus category, Response. Switch vs. Repeat of higher level induces switch vs. repeat expectation on lower levels



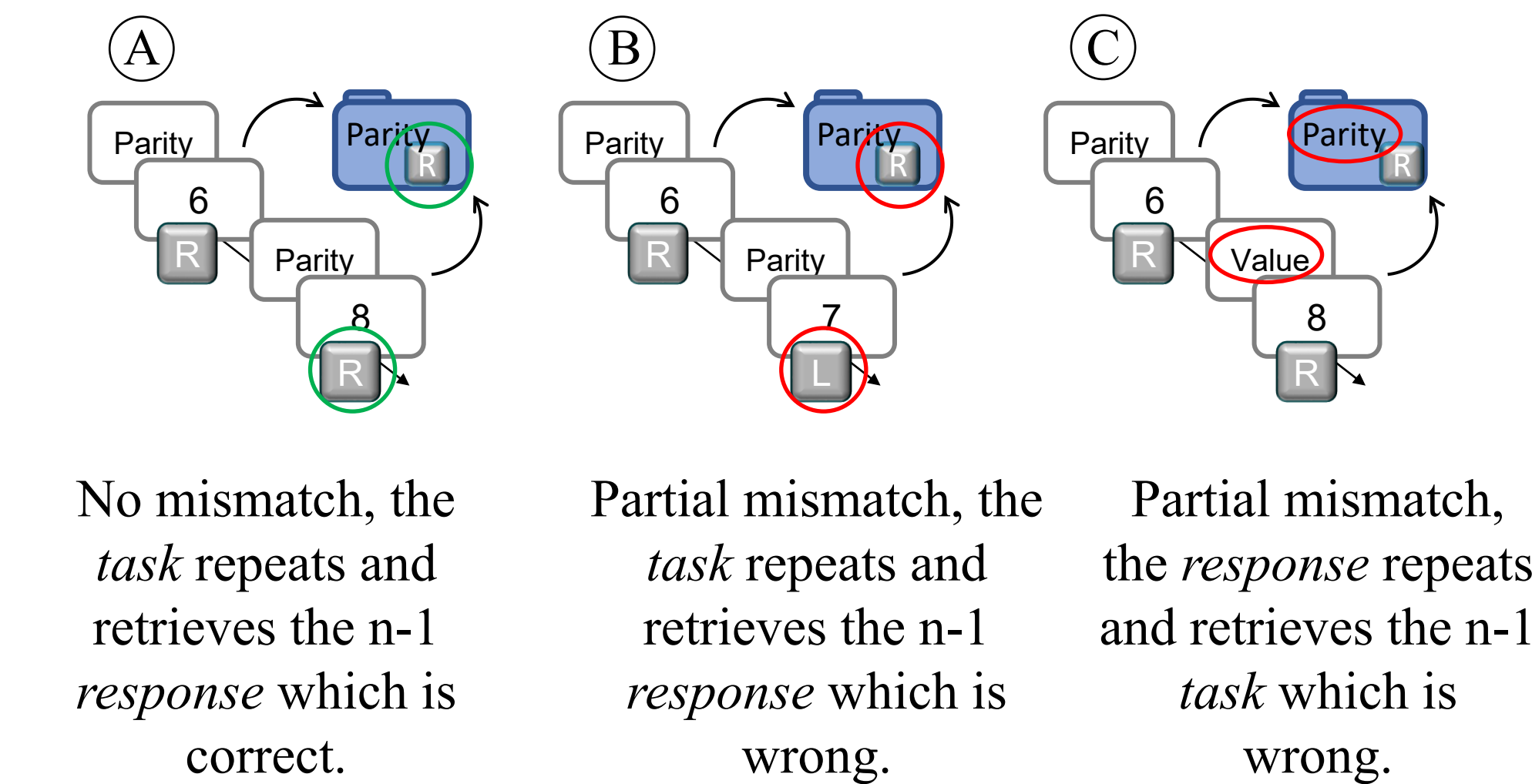
3) **Associative learning account** (Rogers & Monsell, 1995; Schuch & Koch, 2004). The response strengthens its association with the n stimulus category, (even) while weakens that with the category (>5).

Trial n-1 Even ↔ R ↔ >5

Trial n (A) Even ↔ R (B) Odd ↔ L (C) >5 ↔ R

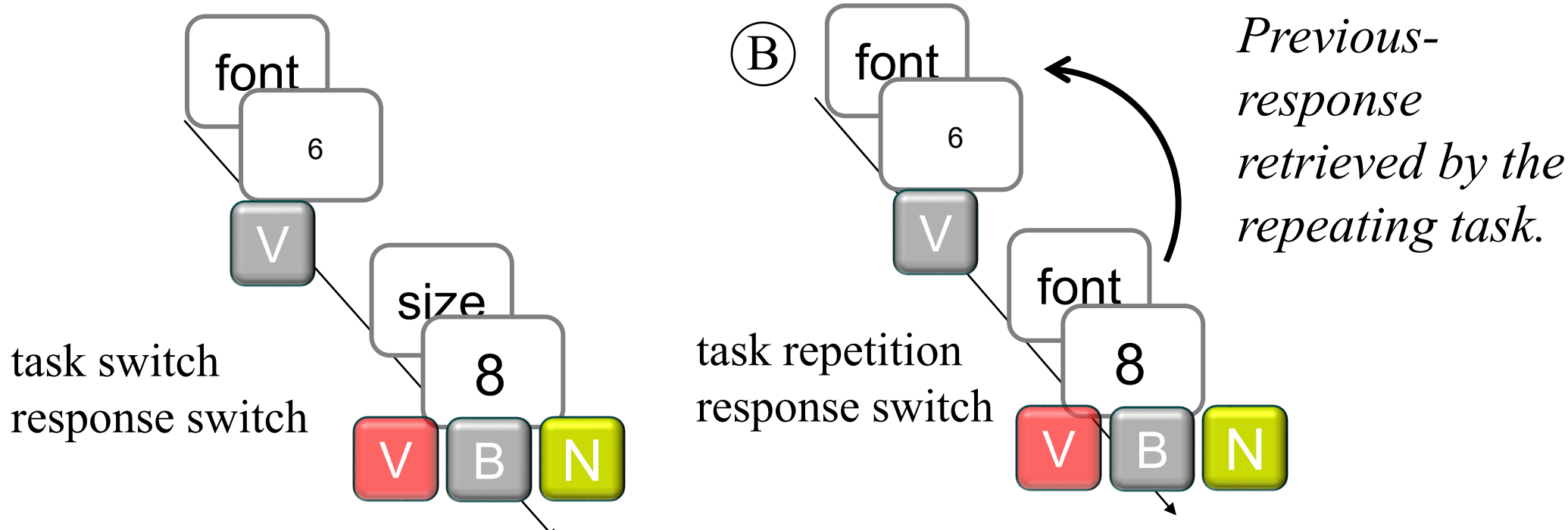
The Feature Binding and Episodic Retrieval Account

4) **Task-response binding and retrieval account** (Altmann, 2011; Koch, Frings & Schuch, 2018). For example, the BRAC framework (Frings et al., 2020). RR effect reflects **partial repetition costs**:



The Present Study

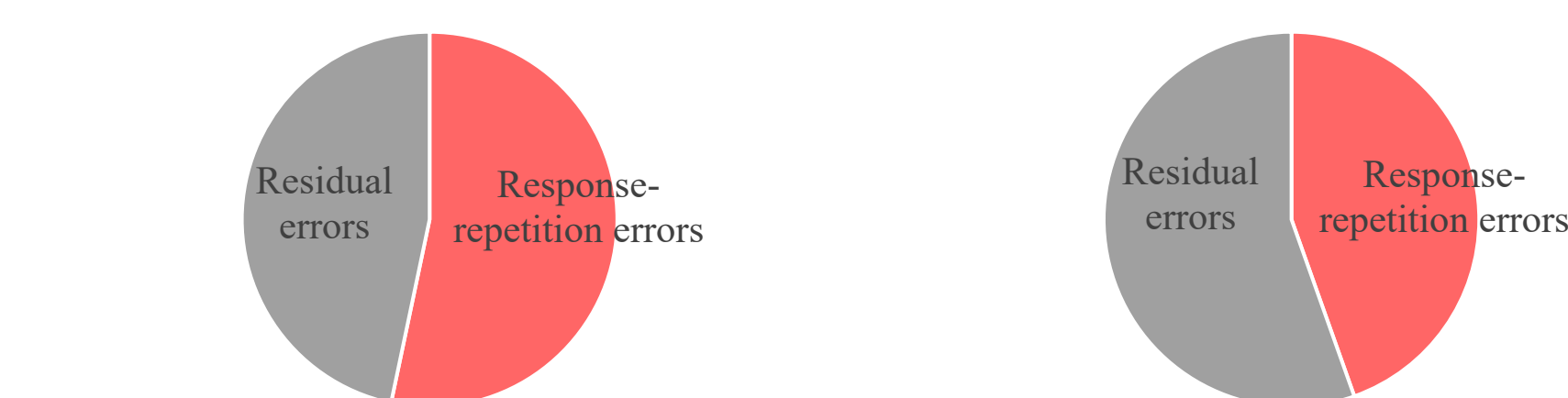
We tested a prediction from the binding and retrieval account: repeating the task should retrieve the response.



Experiment 1

Participants switched between two tasks (digit font or magnitude), with three responses (small, medium or large, mapped on V, B and N). In this example, N (large) is correct; V (small) is a response-repetition error, B (medium) is a residual error.

Hypothesis: In task repetitions, higher % of response-repetition errors than in task switches, due to task-triggered retrieval of the n-1 episode.



100% = Errors in response switches with task repetitions

100% = Errors in response switches with task switches

Experiment 2

We added a **task-irrelevant context** (i.e., cue colour) that could switch or repeat.

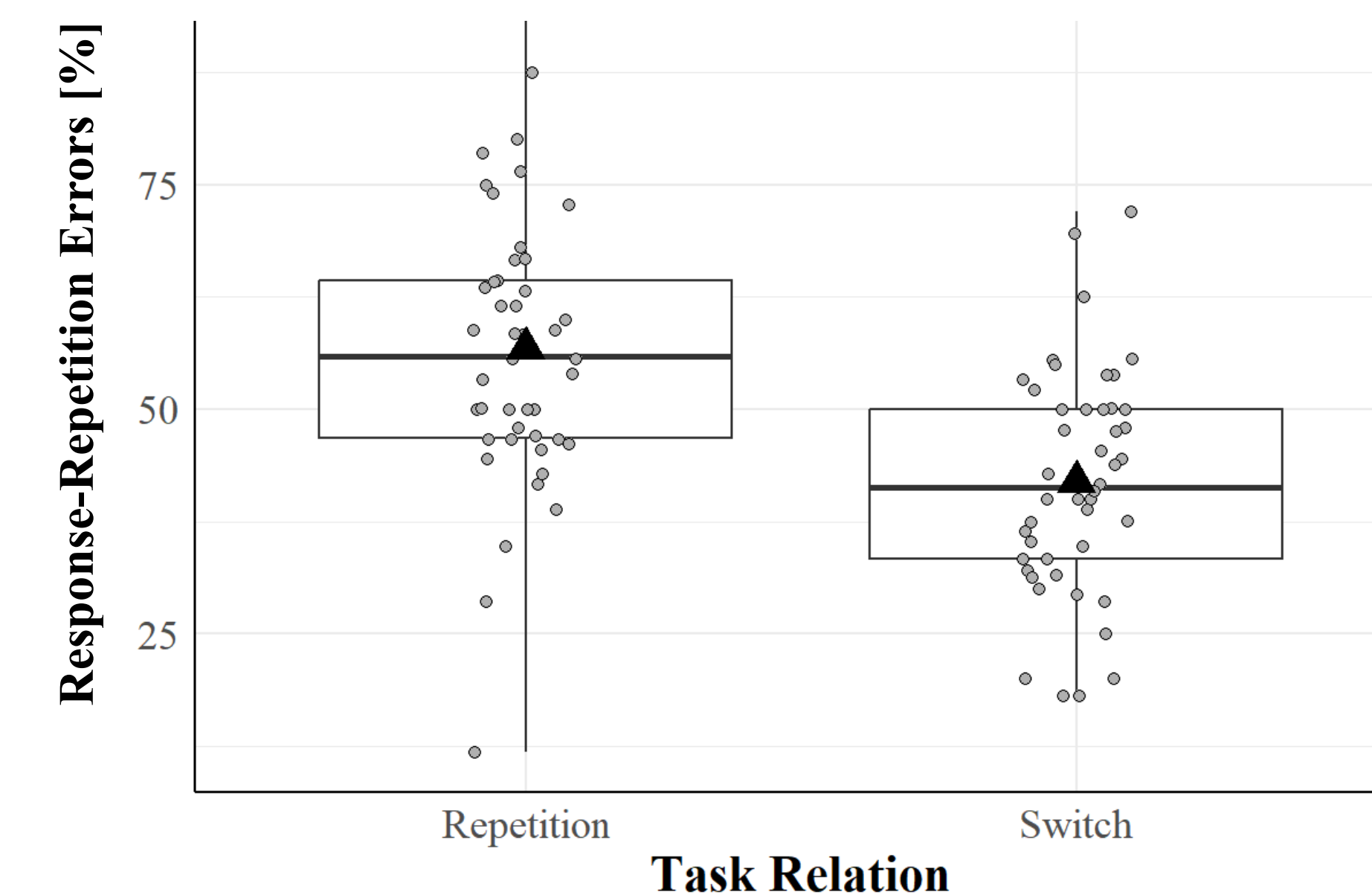
If the context was also bound with the task and the response, repeating it should augment the % response-repetition errors compared to switching the context.

Results

Results of Experiment 1 (N=46)

Most of the errors (56.8 %) were response-repetition errors in task repetitions, but the opposite was true in task switches (41.9 %), $F(1, 45) = 21.12, p < .001, \eta_p^2 = 0.32, \eta_G^2 = 0.22$.

Boxplots including the group means (the black triangles) and the individual means (the dots) in task repetitions versus switches.

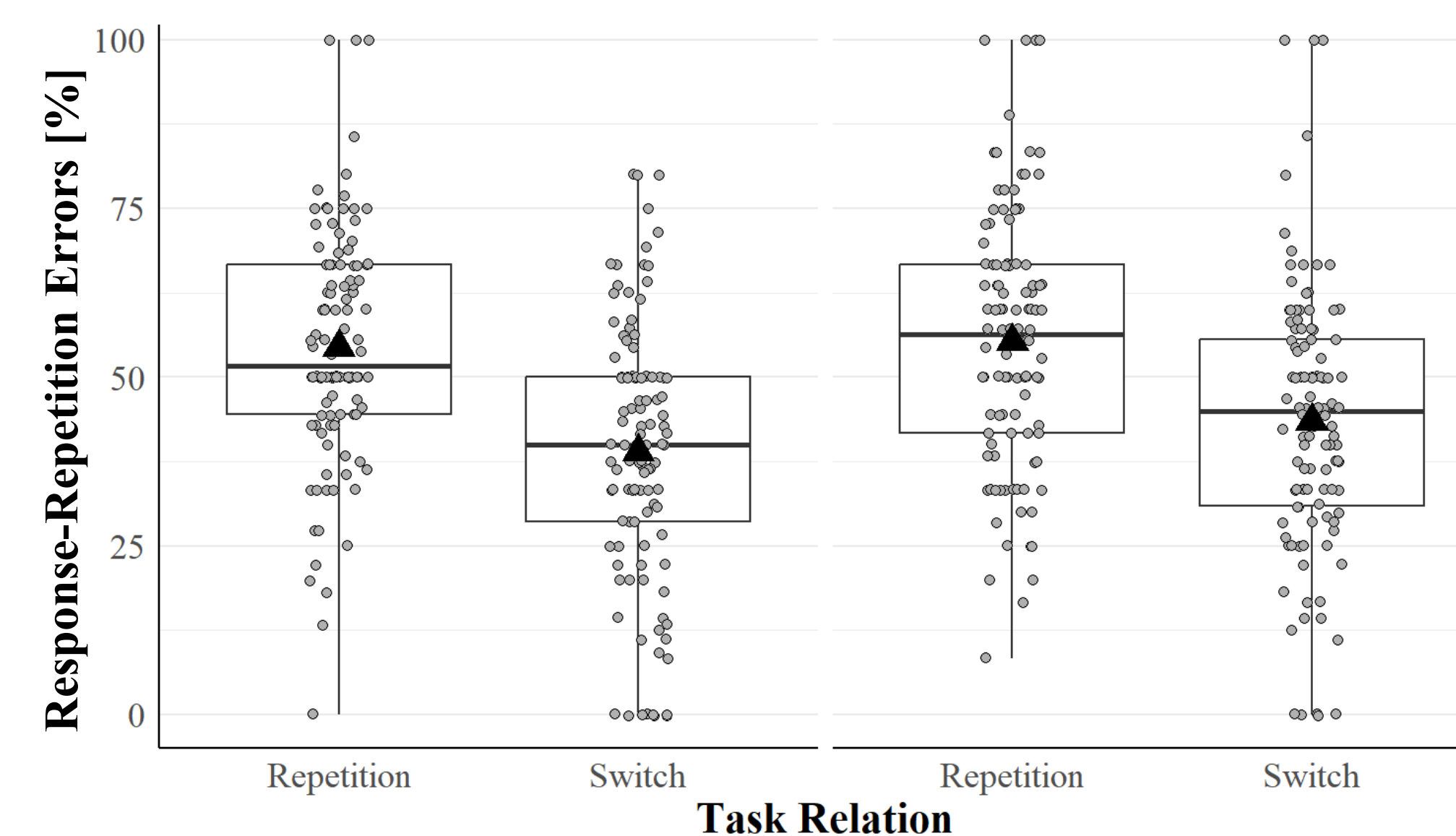


Results of Experiment 2 (N = 110)

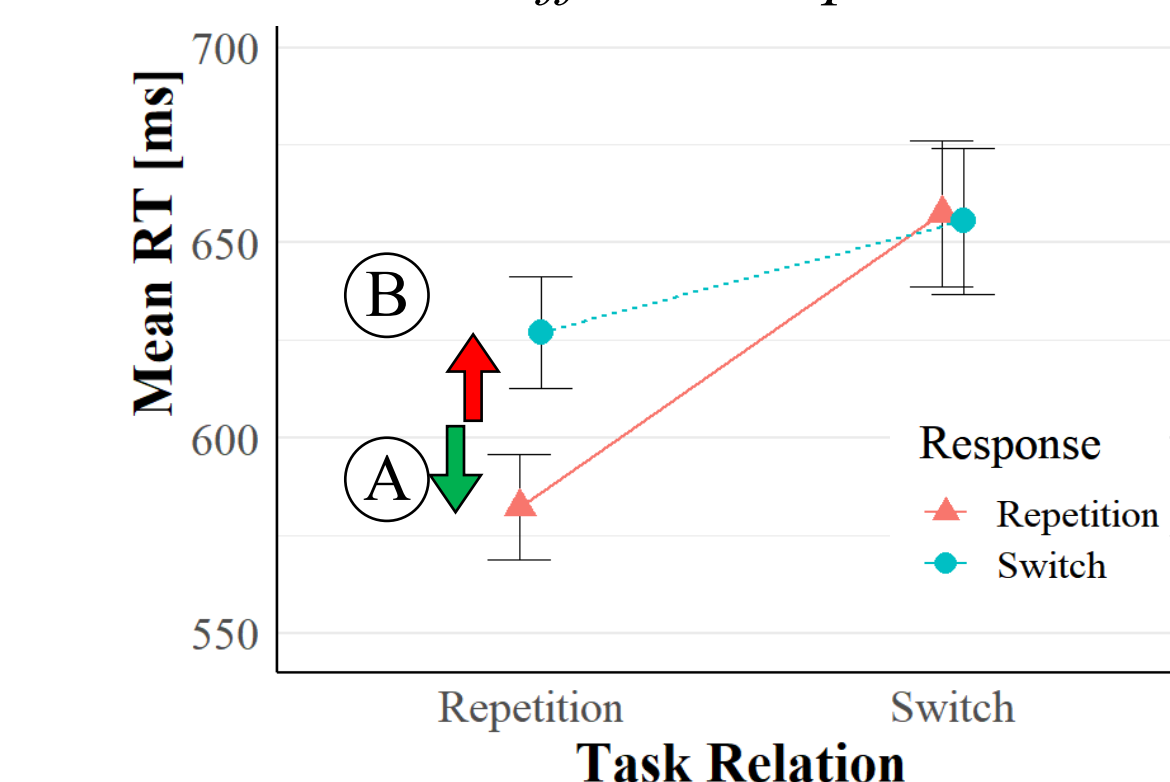
Replicated Experiment 1 with most of the errors being response-repetition errors in task repetitions but not in task switches 54.9 % vs. 41.2%, $F(1, 109) = 57.23, p < .001, \eta_p^2 = 0.34, \eta_G^2 = 0.12$.

No effect of repeating the task-irrelevant context.

Boxplots including the group means (the black triangles) and the individual means (the dots) in task repetitions versus switches and context repetitions versus switches.



The RR effect in Experiment 1



Note. Vertical bars indicate 95% confidence intervals.

The response repetition benefits in task repetitions reflect task-triggered retrieval of the n-1 response that is beneficial when both repeat (A) but detrimental when the response switches (B).

Discussion

In two experiments, more response-repetition errors were observed when the task repeated than when it switched.

Indicates task-triggered retrieval of the n-1 response, thus evidence for task-response binding.

The 3 alternative accounts do not predict this result!

We analysed only stimulus category switches. The alternative accounts predict that this prevents n-1 response activation since...

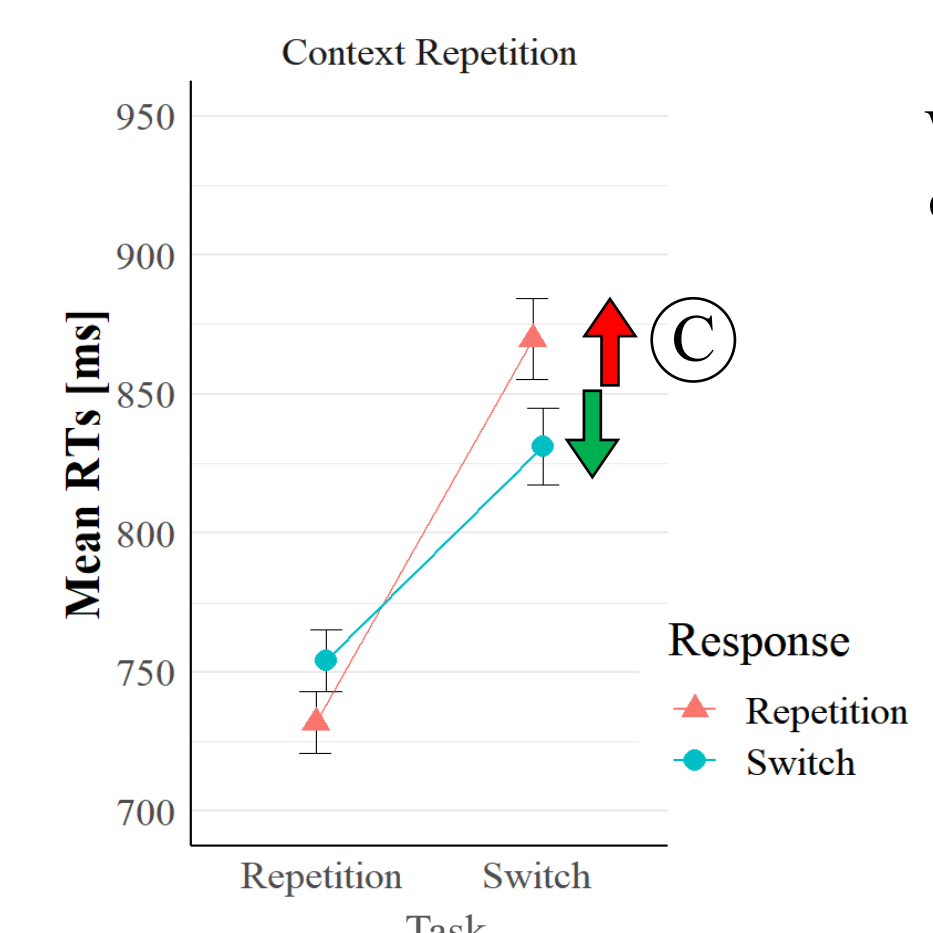
- ... there is no response priming;
- ...it demands a switch at the hierarchically-lower response level;
- ... the n-1 response is associated to another stimulus category.

These results speak in favour of a short-term task-response binding mechanism influencing task-switching performance.

Further Evidence of Episodic Retrieval

In a follow-up unpublished study, we specifically looked at RR costs in task switches.

Are RR costs in task switches due to response-triggered retrieval of n-1 task?



We found evidence for larger % of task-repetition errors in correct-response repetitions than in correct-response switches.

Taken together, task-response short-term binding and retrieval can explain the RR effect without assuming a response inhibition mechanism, a special role of the stimulus category or a longer-term stimulus-category-response association mechanism.

References

- The present study is published: Benini, E., Möller, M., Koch, I., Philipp, A. M., Qiu, R., & Mayr, S. (in press). Evidence of Task-Triggered Retrieval of the Previous Response: A Binding Perspective on Response-Repetition Benefits in Task Switching. *Psychonomic Bulletin & Review*.
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