# Evidence of episodic retrieval in task switching:
# Repeating the response retrieves the task and vice versa


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



RWTH AACHEN UNIVERSITY — Chair for Cognitive and Experimental Psychology — BINDING AND RETRIEVAL IN ACTION CONTROL

**BRAC Conference at Trier University**
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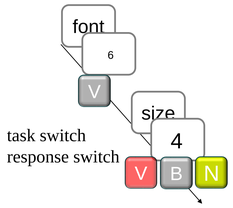
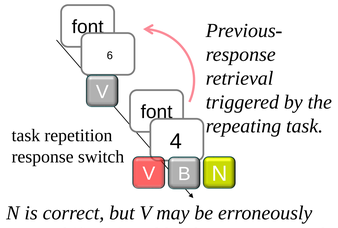
## Study 1: Task-Triggered Retrieval of the N-1 Response

Participants switched between two tasks (digit font or magnitude), with three responses (small, medium or large, mapped on V, B and N, respectively). We could distinguish correct responses from response-retrieval errors from residual errors.

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



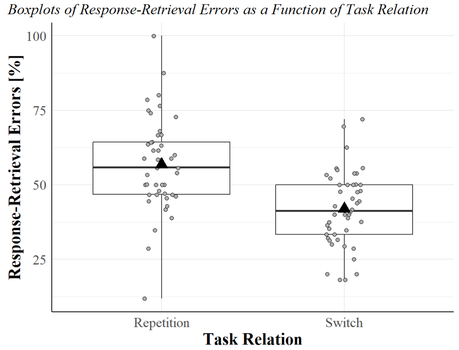




*Previous-response retrieval triggered by the repeating task.*

*N is correct, but V may be erroneously pressed if retrieved by the repeating task.*

## Higher % of Response-Retrieval Errors With Task Repetitions Than Switches

*Boxplots of Response-Retrieval Errors as a Function of Task Relation*

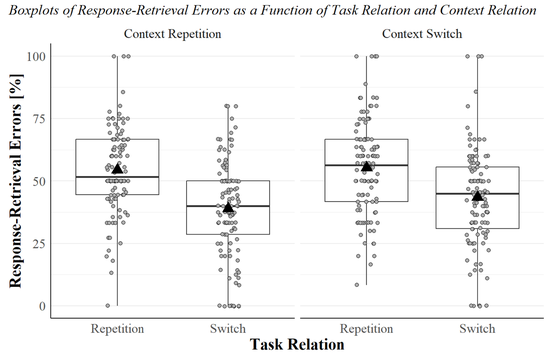



In Experiment 1 (N=46), most of the errors (56.8 %) were response-retrieval errors in task repetitions, but the opposite was true in task switches (41.9 %), $F(1, 45) = 21.12$, $p < .001$, $\eta_p^2 = 0.32$, $\eta_G^2 = 0.22$.

Replicated in an Experiment 2 (N = 110), 54.9 % vs. 41.2%, $F(1, 109) = 57.23$, $p < .001$, $\eta_p^2 = 0.34$, $\eta_G^2 = 0.12$.

In Experiment 2, we had also an irrelevant context (i.e., cue colour), but repeating it did not significantly increase response-retrieval errors—only numerically.

*Boxplots of Response-Retrieval Errors as a Function of Task Relation and Context Relation*



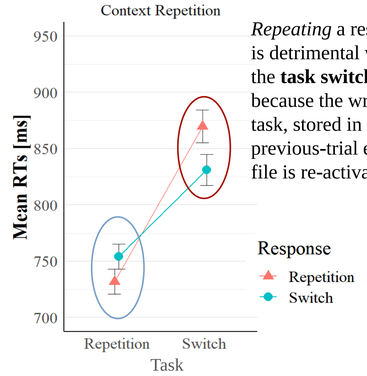

## The Response Repetition (RR) Effect

In task switching, response repetition benefits in task repetitions but *costs* in task switches. Different accounts exist that can explain this effect:

i. response inhibition + priming accounts (Druey, 2014; Hübner & Druey, 2006);
ii. reconfiguration account (Kleinsorge, 1999);
iii. associative learning account (Rogers & Monsell, 1995; Schuch & Koch, 2004);
iv. task-response binding and retrieval account (Altmann, 2011; Koch, Frings & Schuch, 2018). For example, the BRAC framework (Frings et al., 2020) frames the RR effect as partial repetition costs:

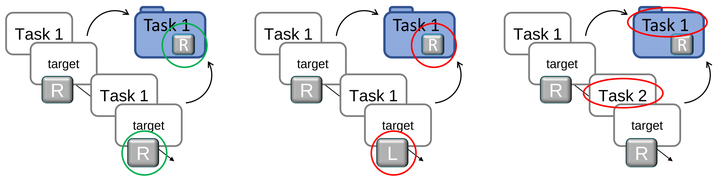
Switching a response is detrimental when the **task repeats**, because the wrong response, stored in the previous-trial event-file, is re-activated.

Study 1




*Repeating* a response is detrimental when the **task switches**, because the wrong task, stored in the previous-trial event-file is re-activated.

Study 2




No mismatch, the task repeats and retrieves the n-1 response which is correct.

Partial mismatch, the task repeats and retrieves the n-1 response which is wrong.

Partial mismatch, the response repeats and retrieves the n-1 task which is wrong.

## Summary & Discussion

We provided evidence for episodic retrieval upon task repetition & upon response repetition.

- In Study 1, across two experiments, participants were indeed more likely to erroneously repeat the response when the task repeated than when it switched. This is evidence for task-triggered retrieval of the n-1 response.
- In Study 2, participants were more likely (re-analysis) or showed a tendency (current experiment) to erroneously repeat the n-1 task when the correct response repeated. This is evidence for response-triggered retrieval of the n-1 task.

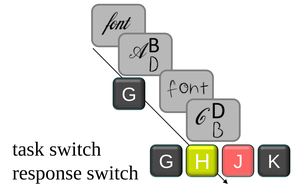
In both studies, the task-relevant stimulus dimension never repeated—we only analysed response switches in Study 1, and task switches in Study 2. The results cannot be easily explained with stimulus category repetition priming, which is implied by the other three theoretical accounts for the RR effect.

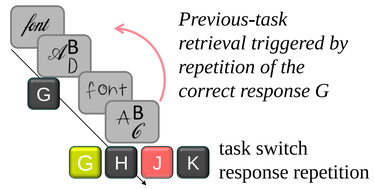
To our knowledge, these are the first studies providing direct evidence for response retrieval by task and for task retrieval by response in task switching.

## Study 2: Response-Triggered Retrieval of the N-1 Task

Participants switched between three tasks (detect the letter in a given font), with four responses (A, B, C, or D mapped on G, H, J and K, respectively). We could distinguish correct responses from n-1 task confusion errors, third task-confusion errors and response confusion errors.

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



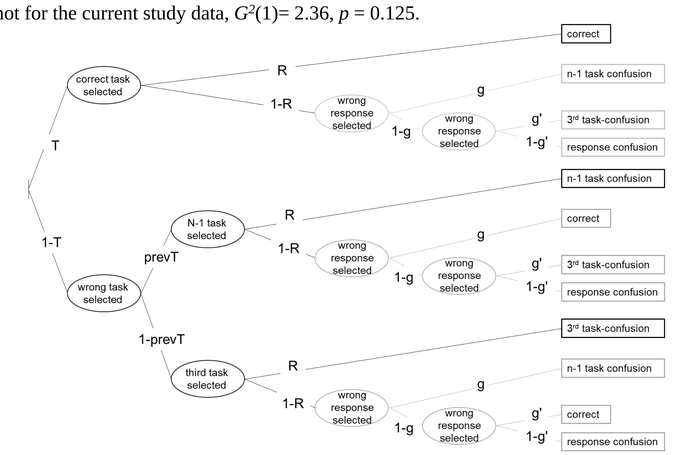

*G is correct, but J may be erroneously pressed if the n-1 task is retrieved and performed.*

## Higher % of N-1 Task Confusions Errors with Response Repetitions Than Switches

We looked at the % of each error type over the total number of errors, pooling data from all participants (N=96). We found higher probability of n-1 task confusions in response repetitions than in switches. We also re-analysed the dataset of Grange (2023) (N=255) who also employed three tasks and four responses, and found the same results.

| | | % of Errors Pooled | |
|---|---|---|---|
| **Response** | **Category** | **Current** | **Grange, 2023** |
| Response Repetition | N-1 task confusion | **32.62%** | **45.80%** |
| | Response confusion | 28.74% | 6.44% |
| | Third task confusion | 38.64% | 47.76% |
| Response Switch | N-1 task confusion | **29.19%** | **36.01%** |
| | Response confusion | 27.76% | 6.93% |
| | Third task confusion | 43.05% | 57.06% |

We designed the Multinomial Processing Tree Model (MPT) below. The *T* parameter indicates selection of the correct task, *prevT* selection of the n-1 task, and *R* selection of the correct response for the selected task. We predicted the $prevT_{response\ repetition}$ parameter to be higher in response repetitions than switches. Thus, a model in which $prevT_{response\ repetition} = prevT_{response\ switch}$ should misfit the data. This was the case for Grange (2023) data, $G^2(1)= 45.87$, $p < .001$, but not for the current study data, $G^2(1)= 2.36$, $p = 0.125$.




| **prevT Parameter** | **Saturated Model Estimates (C.I.)** | |
|---|---|---|
| | Current Study | Grange (2023) |
| Response Repetition | .31 (.14-.47) | 0.48 (.46-.51) |
| Response Switch | .12 (.01-.24) | 0.36 (.35-.39) |

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