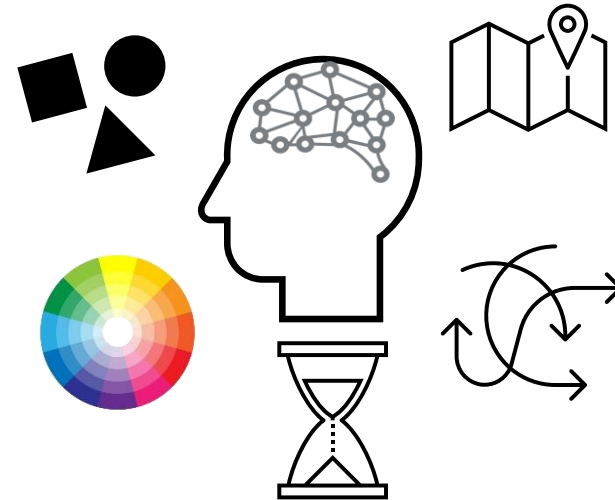




Contextual and Temporal Influences on Abstract Cognitive Control

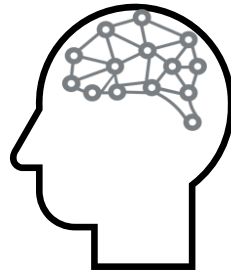
Moritz Schiltenswolf

21.05.2025



Cognitive control

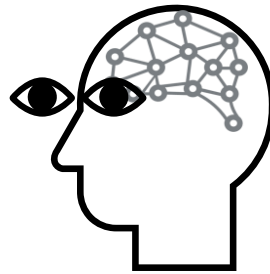
Representing the perceived world in line with internal goals



Cognitive control

Representing the perceived world in line with internal goals

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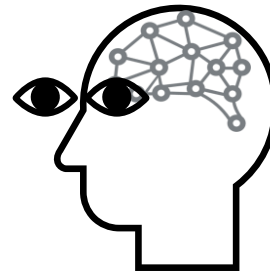
Cognitive control

Representing the perceived world in line with internal goals

State of cognitive control

ABCD		12345
EFGH		67890

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Cognitive control

Representing the perceived world in line with internal goals

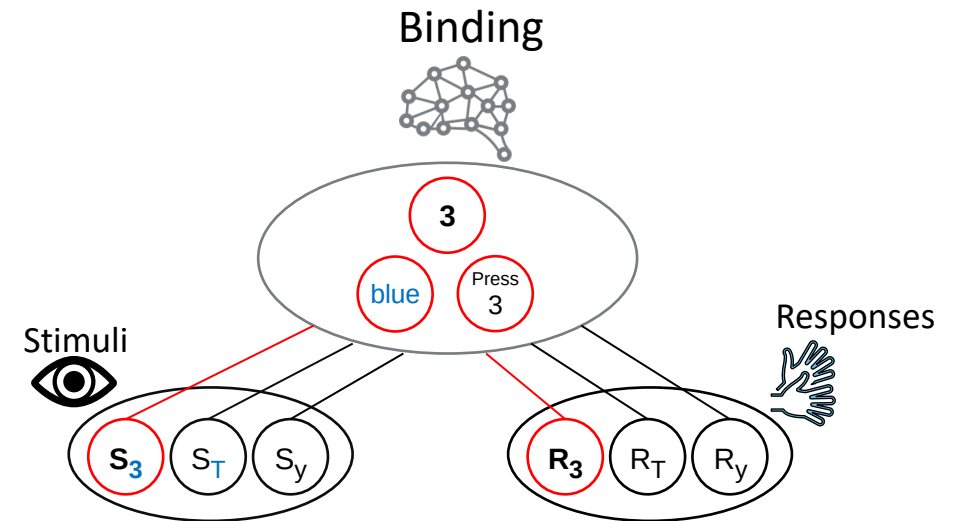
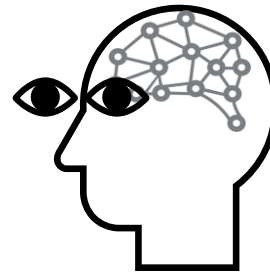
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State of cognitive control

ABCD
EFGH



12345
67890



Adopted from Hommel, et al. (2001)
See also Frings et al. (2020, 2024)

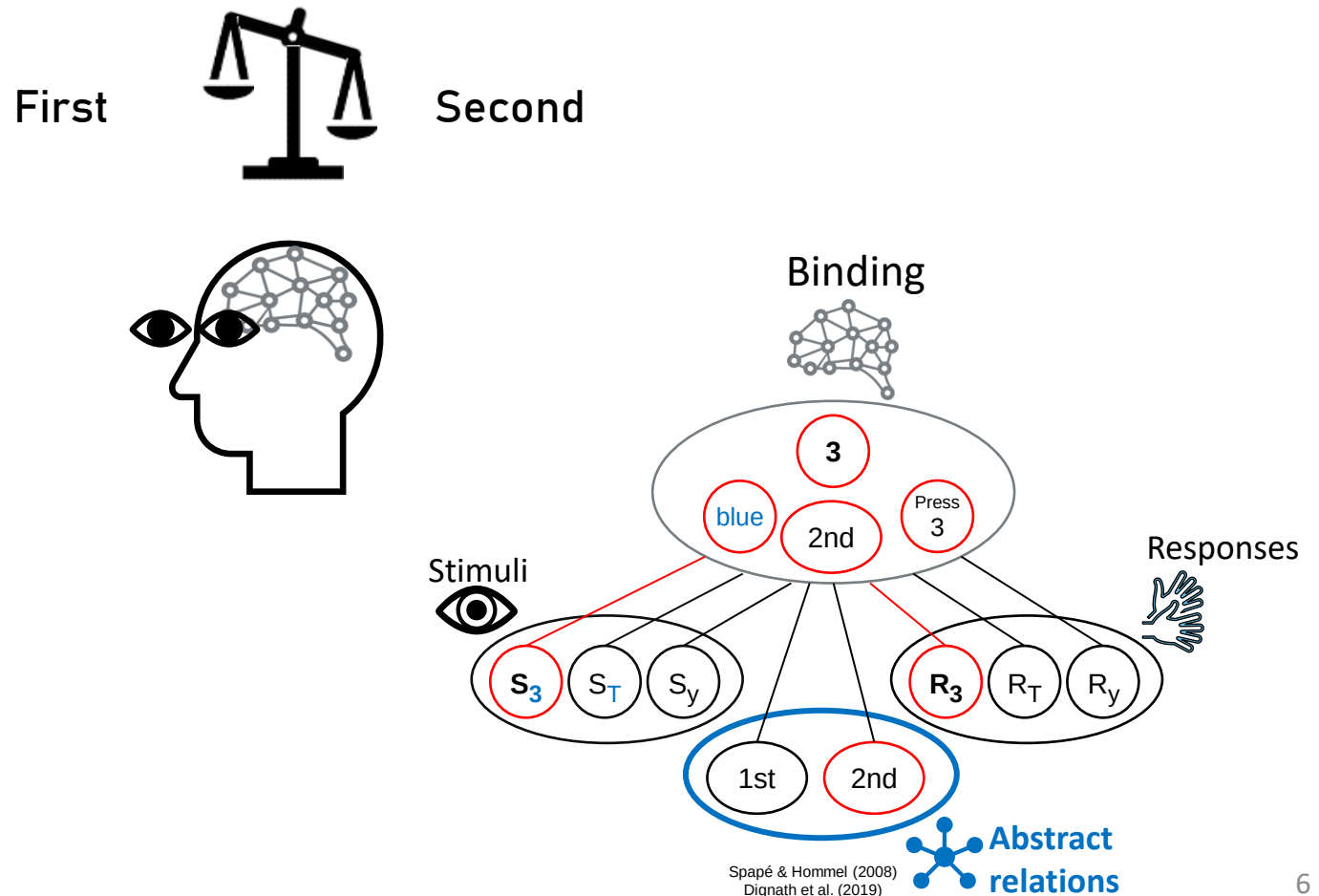


Cognitive control

Representing the perceived world in line with internal goals

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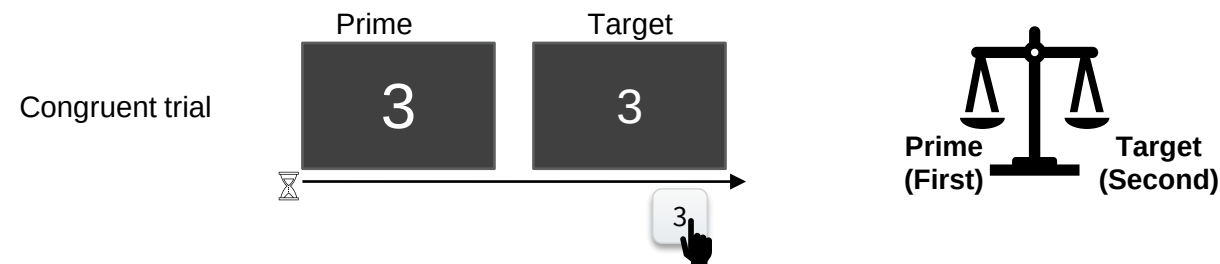
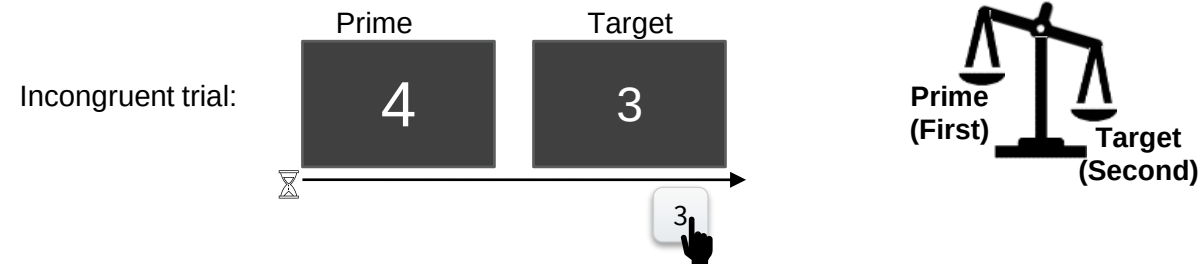
Abstract cognitive control



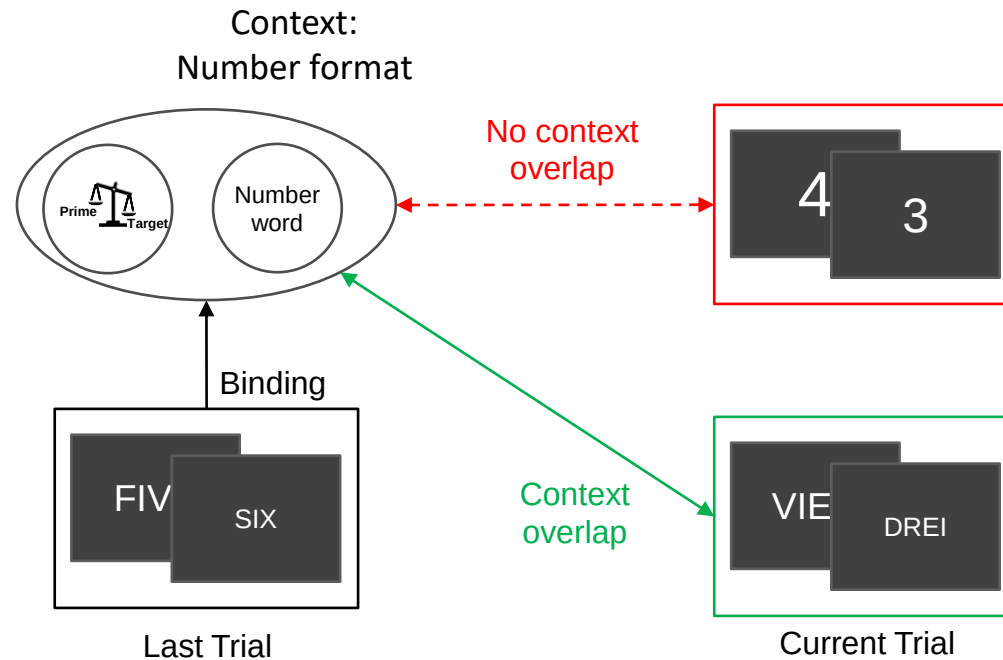
Spapé & Hommel (2008)
Dignath et al. (2019)

**Abstract
relations**

Testing abstract cognitive control in experiments.



Testing abstract cognitive control in experiments.



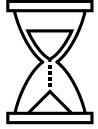
Behavioral
measures

Reaction
times

Error
rates



Central research questions



How is the ***time course*** of abstract cognitive control (bindings)?



Is the context-specificity of abstract cognitive control the result of a ***retrieval process***?

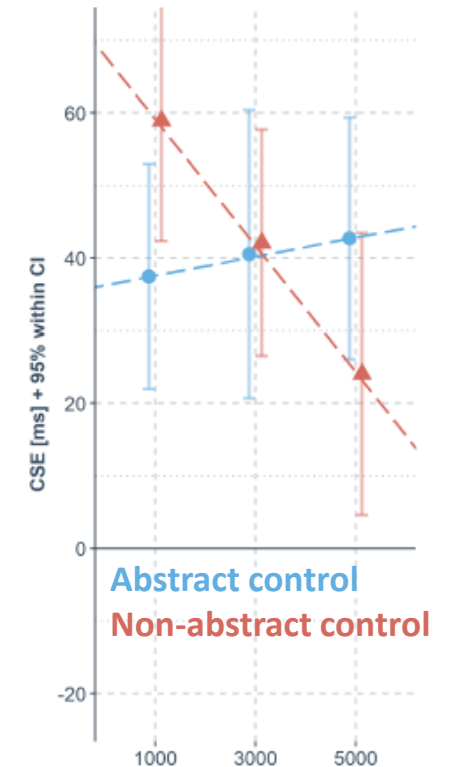
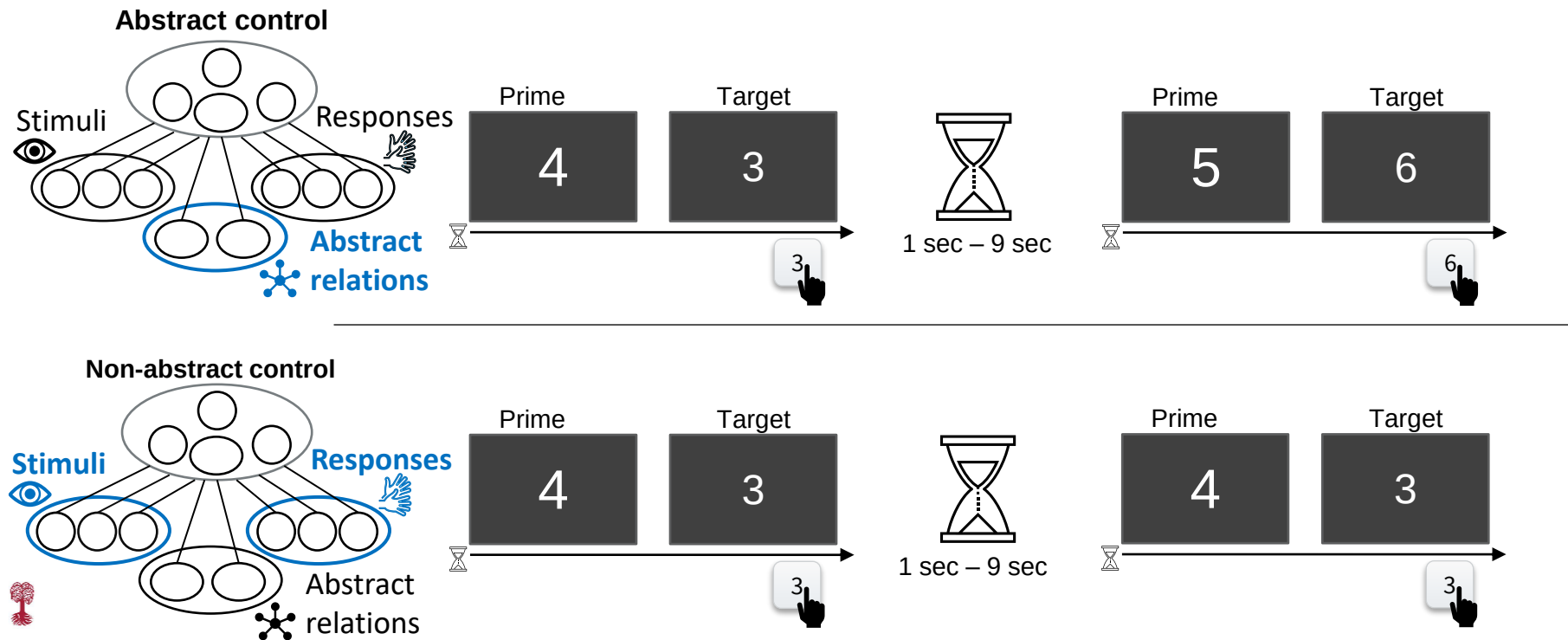


Can control-context bindings be ***generalized to task control***?



How is the *time course* of abstract cognitive control (bindings)?

1) Compare the time-course of abstract and non-abstract control states.

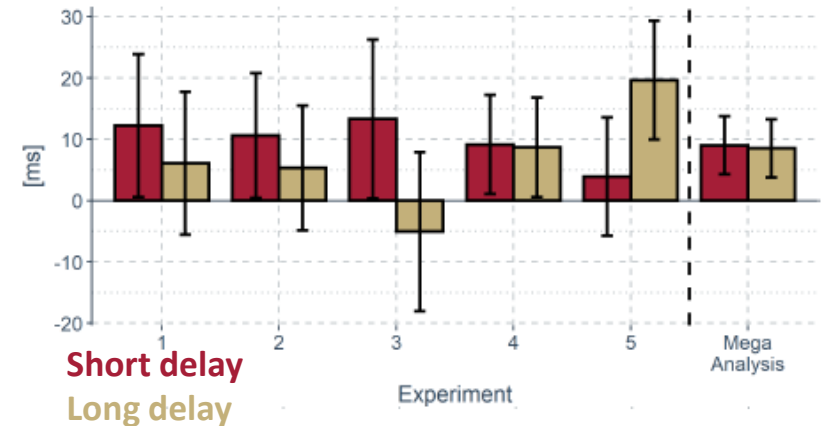
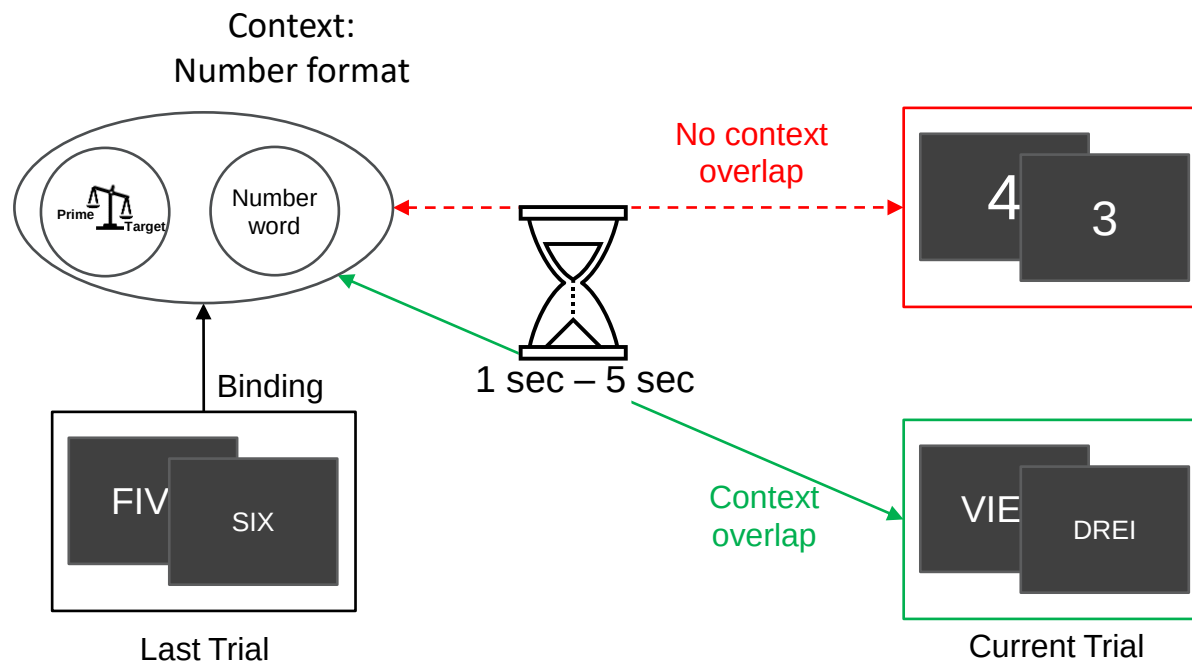


4 experiments show that **abstract control states are robust against temporal delays.** **Non-abstract control states seem to decay over time**

Schiltenswolf, M., Kiesel, A., & Dignath, D. (2022). No temporal decay of cognitive control in the congruency sequence effect. *Journal of Experimental Psychology: Learning, Memory, and Cognition*. <https://doi.org/10.1037/xlm0001159>.

How is the *time course* of abstract cognitive control (bindings)?

2) Are bindings between abstract control states and their context temporally robust?



Mixed-results.

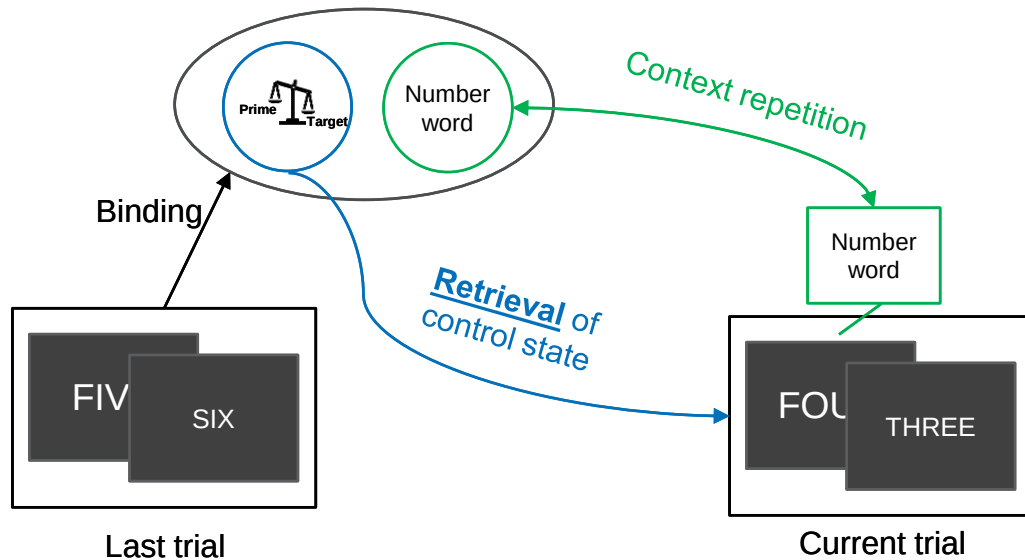
Large sample analysis
(5 experiments; N=326)
suggests **temporal stability** of
context-control bindings

Schiltenswolf, M., Kiesel, A., Frings, C., & Dignath, D. (2023). Memory for abstract control states does not decay with increasing retrieval delays. *Psychological Research*. <https://doi.org/10.1007/s00426-023-01870-4>



Is the context-specificity of abstract cognitive control the result of a *retrieval process*?

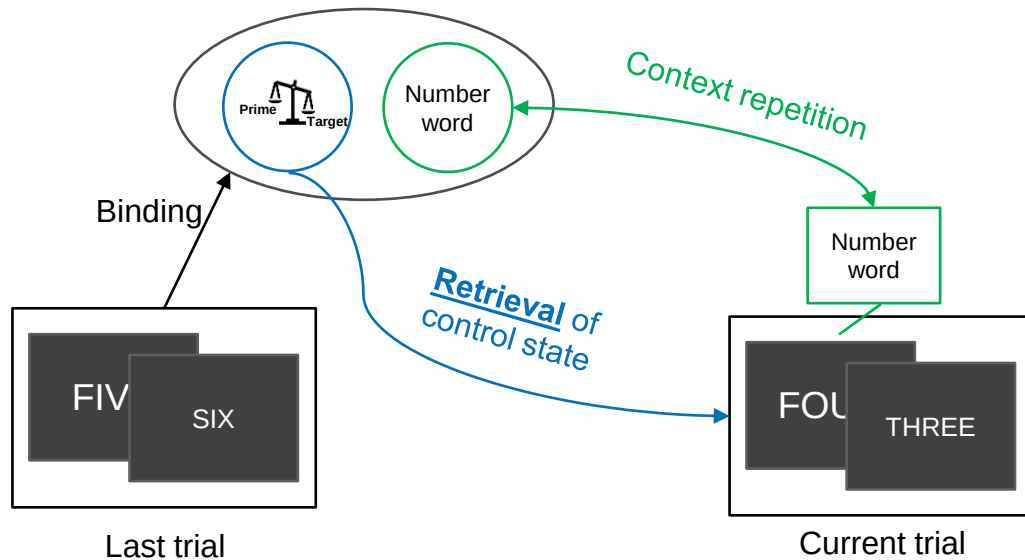
Binding theories claim that feature repetitions initiate a retrieval process. Frings et al. (2020, 2024)



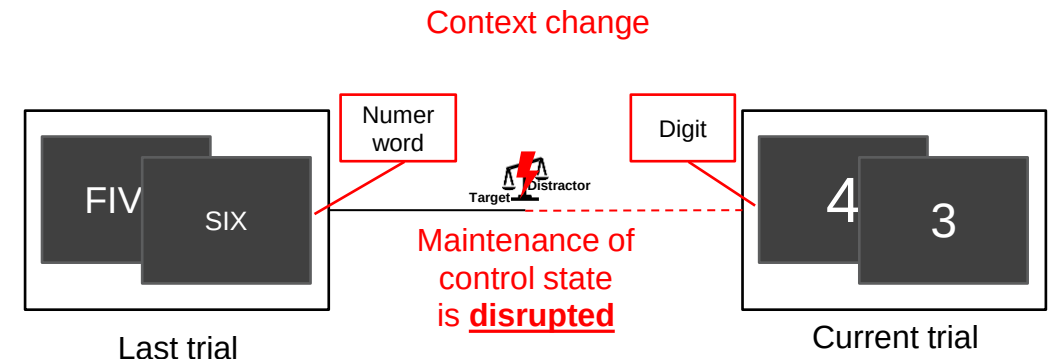
Is the context-specificity of abstract cognitive control the result of a *retrieval process*?

Binding theories claim that feature repetitions initiate a retrieval process. Frings et al. (2020, 2024)

However, context-change induced control disruption was proposed as alternative. Kreutzfeld et al. (2016)



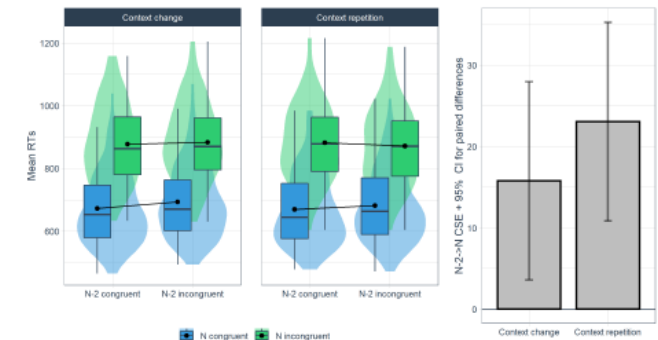
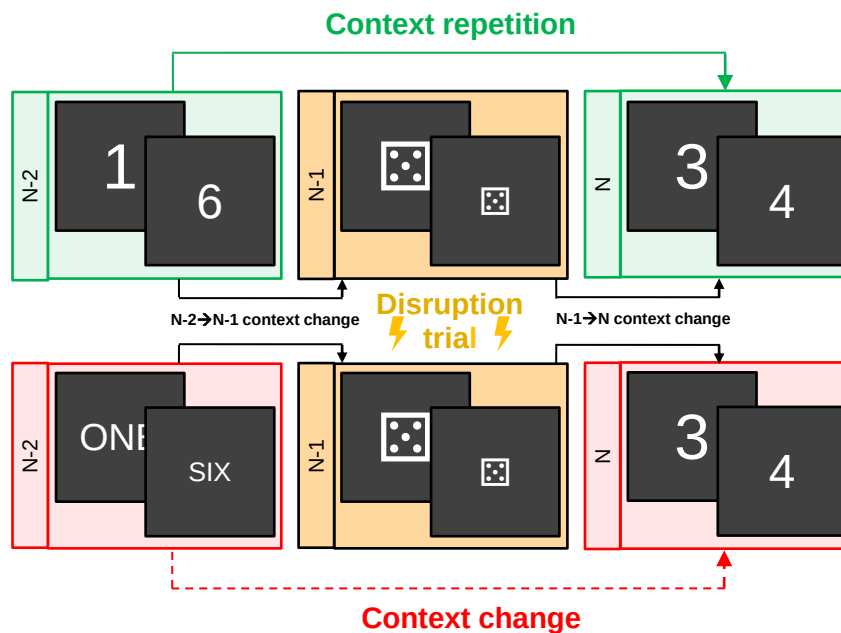
VS.



Is the context-specificity of abstract cognitive control the result of a *retrieval process*?

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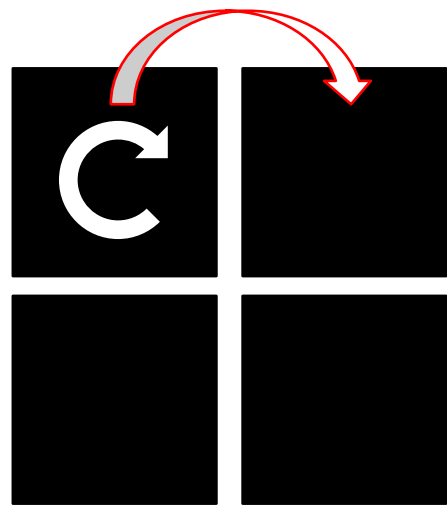
Results of 3 experiments favor control disruption as the mechanism behind context-specific cognitive control.



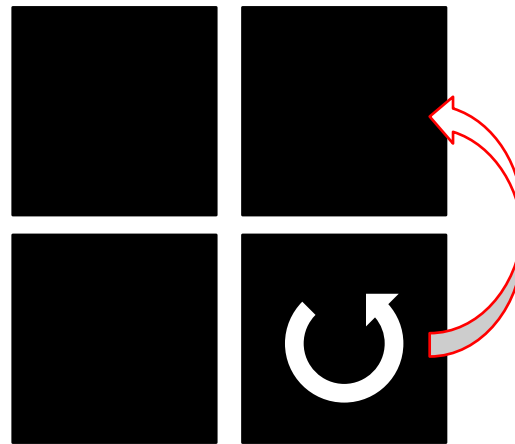
Can control-context relationships be *generalized to task control*?

Studies investigating context-control bindings focus on attentional-weighting.

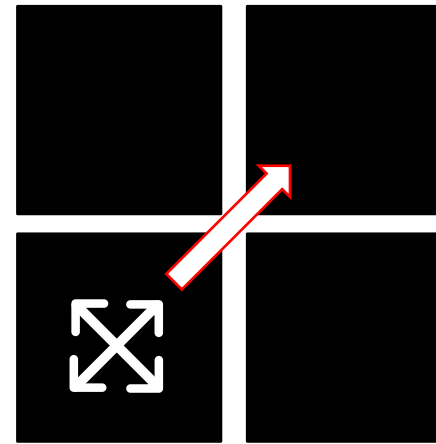
But can we find similar effects in abstract task control?



Task „clockwise“

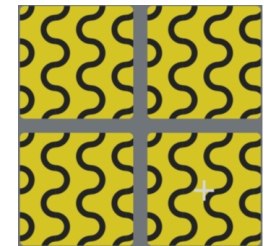
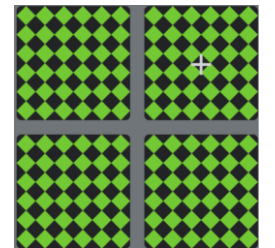
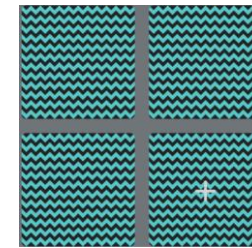


Task „counter-clockwise“

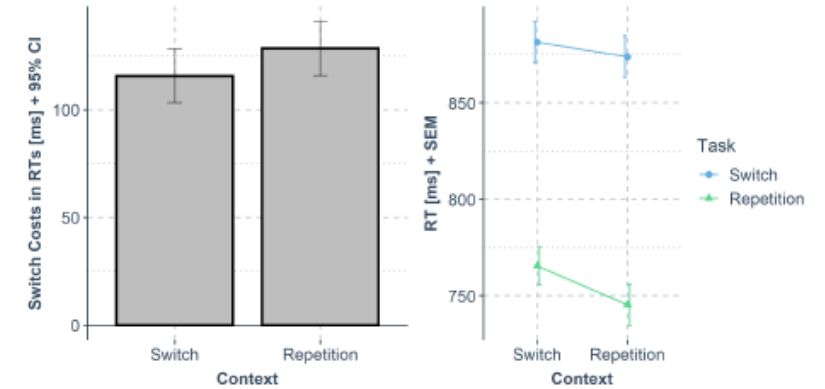
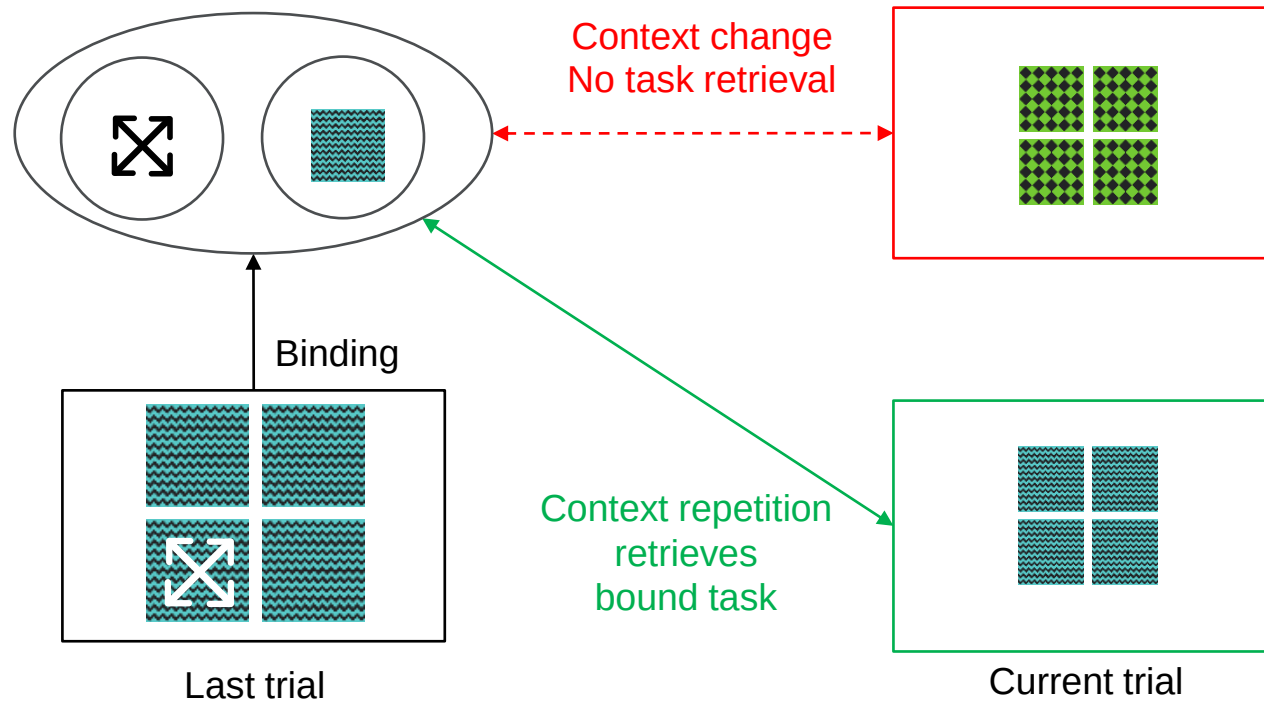


Task „across“

Context „background pattern“



Can control-context relationships be *generalized to task control?*



Results of 3 experiments robustly show evidence for bindings between contexts and response-independent tasks

Key takeaways

Abstract control states and their bindings are resilient against temporal delays.

Context changes seem to disrupt the maintenance of cognitive control. Retrieval seems to be less important than assumed by binding theories.

Context to control bindings are not specific to attentional control, but can be generalized to abstract task rules.



Literature

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