

Learned action sequences scaffold novel event memories

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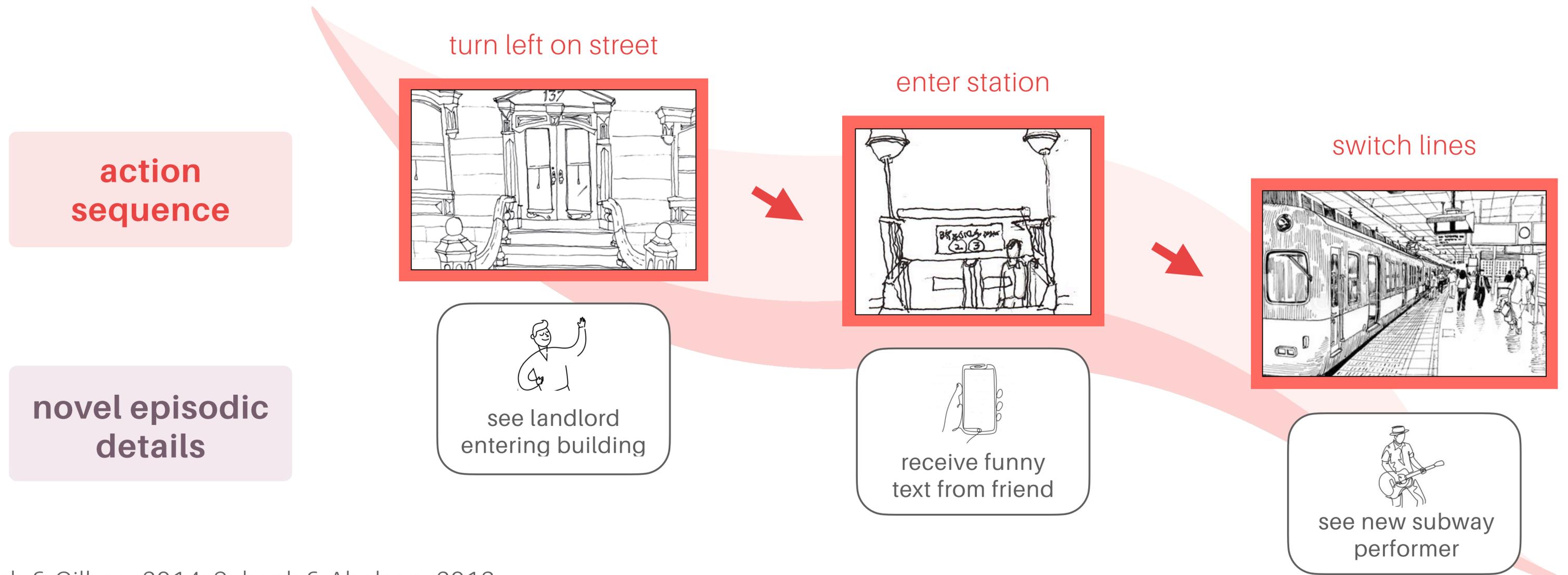
²Nathan Kline Institute

Davachi Memory Lab

Background

Our lives contain many highly familiar sequences of behaviors (**action sequences**), e.g., a commute.

While previous work has explored how prior knowledge structures can facilitate novel, conceptually-related learning¹⁻⁴, here we ask the novel question: **how does engaging in a familiar action sequence scaffold memory for unrelated information that is encountered in parallel?**



Background

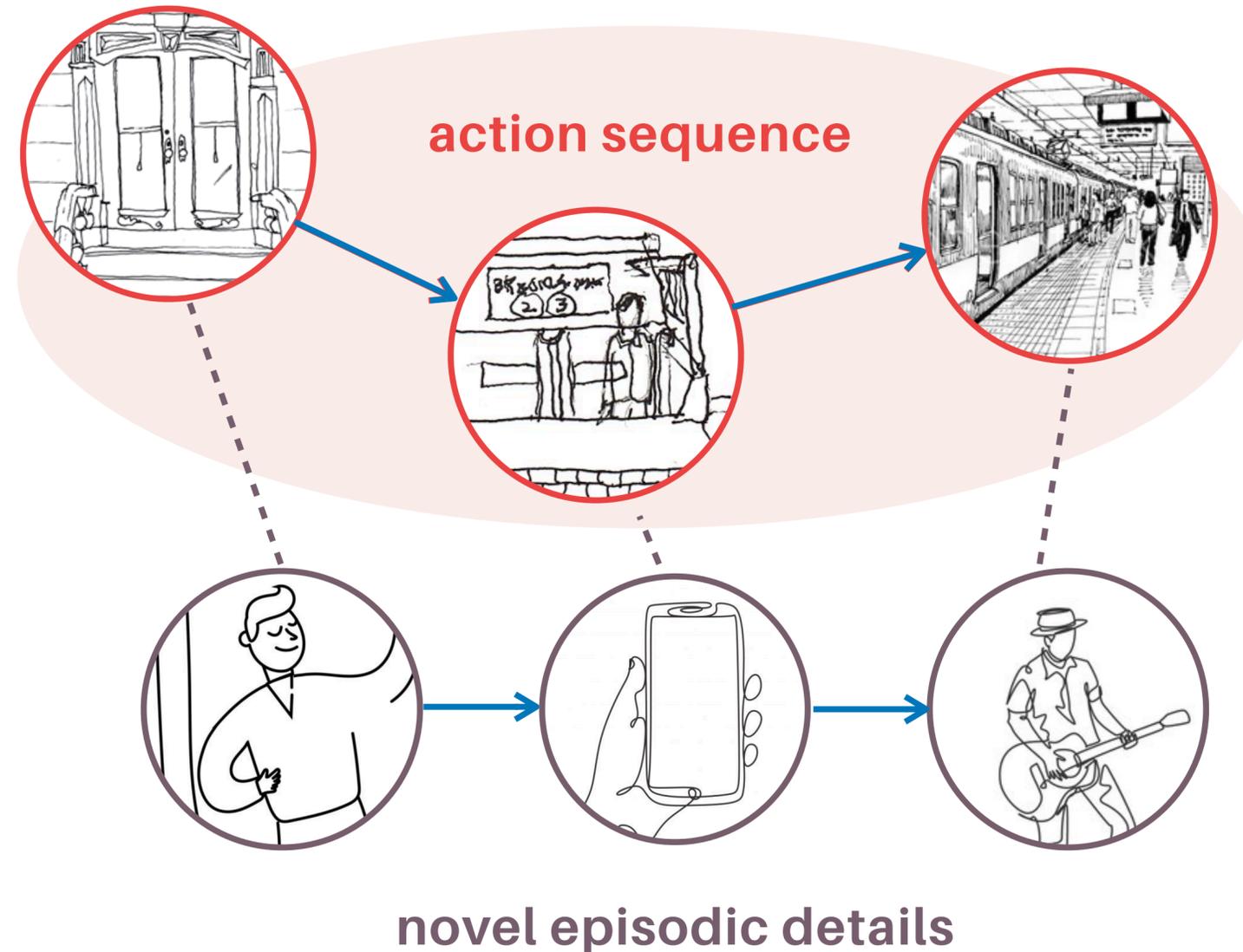
How might action sequences scaffold novel encoding?

attentional resources hypothesis

prior knowledge frees up cognitive resources for the processing of new material⁵⁻⁸



all types of memory should be enhanced



temporal scaffolding hypothesis

novel pieces of information get embedded within a **pre-existing memory representation**^{1,9-10}

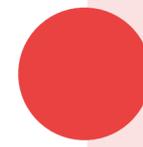
because the action sequence extends across time, it promotes encoding of the **temporal links** between novel items

Experiment Design

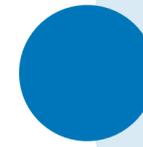
3 online experiments
N = 80 participants each

Participants complete errands through two stores: the **pet store** & the **grocery store**.

During each errand, they press a series of buttons to visit a sequence of aisles & collect a sequence of items.

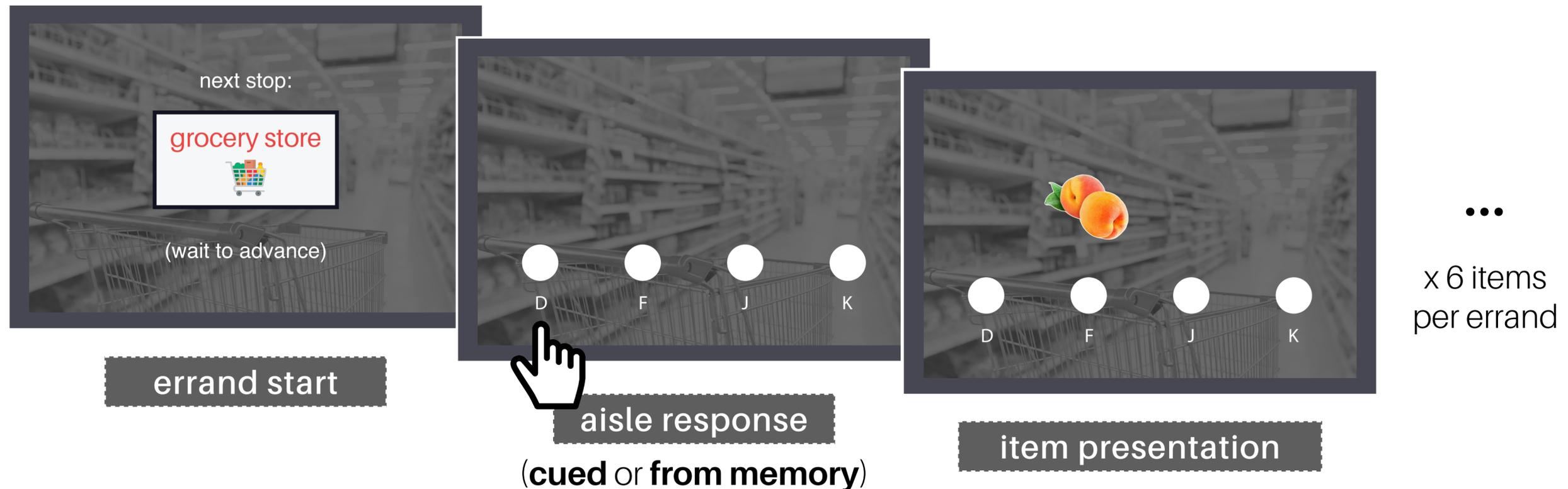


In the **predictable** store, the route that Ps follow (the sequence of buttons they press & the aisle locations objects appear in) is **always the same**.



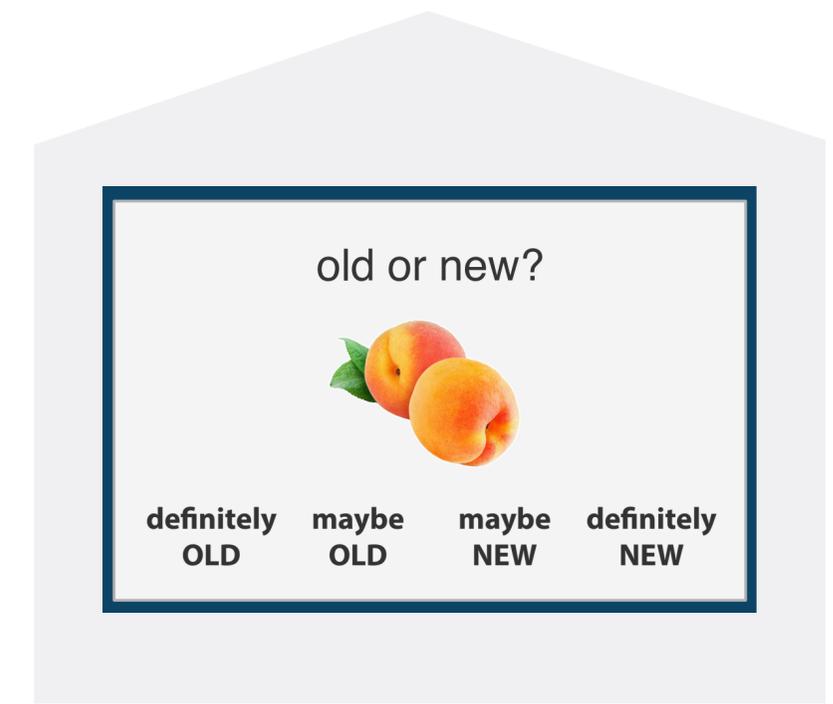
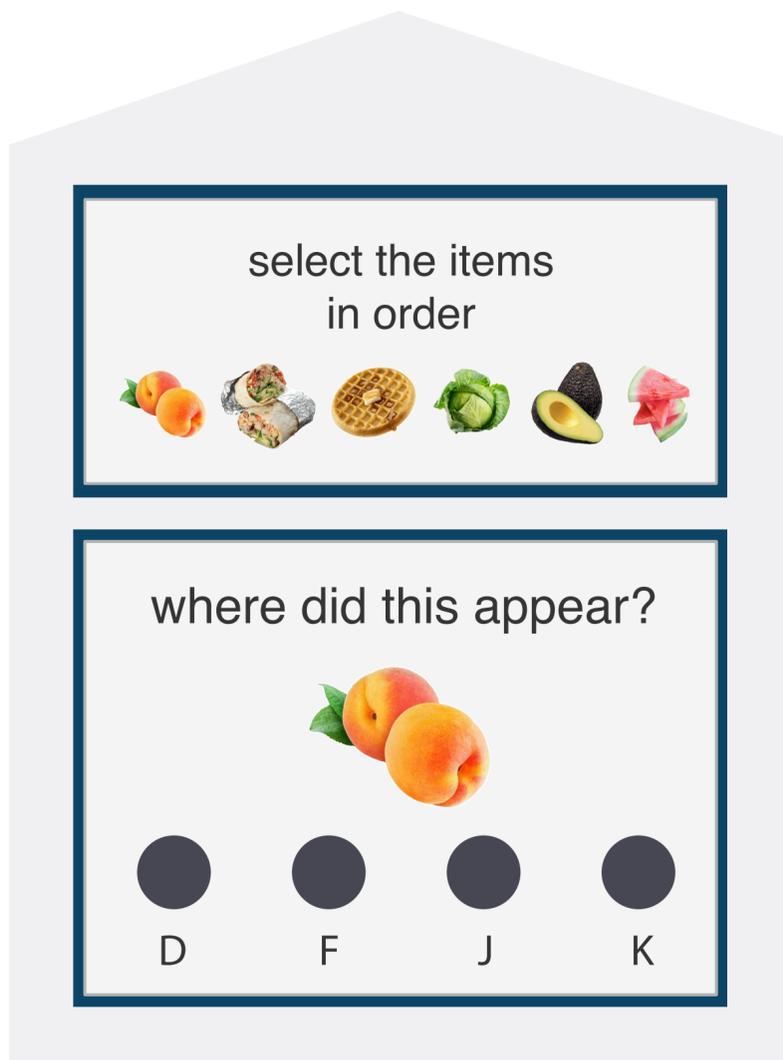
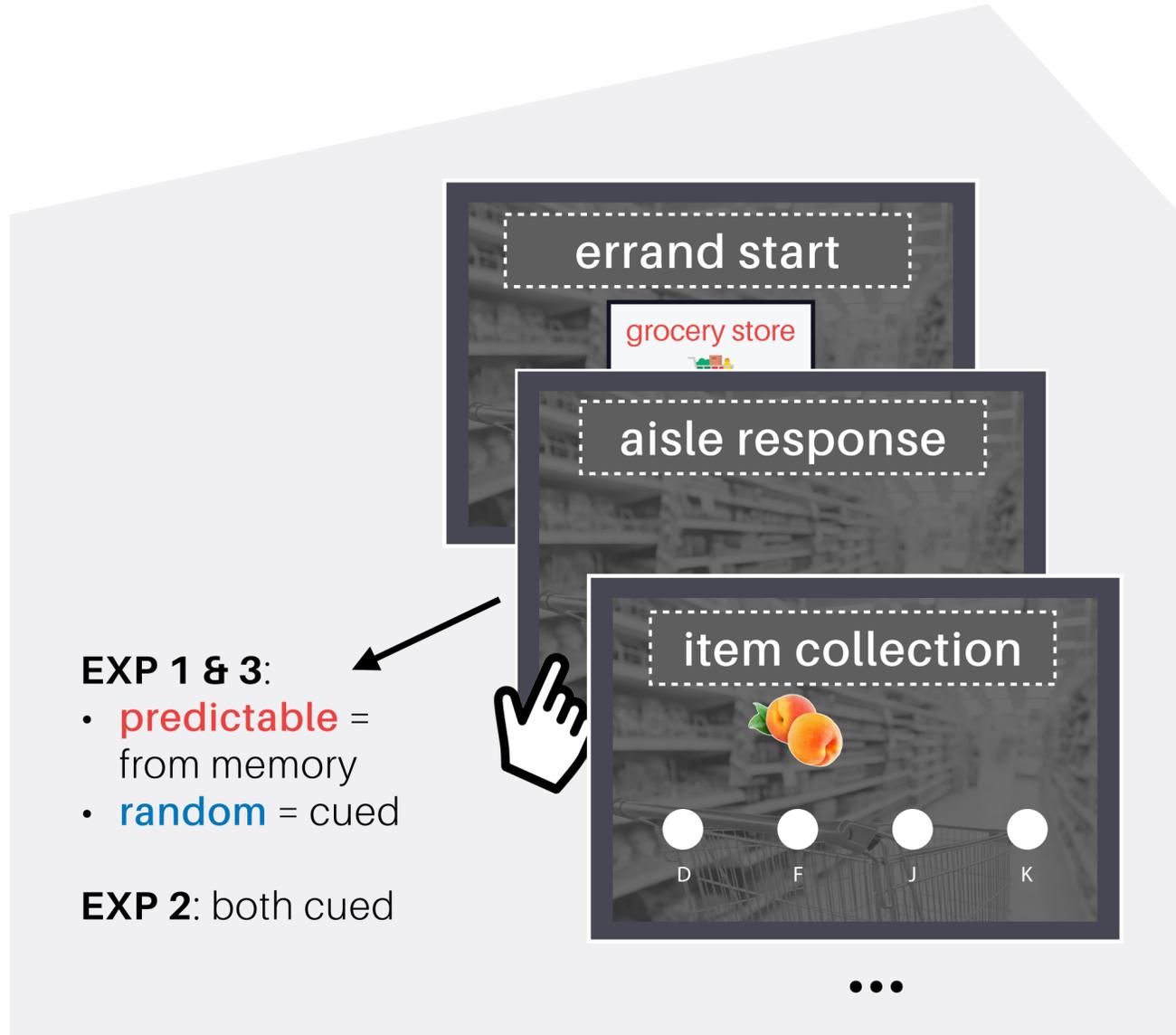
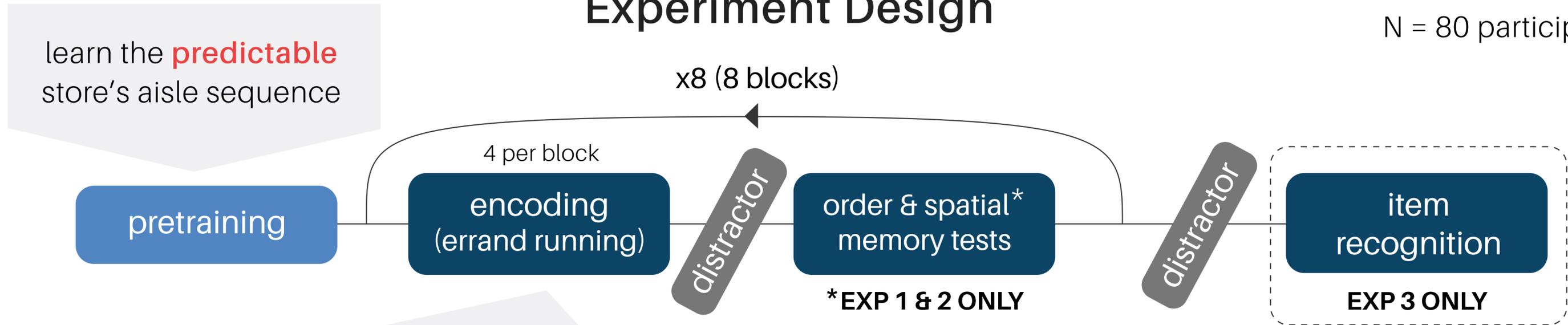
In the **random** store, Ps follow a different route & a different aisle sequence each time they visit.

errand running



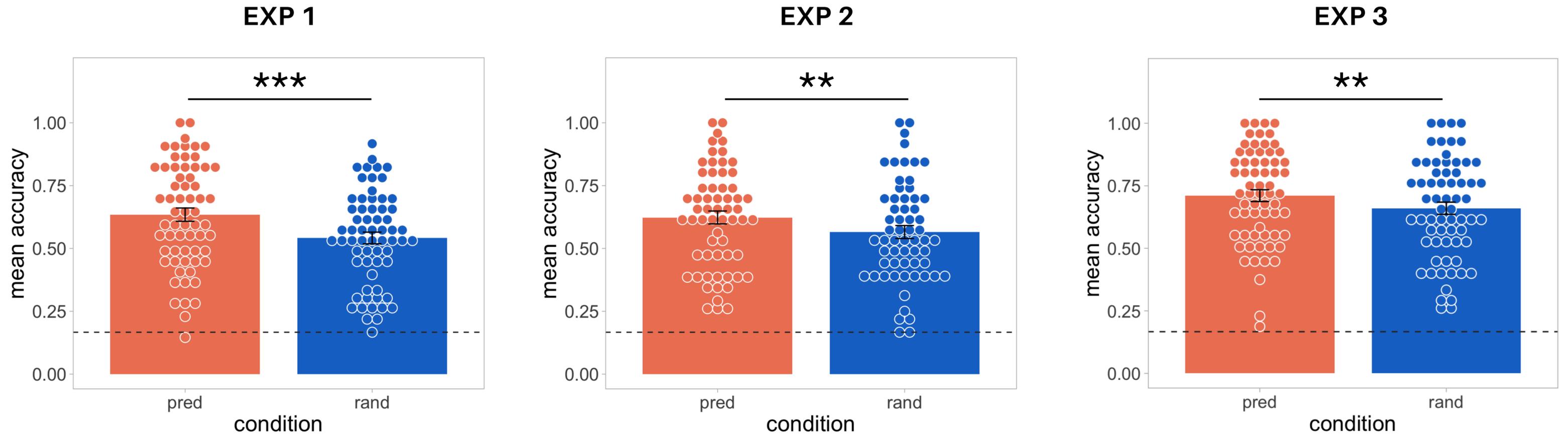
Experiment Design

3 online experiments
N = 80 participants each



Results: Learned action sequences scaffold temporal order memory

Temporal order memory is **enhanced** for predictable vs. random events.

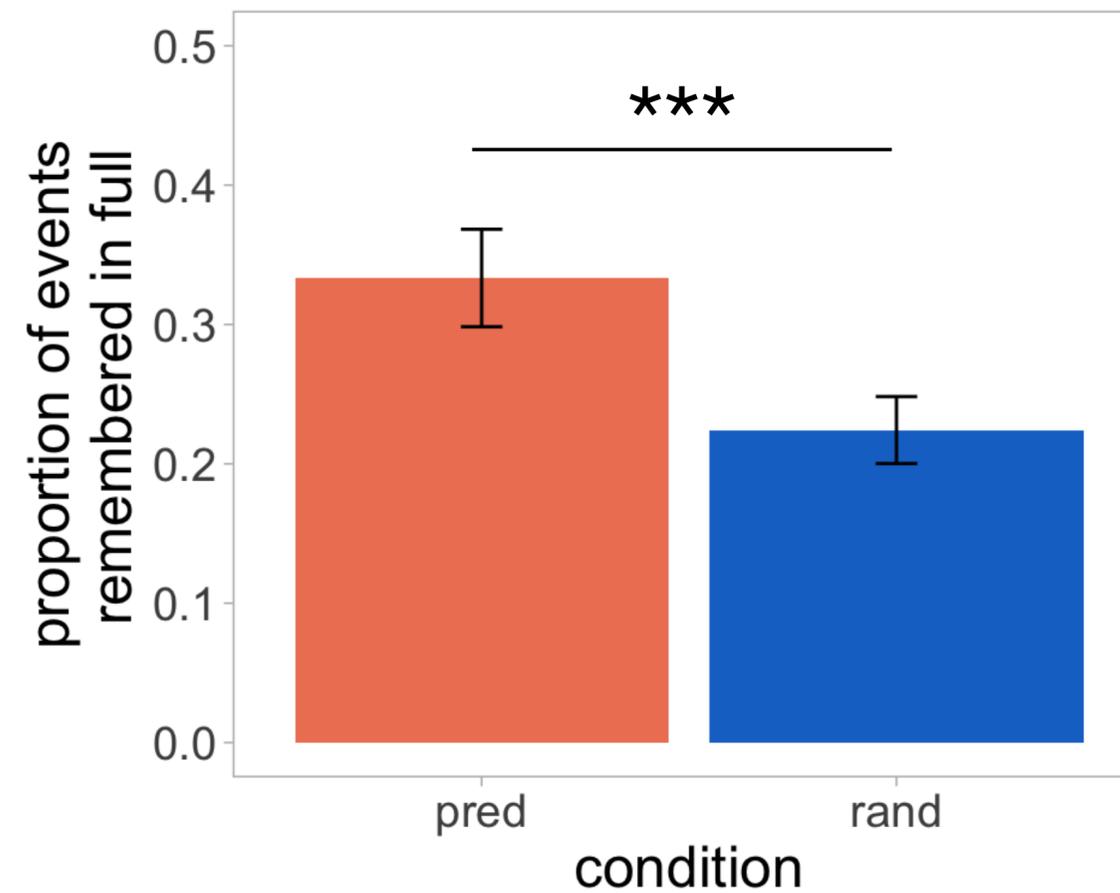
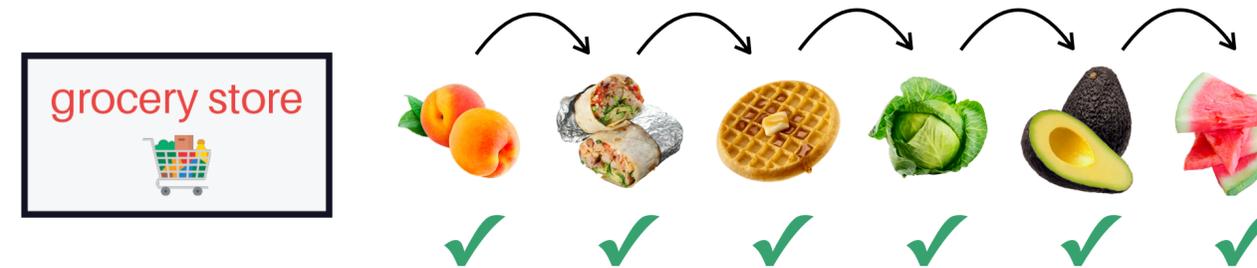


Engaging in a well-learned action sequence during encoding scaffolds order memory for novel, unrelated items.

This is true even when there's no explicit demand to use sequence knowledge during encoding (i.e., in **EXP 2**, when aisle responses are always cued).

Results: Learned action sequences scaffold temporal order memory

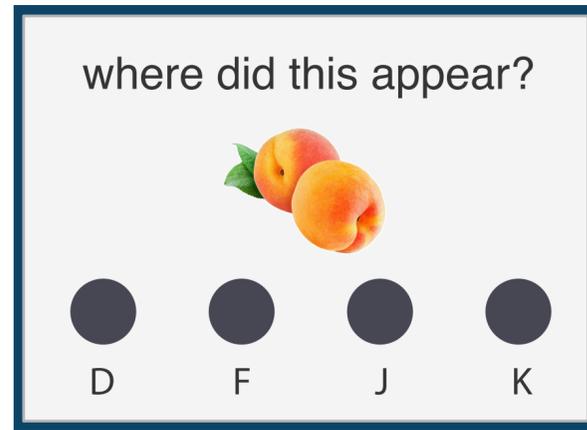
The action sequence is particularly effective in helping people remember an **entire** event sequence.



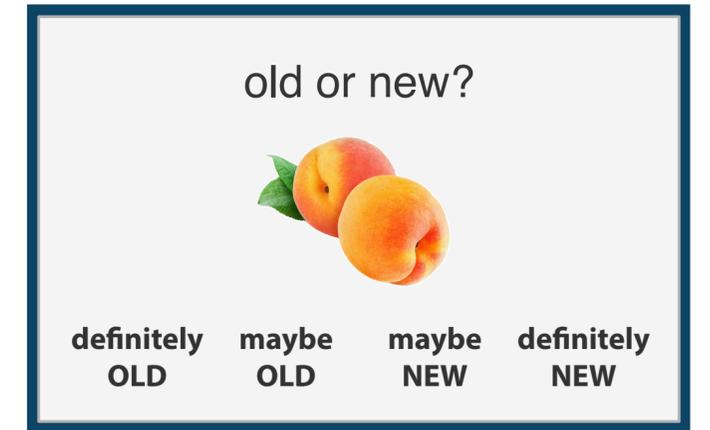
(showing data from **EXP 1**, but effect is present in all three experiments)

Results: no robust effects of action sequences on source or item memory

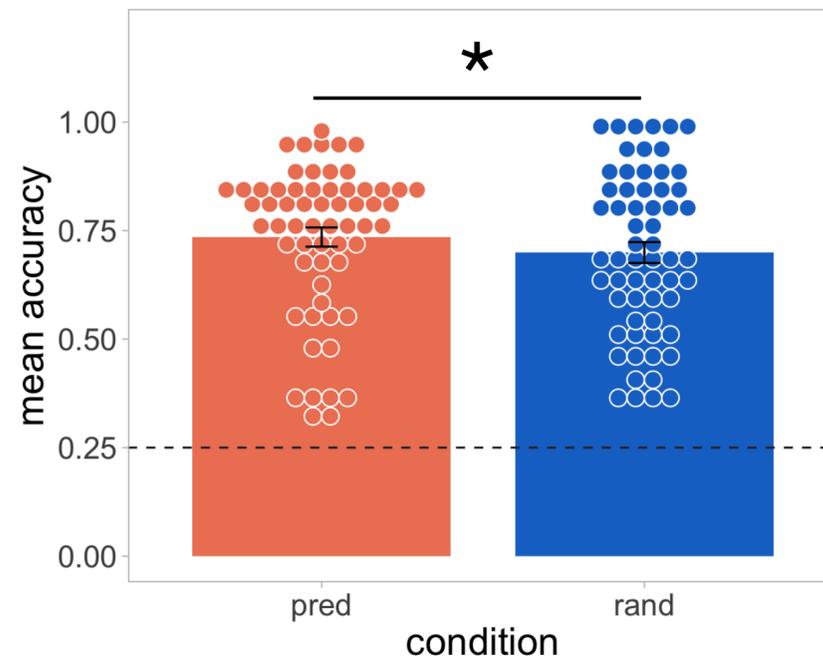
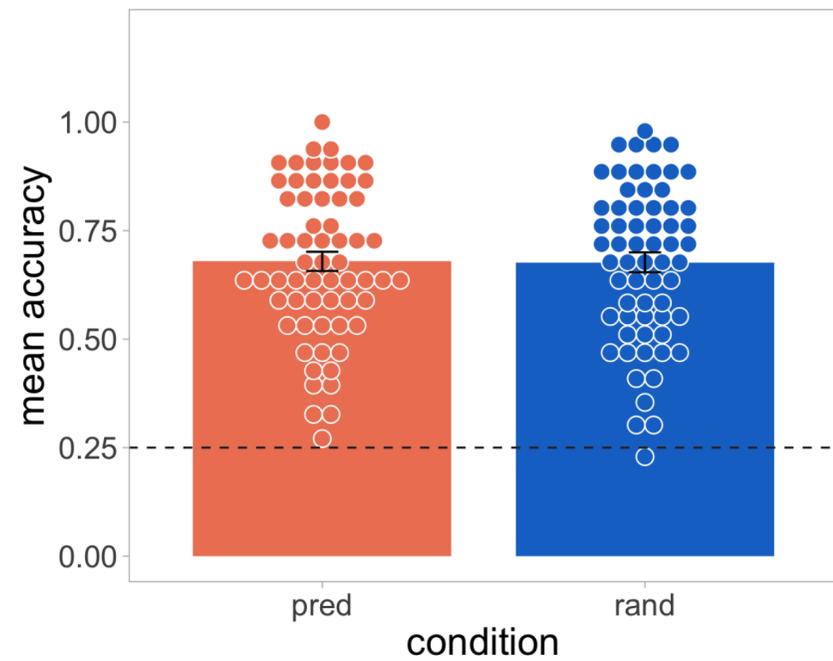
spatial
memory test



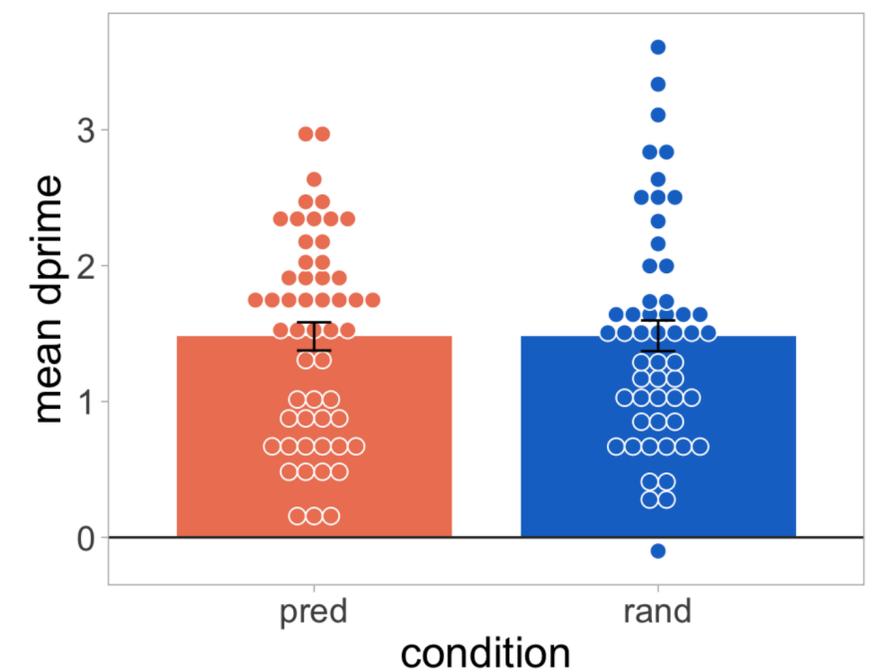
item
recognition
test



EXP 1 ns EXP 2



EXP 3

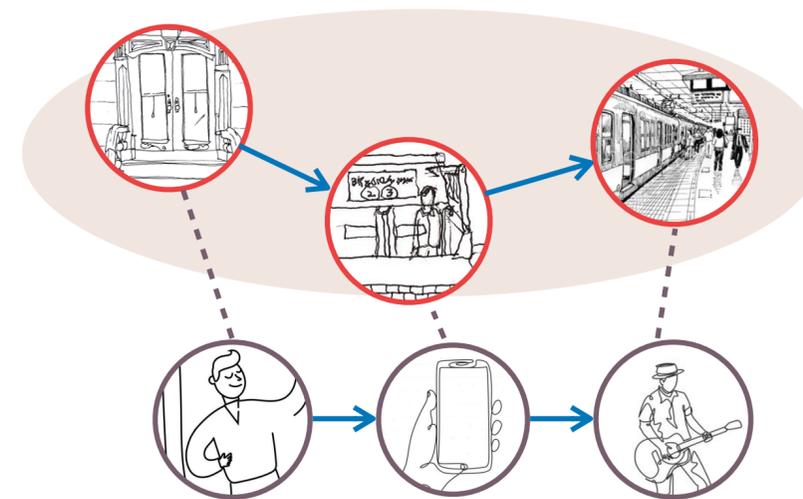
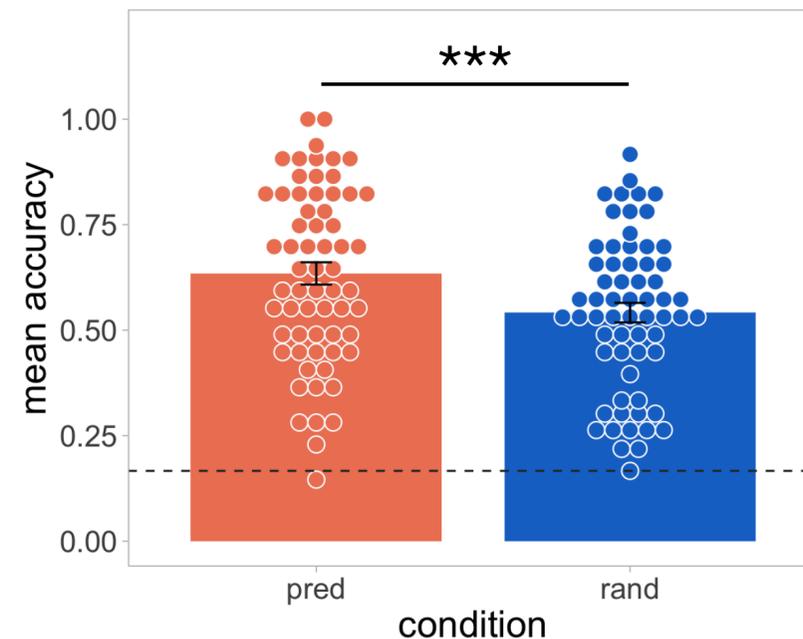


Familiar sequential actions *don't* simply boost all aspects of memory for novel items.

Conclusions

Participants are better able to remember novel sequences of items when they are encountered alongside a well-learned **action sequence**.

This familiar **action sequence** has a selective benefit on temporal order memory, and does not seem to boost item or context encoding in general.



Future work will examine the neural underpinnings of how following familiar behavioral routines can support simultaneous encoding.