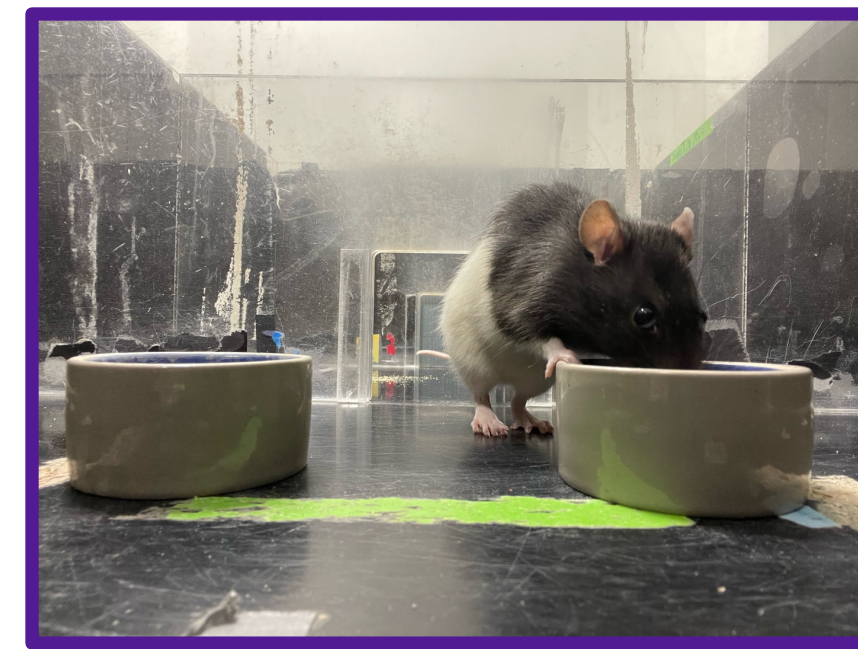


**Transitive Inference (TI)** is a form of deductive reasoning that involves use of explicitly learned relationships (e.g.  $A > B$ ,  $B > C$ ) to make inferences about implicitly related stimuli ( $A > C$ ).

Ten male Long-Evans rats were trained to discriminate four odor pairs ( $A > B > C > D > E$ ; list 1,  $F > G > H > I > J$ ; list 2).



List 1:  $A > B > C > D > E$

List 2:  $F > G > H > I > J$

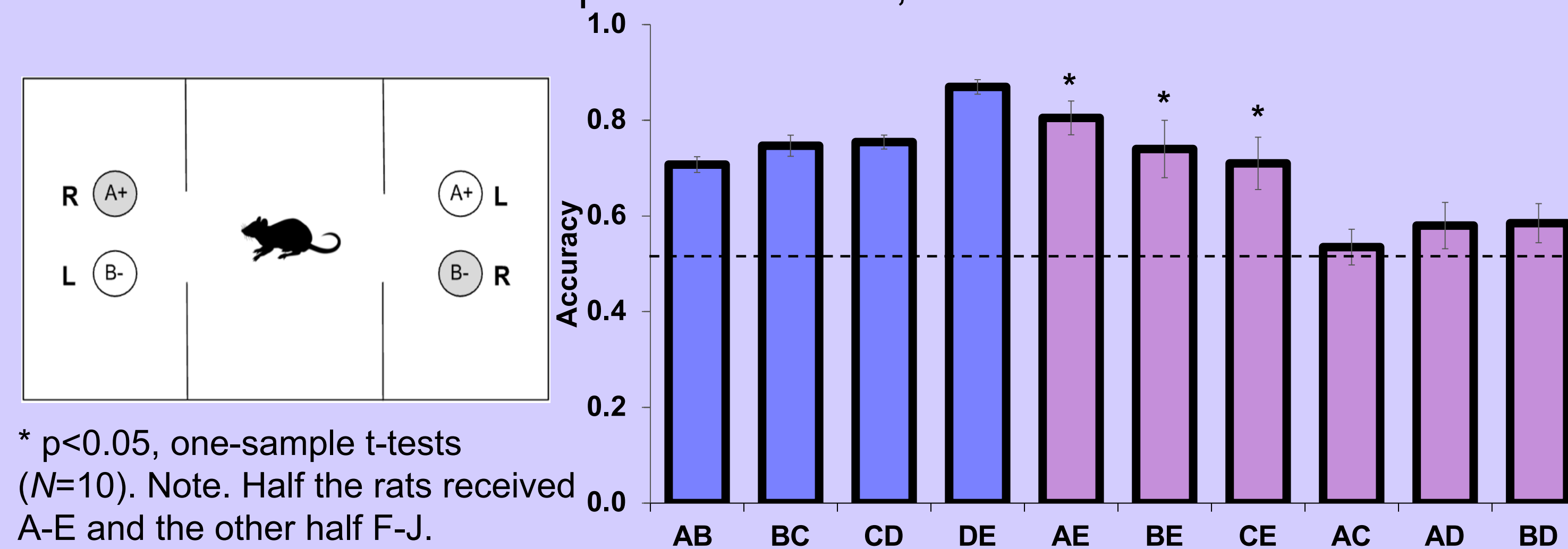
$E > F = A > B > C > D > E > F > G > H > I > J$ ?

A(Thyme), B(Paprika), C(Cumin), D(Ginger), E(Parsley)  
F(Cinnamon), G(Basil), H(Cocoa), I(Onion), J(Oregano)

## Experiment 1: Primary List:

**Premise pair** criterion: 80% accuracy overall on all pairs ( $n=10$ ,  $M=97$ ,  $SD=17$ ; 8 trials/session training)

**Within-list probe** session: 8 premise pairs + 4 non-differentially reinforced probes/ session, for 30 sessions.

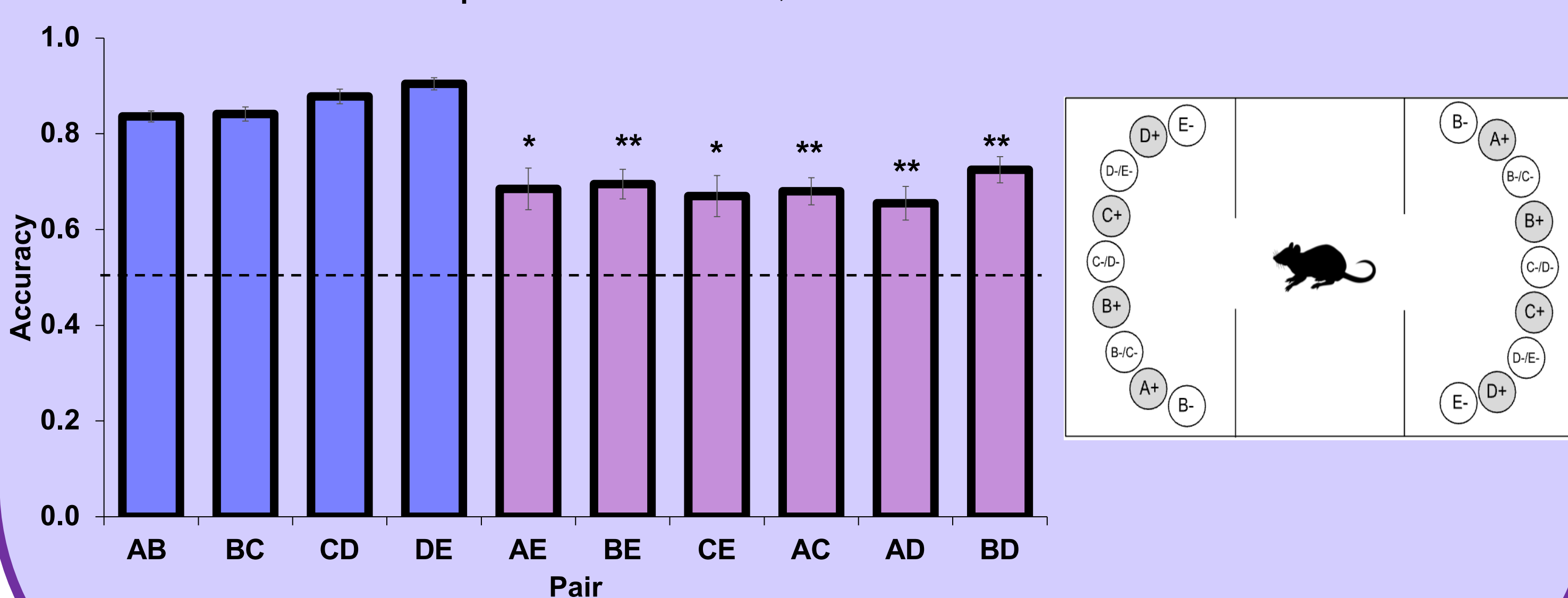


**Experiment 1: Secondary List.** Prior research suggests a common magnitude system underlies ordinal and spatial representations, with spatial arrangement enhancing ordinal list acquisition (Roberts & Phelps, 1994; Gazes et al., 2023).

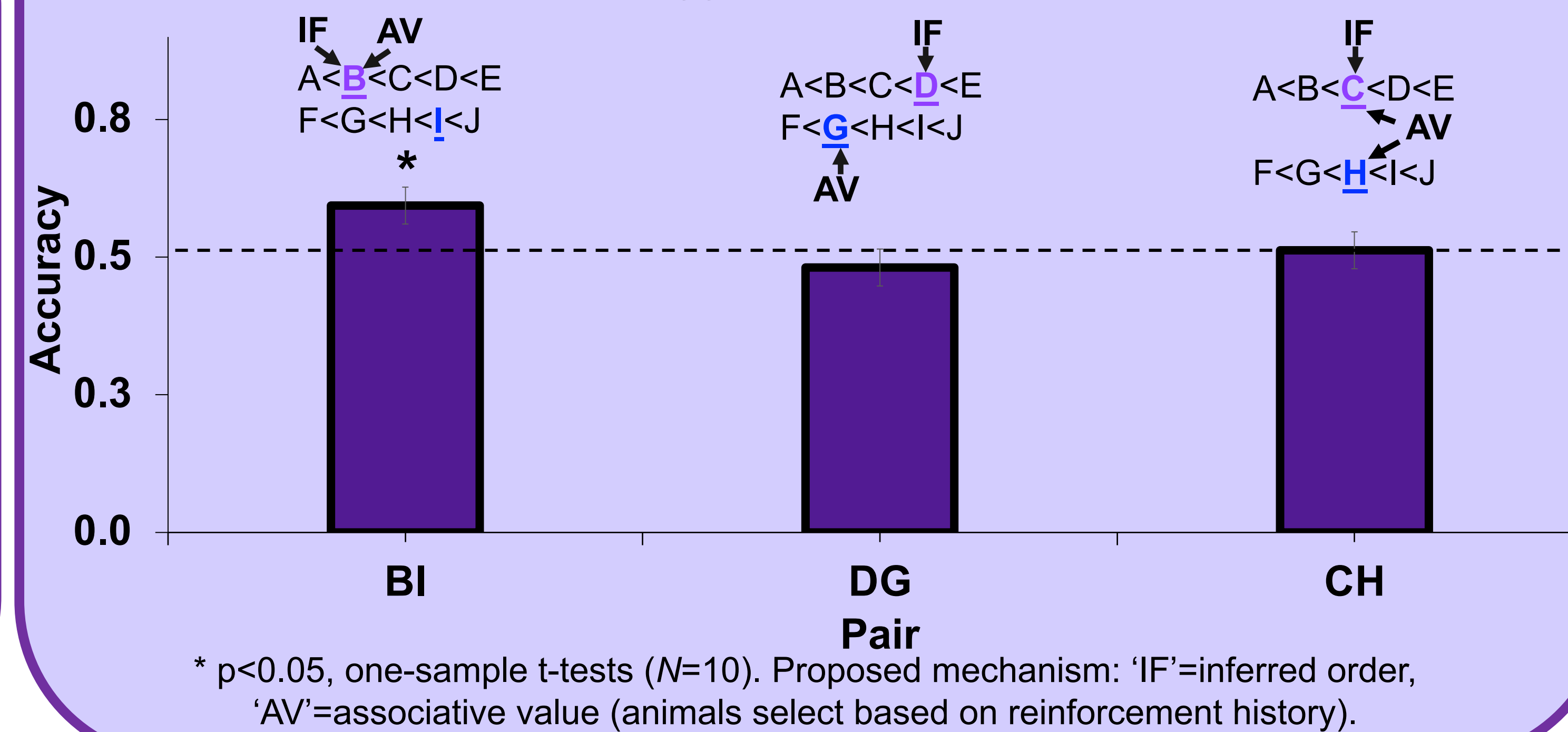
Spatial **premise pair** trial criterion: 80% accuracy on all pairs, 10 consecutive sessions ( $n=10$ ,  $M=26$ ,  $SD=11$ ; 8 trials/session).

Non-spatial **premise pair** trial criterion: 80%, 10 consecutive sessions ( $n=10$ ,  $M=17$ ,  $SD=6$ ; 8 trials/session).

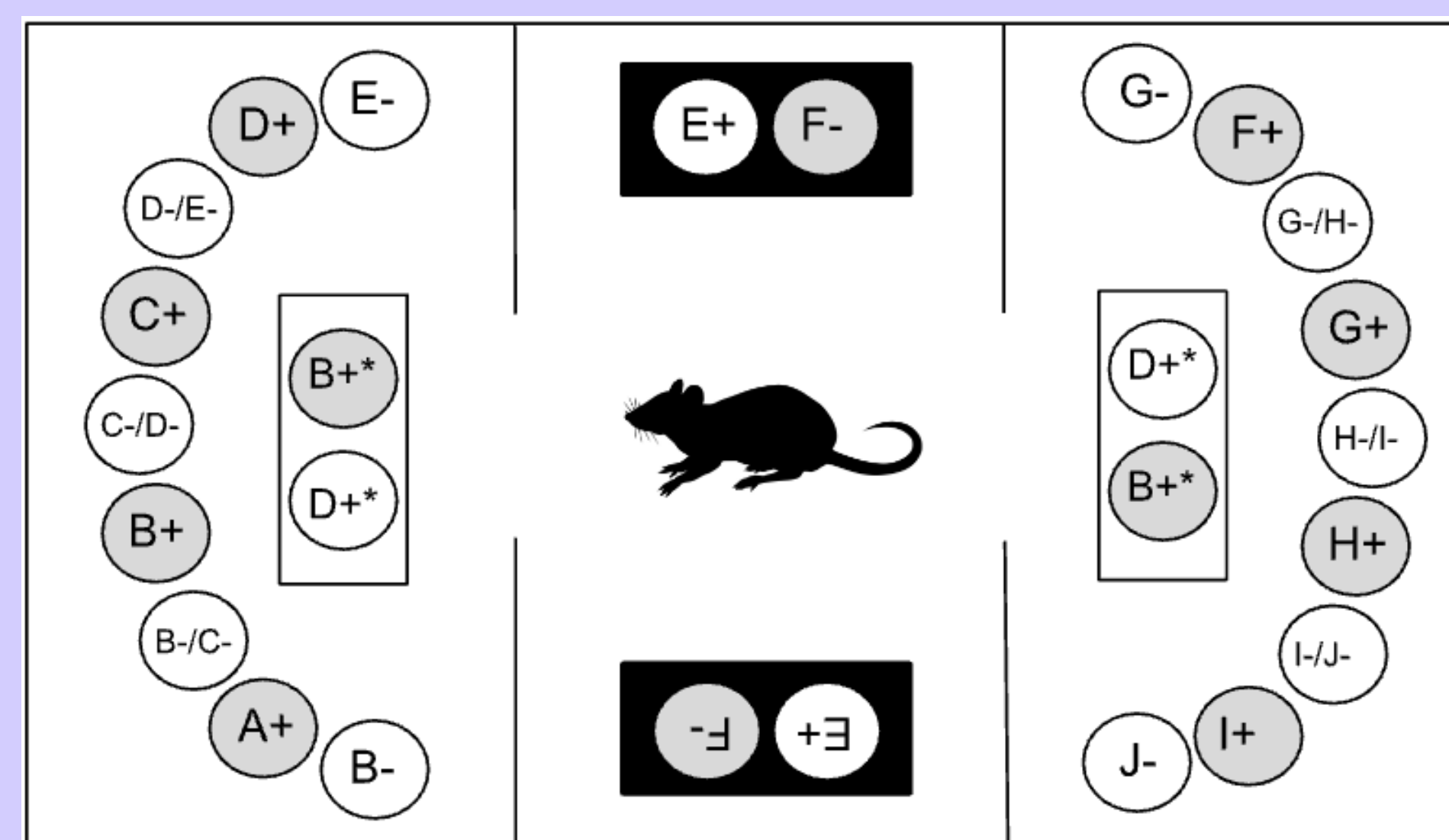
**Within-list probe** session: 8 premise pairs + 4 non-differentially reinforced probes/ session, for 30 sessions.



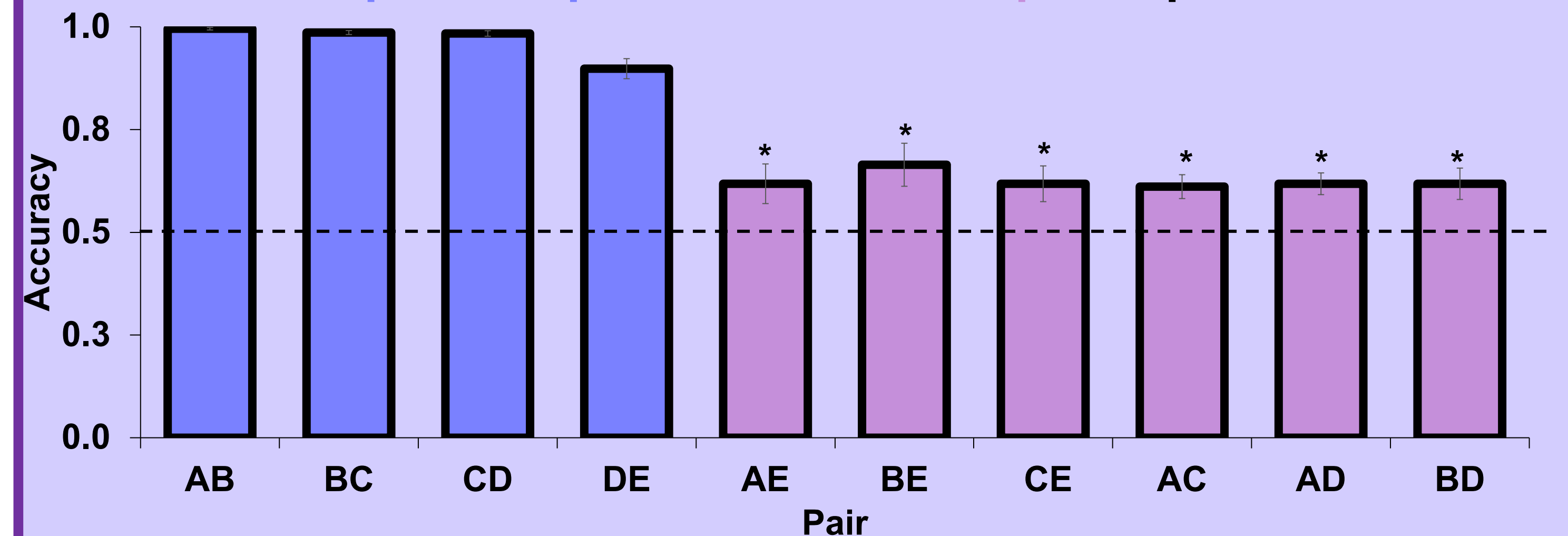
Rats underwent **list-linking** training (e.g.,  $E > F$ -)  
**Experiment 2: List Linking with non-spatial premise pair training:**  
Results suggest rats do not list link.



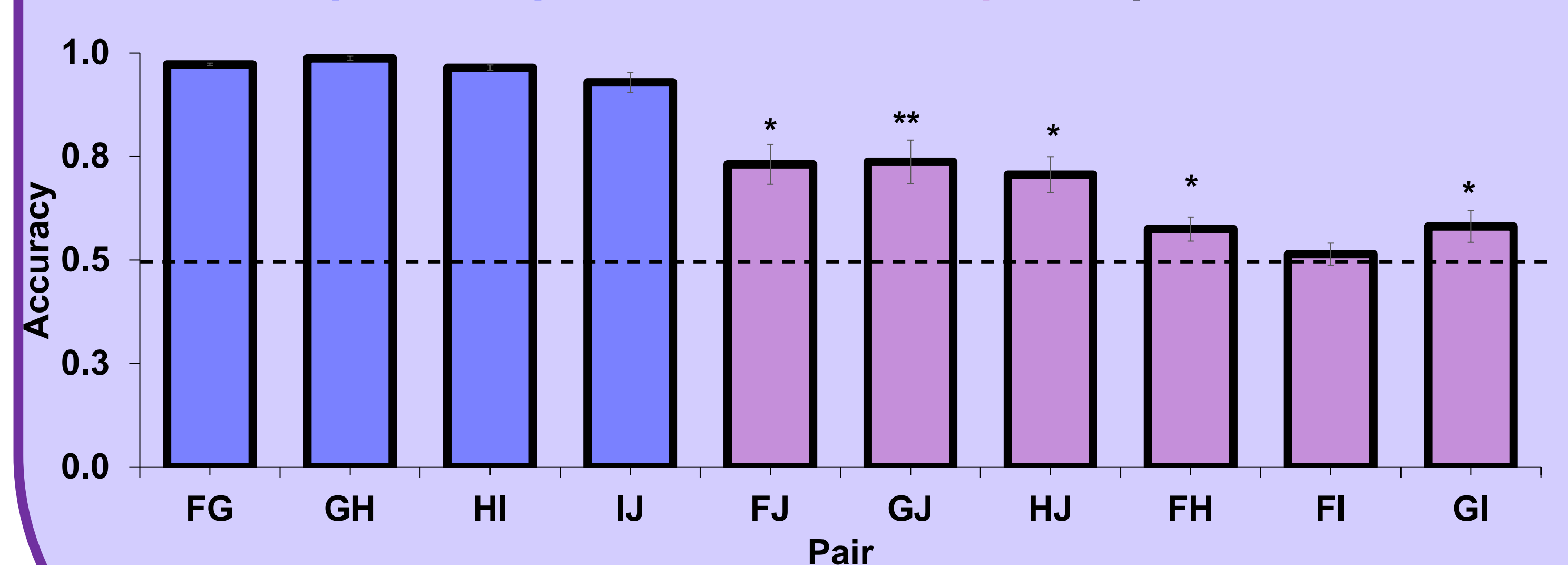
## Experiment 3: Spatial premise pair training and within-list probes:



### List 1 A-E premise pair and within-list probe performance:

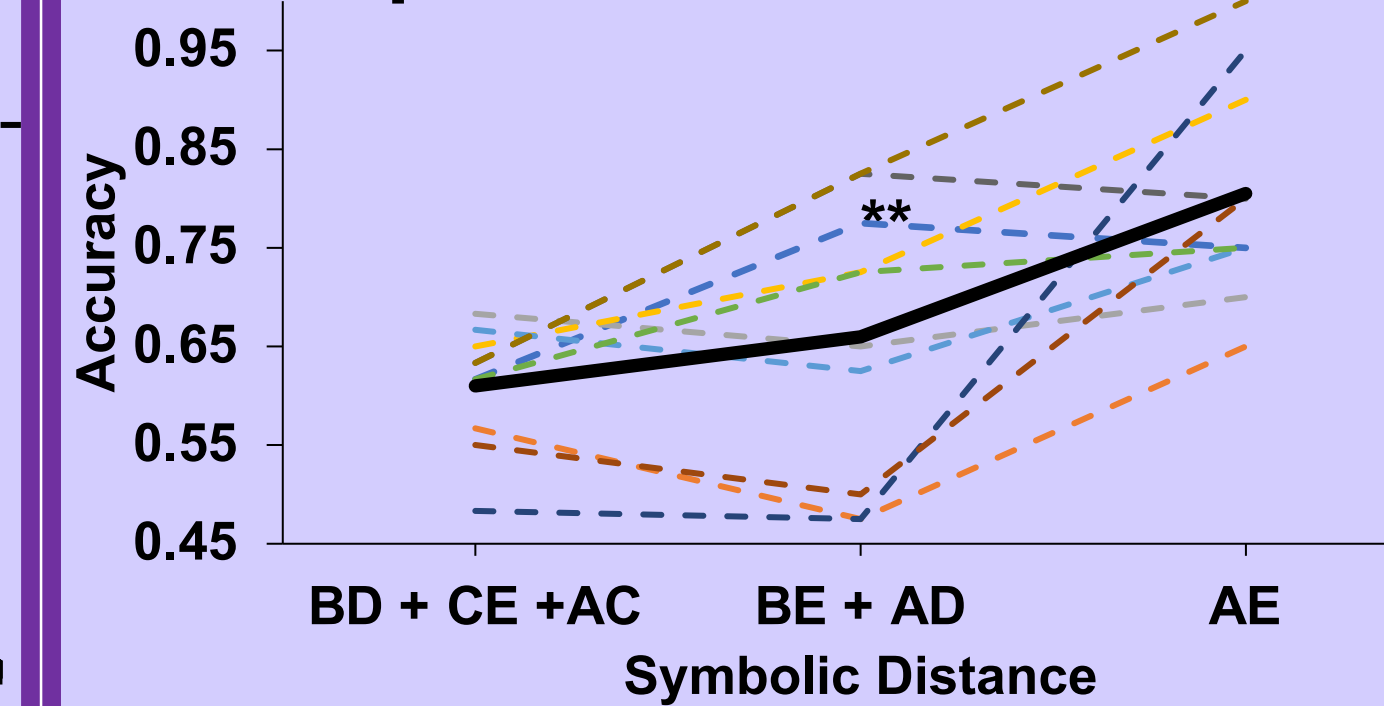


### List 2 F-J premise pair and within-list probe performance:

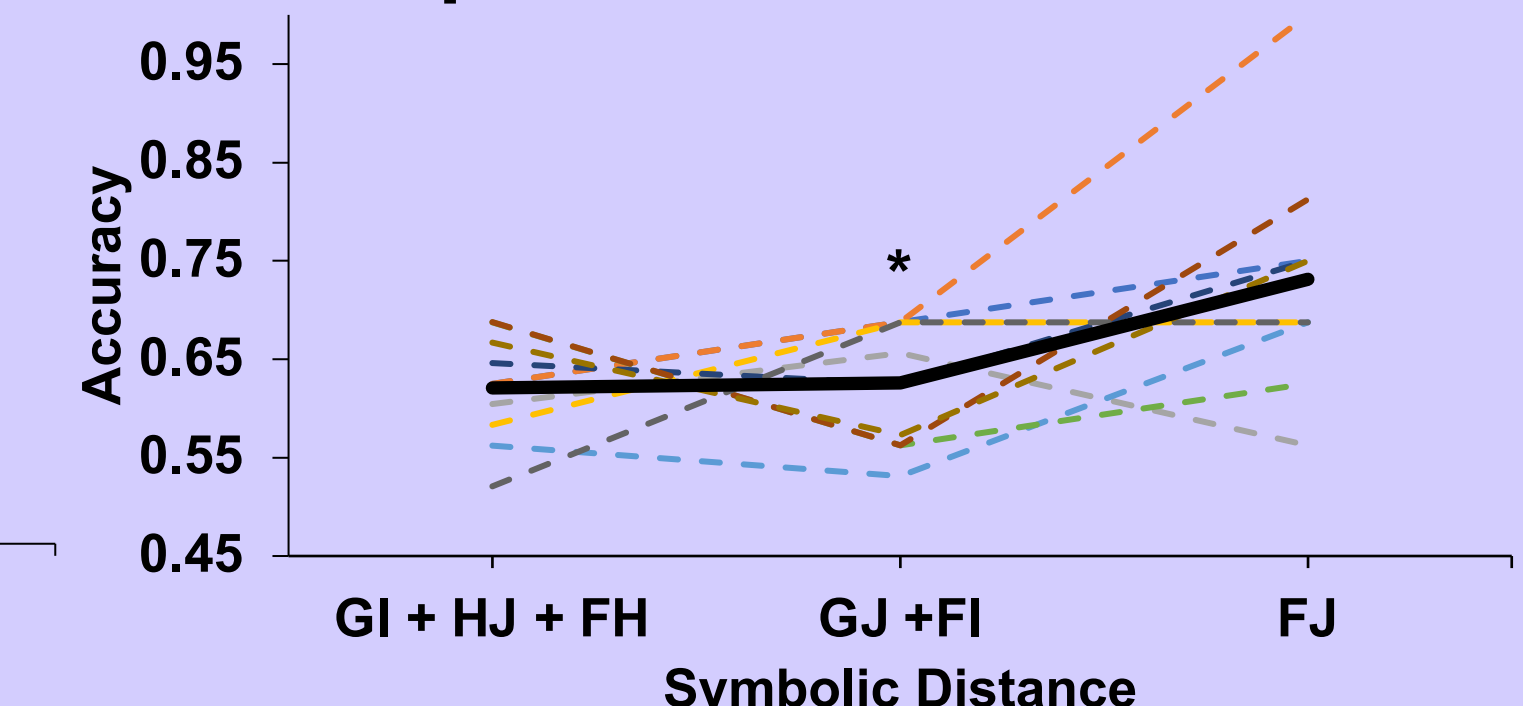


**Symbolic Distance Effect (SDE):** The SDE refers to a phenomenon where participants tend to show higher accuracy on test pairs that have a larger symbolic distance in a sequence. For instance, the pair AE has a symbolic distance of 3 ( $SD=3$ ) since there are three items separating A and E in the order ( $A > B > C > D > E$ ).

### Experiment 1: List 1 SDE



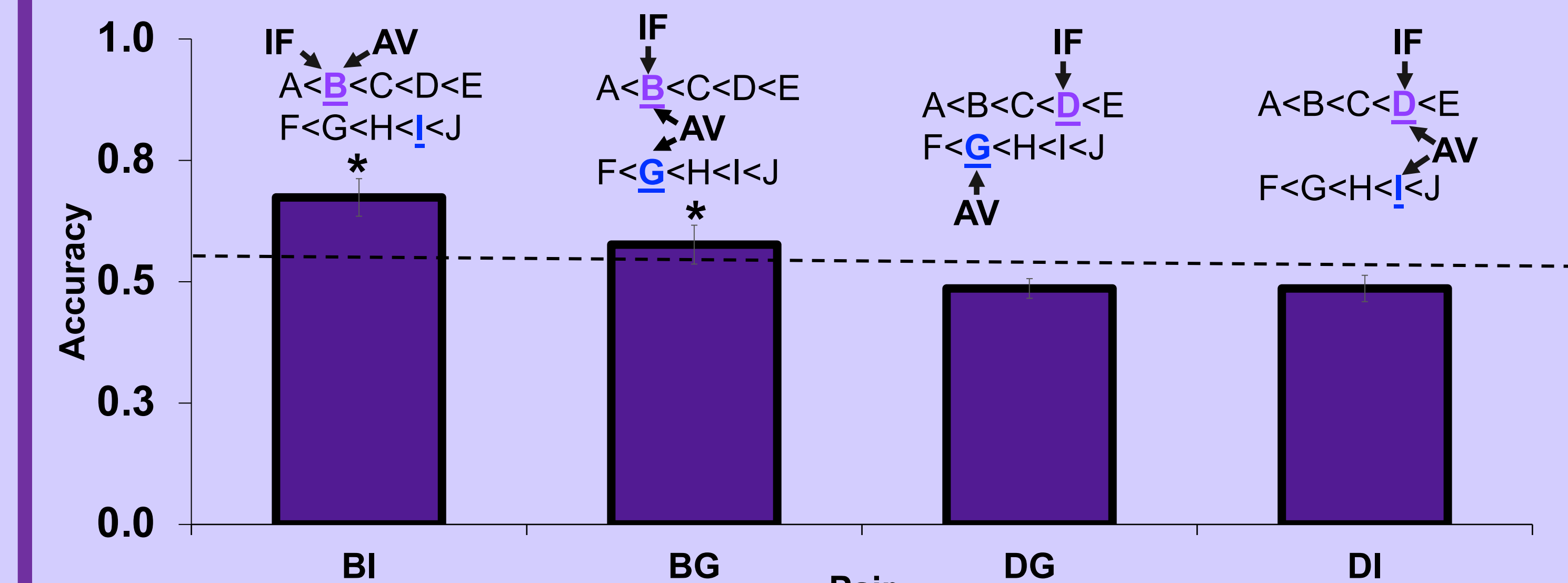
### Experiment 3: List 2 SDE



\*  $p < 0.05$ , \*\*  $p < 0.01$  repeated measures ANOVA ( $N=10$ ).

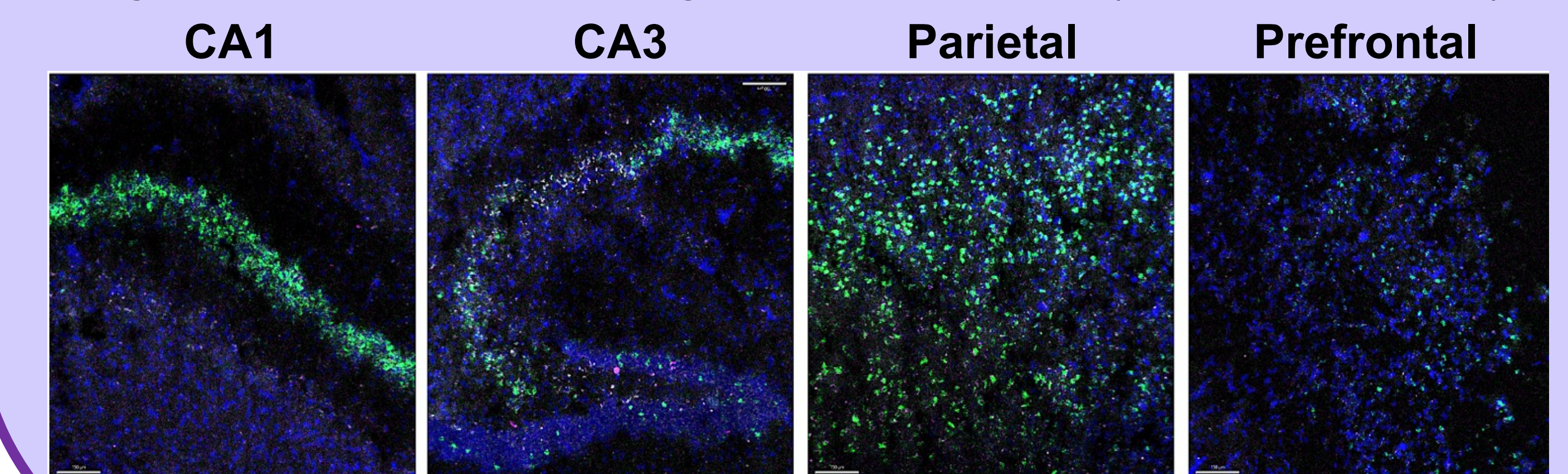
**Experiment 3:** Rats did not list link after spatial **premise pair** training and additional non-spatial **list linking** training with  $E > F$ - and  $C > H$ -. Seamless linking would have suggested dominance of an inferential mechanism.

**Results therefore imply that rats use a certain degree of inference (e.g.  $B > G$ ) alongside associative value when making decisions in TI.**



## Experiment 4: Brain activation during premise pair training and within-list probe testing:

Immediate early gene expression is currently being quantified to infer brain region activity during two distinct epochs of time. Rats were tested on eight premise pairs (List 1, A-E) during one period and eight within-list probes during the second period (4 BD, 2 AC, 2 CE).



## REFERENCES

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Gazes, R. P., Templer, V. L., & Lazareva, O. F. Thinking about order: a review of common processing of magnitude and learned orders in animals. *Anim Cogn* 26, 299-317 (2023).  
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