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Modeling of Reduced Temporal Contiguity for Distinct Items

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What is the Temporal Contiguity Effect (TCE)?

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- In the Temporal Contiguity Effect, recall of one event triggers recall of other events originally experienced nearby in time (Kahana, 1996).
- Retrieved Context Models attribute the TCE to automatic encoding of temporal information (Healey, Long, & Kahana, 2019).
  - Accordingly, Retrieved Context Models naturally predict a TCE whenever new memories are formed.

The TCE has been studied under a variety of experimental conditions

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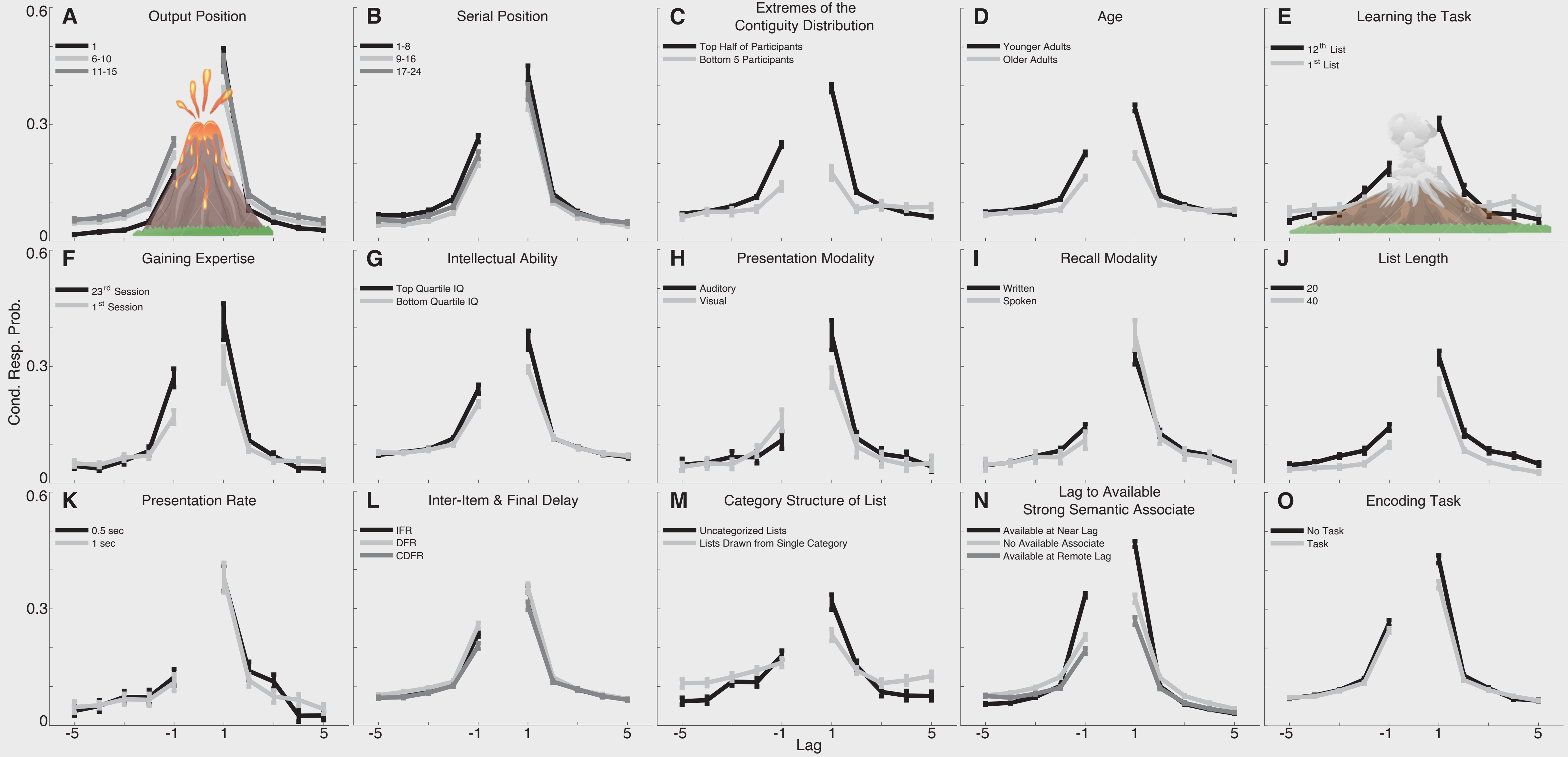

Healey, Long, & Kahana (2019)

Can Retrieved Context Models account for how stimuli manipulations change the size and shape of the TCE?

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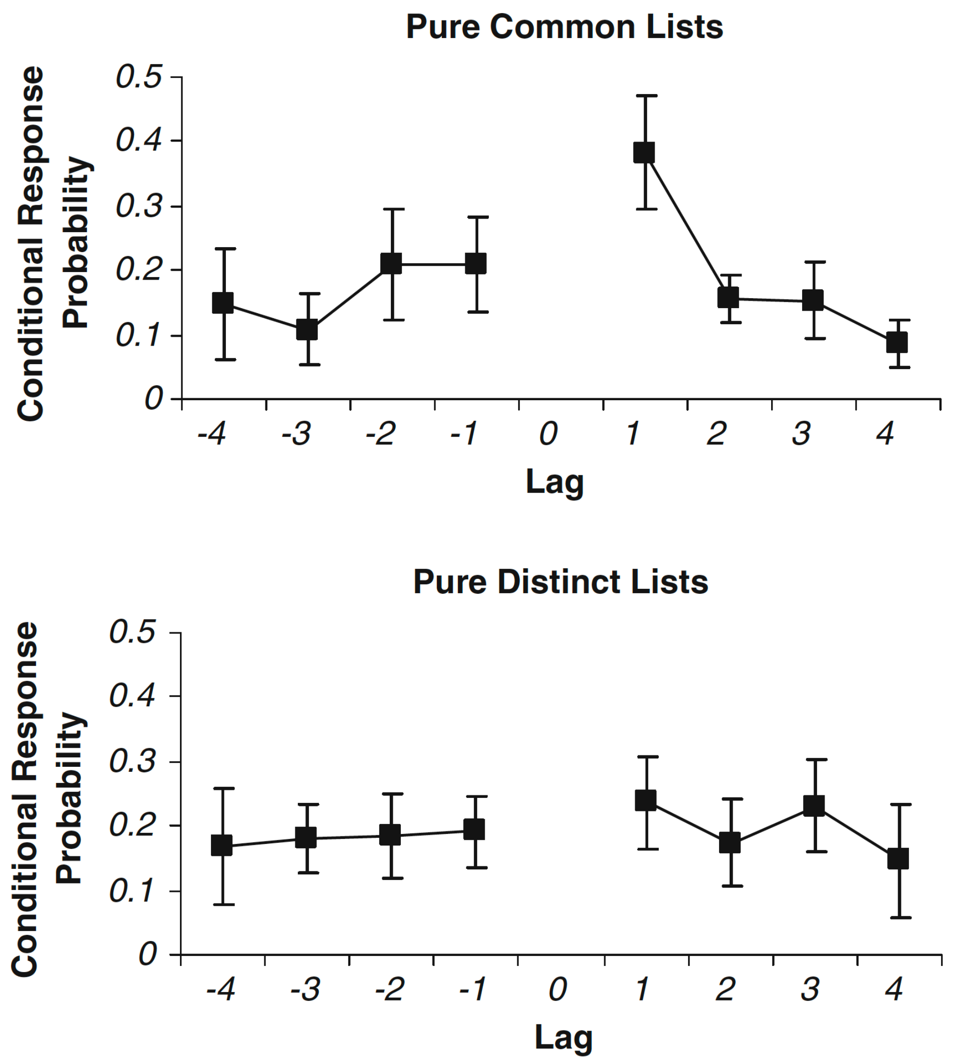
- Here, we try to model the effect of orthographic distinctiveness using a version of the Temporal Context Model.
- Lists composed of orthographically distinct items dramatically reduce the TCE (McDaniel et al., 2011).



McDaniel et al. (2011)

Experiment 1: Methods

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Amazon MTurk

- *N* = 313
- Immediate free recall
    - 3 lists per participant
    - 10 words per list
    - Presentation rate: 2 seconds
        - ISI: 1 second

Conditions

- Pure lists of either orthographically common (control) or distinct items

Computational Modeling

- Retrieved Context Model fit using genetic algorithm
- Both conditions fit simultaneously, allowing specific parameters to vary between conditions

Control Items (*n* = 152) Orthographically Common	Distinct Items (*n* = 161) Orthographically Distinct
AMPLIFICATION	AFGHAN
BISON	FJORDS
ERASER	KHAKI
PARACHUTE	ALFALFA
RULER	SVELTE
CUBE	HYENA
KENNEL	GNAW
REFINEMENT	LYMPH
SLEET	CRYPT
CEDAR	ASPHYXIATION

Experiment 1: Results

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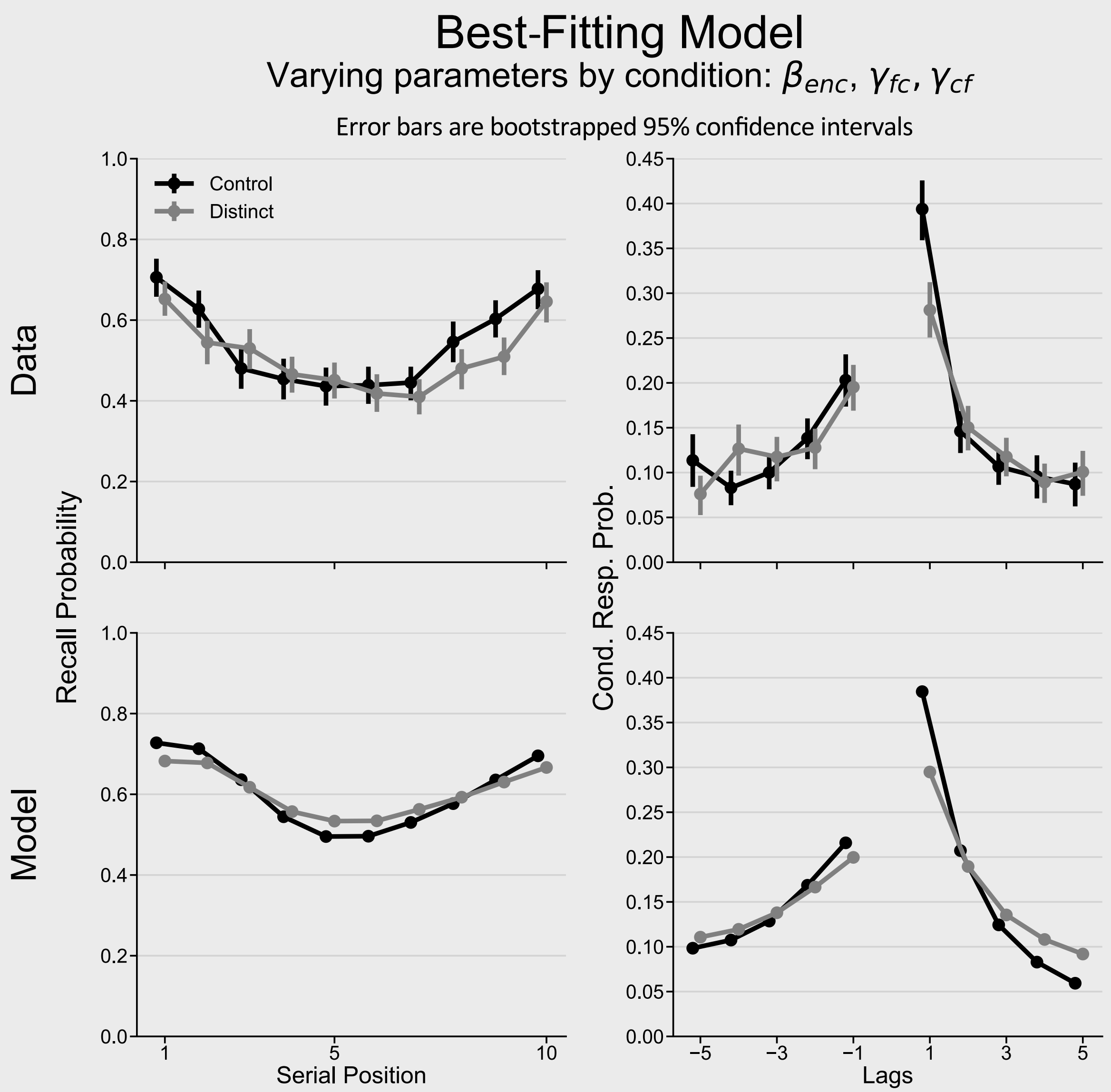
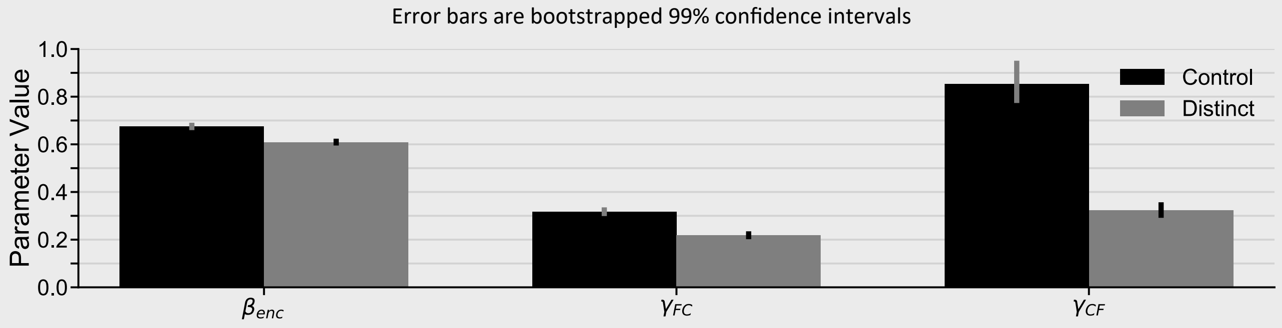


- Orthographic distinctiveness attenuates, but does not eliminate, the TCE.
- The Retrieved Context framework is able to fit behavioral results.
    - Our best-fitting model assumes that distinctiveness changes context drift rate (β_{enc}) and the balance of pre-experimental vs. experimental context (γ_{FC} and γ_{CF}).



Experiment 2: Methods

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In Experiment 1, words had been presented in uppercase

- McDaniel et al. (2011) presented words in lowercase.
- Previous research suggests that the effect of orthographic distinctiveness may be modulated by letter case (Hunt & Elliot, 1980).
- To study the effect of letter case on the TCE, we presented words in lowercase for Experiment 2.
  - Methods were otherwise identical to those used in Experiment 1.
  - The final analyzed sample size was 250 in the Control condition and 254 in the Distinct condition.

Experiment 2: Results

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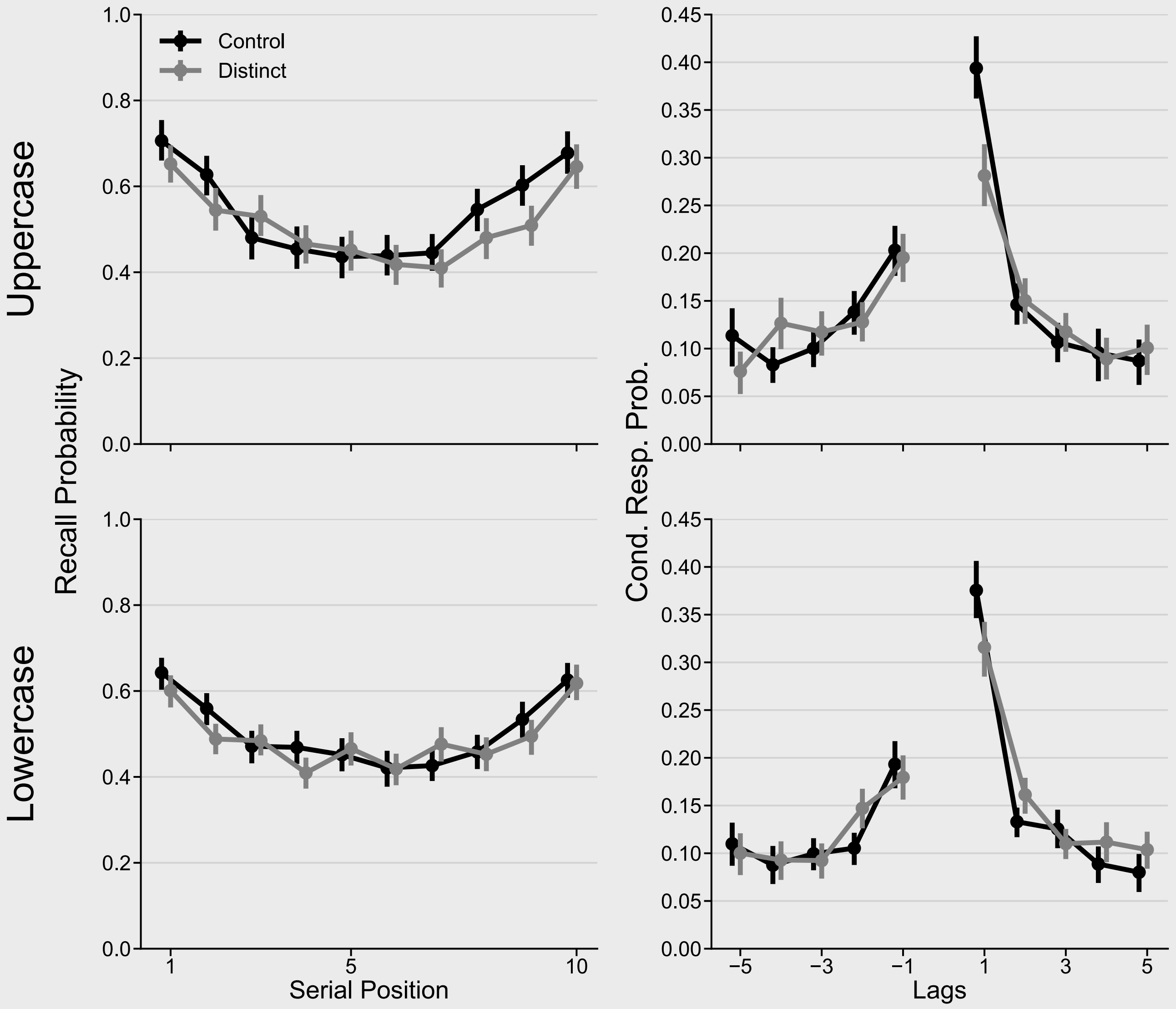
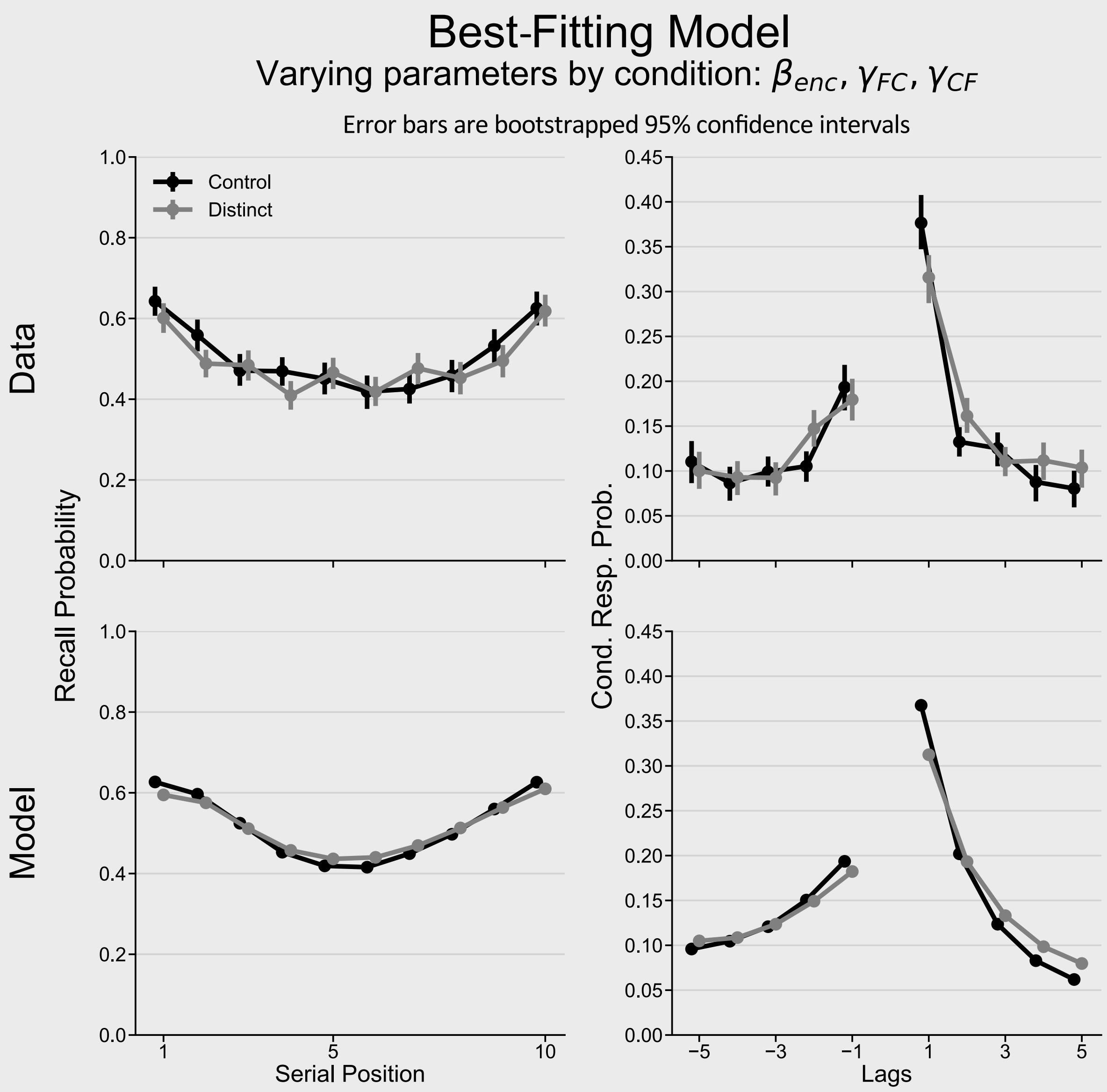
Recall dynamics for the Lowercase sample displayed similar patterns to the Uppercase sample.

Error bars are bootstrapped 95% confidence intervals

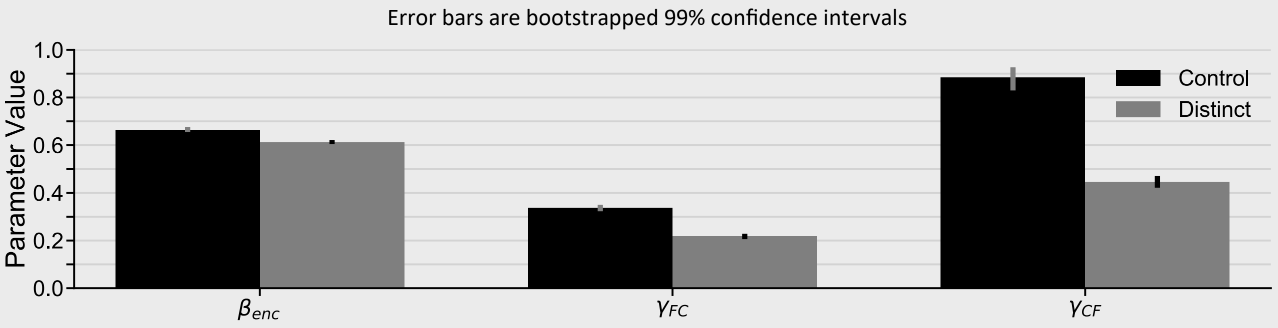


Experiment 2: Results



Replicating Experiment 1:

- Orthographic distinctiveness attenuates the TCE, primarily at *lag* = +1.
- The Retrieved Context framework fit lowercase behavioral results.
  - The best-fitting model assumes that distinctiveness changes context drift rate (β_{enc}) and the balance of pre-experimental vs. experimental context (γ_{FC} and γ_{CF}).



Discussion

- Orthographic distinctiveness appears to reduce temporal contiguity primarily at *lag* = +1.
- Retrieved Context Models are able to simulate the effect of orthographic distinctiveness on the TCE — without the need for additional model mechanisms.
  - Our simulations suggest that orthographic distinctiveness attenuates the TCE by affecting context drift rate (β_{enc}) and the balance of pre-experimental vs. experimental context (γ_{FC} and γ_{CF}) to vary between conditions.

Thank you for listening!

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Hunt, R. R., & Elliot, J. M. (1980). The role of nonsemantic information in memory: Orthographic distinctiveness effects on retention. *Journal of Experimental Psychology: General*, *109*(1), 49-74.

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Supplemental Slides

Experiment 1: Model Comparisons (SPCs & lag-CRPs)

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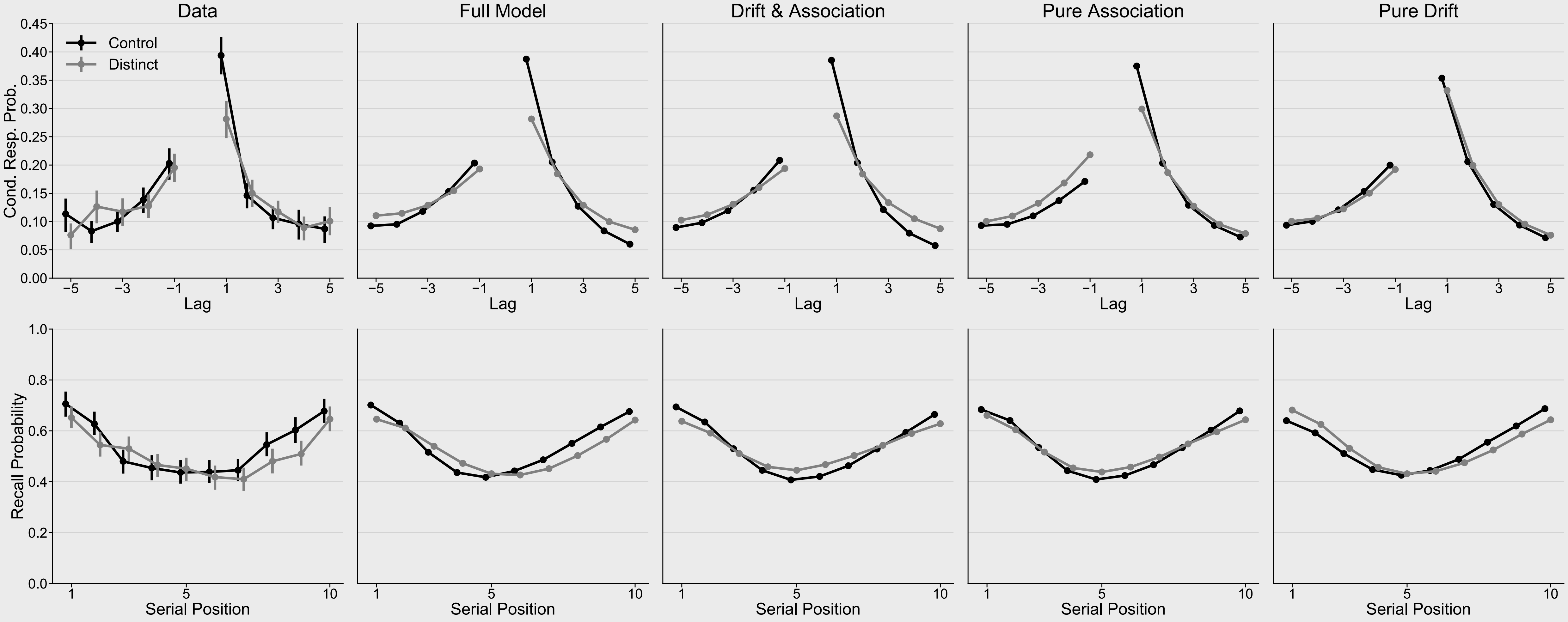

Error bars are bootstrapped 95% confidence intervals

Experiment 1: Model Comparisons

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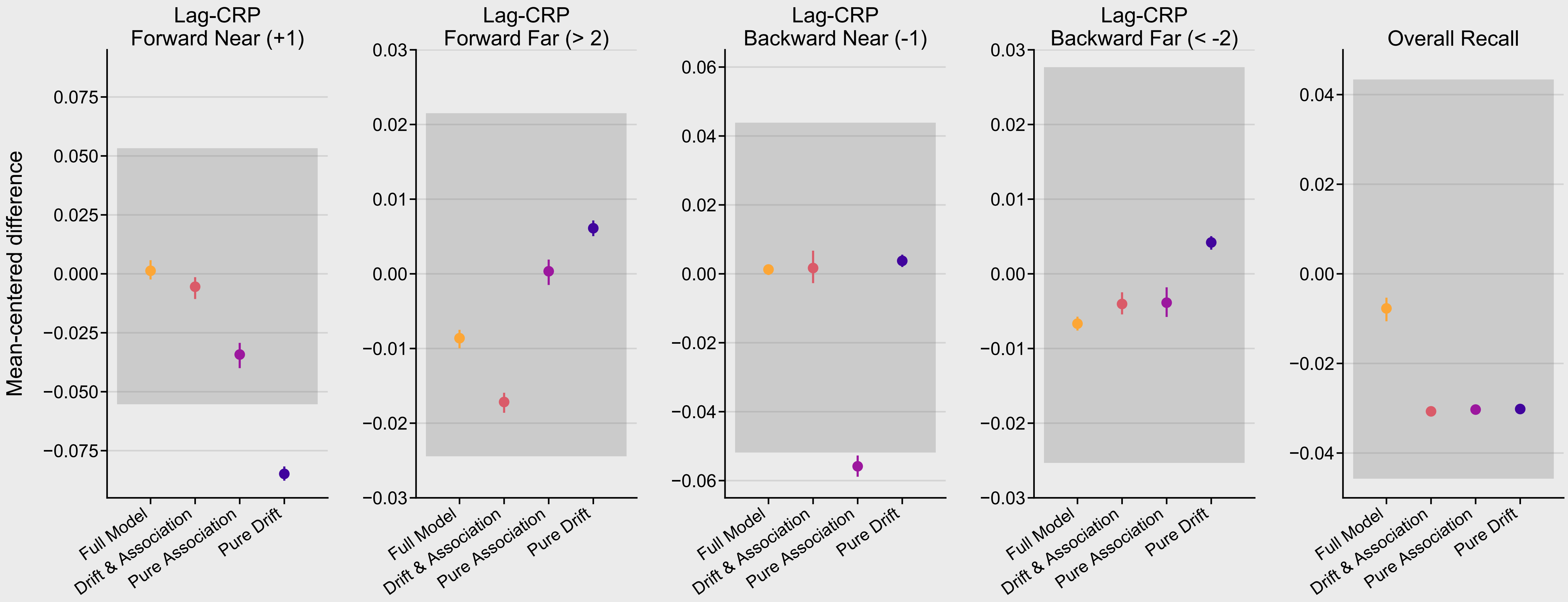

Error bars are bootstrapped 99% confidence intervals

Experiment 1: Model Comparisons

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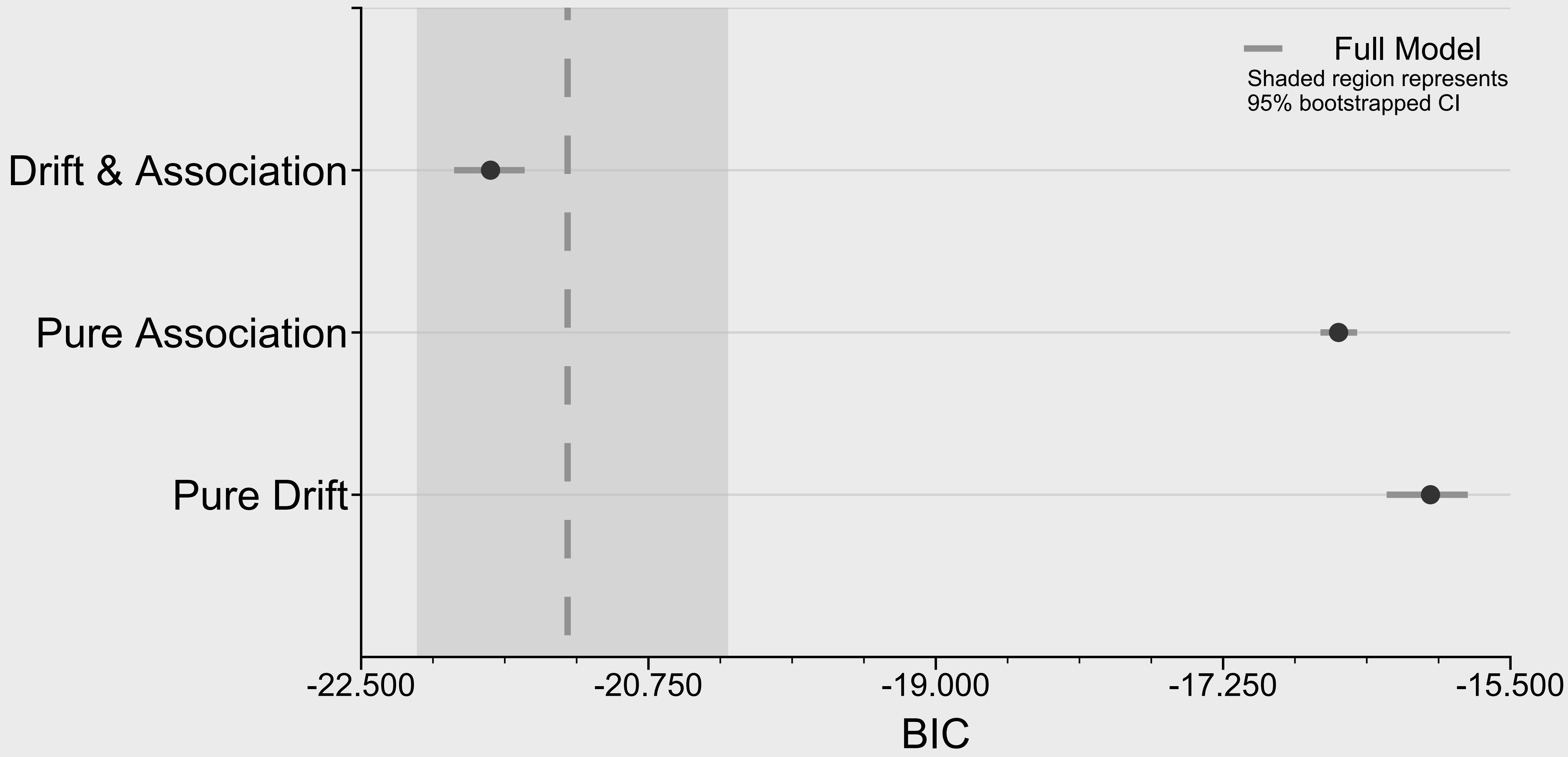

The BICs for sub-models are shown as points with a 99% confidence computed across 10 runs of the model fitting algorithm

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Best-fit parameter values for model fits

	Full Model		Drift and Association		Drift and Association (simulation 2)		Pure Association		Pure Drift	
Parameter	Mean	99% Bootstrap CI	Mean	99% Bootstrap CI	Mean	99% Bootstrap CI	Mean	99% Bootstrap CI	Mean	99% Bootstrap CI
Control										
β_{enc}	0.692	[0.672-0.714]	0.676	[0.659-0.69]	0.664	[0.652-0.673]	—	—	0.741	[0.718-0.772]
γ_{FC}	0.308	[0.292-0.321]	0.318	[0.302-0.336]	0.338	[0.325-0.353]	0.21	[0.201-0.218]	—	—
γ_{CF}	0.817	[0.739-0.906]	0.855	[0.755-0.947]	0.885	[0.846-0.932]	0.788	[0.715-0.863]	—	—
ϕ_s	7.28	[6.33-8.15]	—	—	—	—	—	—	—	—
ϕ_d	1.06	[1.02-1.1]	—	—	—	—	—	—	—	—
β_{rec}	0.862	[0.848-0.873]	—	—	—	—	—	—	—	—
θ_s	0.352	[0.32-0.386]	—	—	—	—	—	—	—	—
θ_r	0.0538	[0.0346-0.0726]	—	—	—	—	—	—	—	—
τ	1.44	[1.31-1.56]	—	—	—	—	—	—	—	—
Distinct										
β_{enc}	0.669	[0.655-0.682]	0.609	[0.593-0.622]	0.613	[0.604-0.623]	—	—	0.711	[0.687-0.738]
γ_{FC}	0.428	[0.408-0.447]	0.22	[0.204-0.236]	0.217	[0.207-0.229]	0.273	[0.256-0.287]	—	—
γ_{CF}	0.882	[0.831-0.931]	0.323	[0.291-0.356]	0.445	[0.42-0.467]	0.368	[0.345-0.391]	—	—
ϕ_s	5.39	[4.85-6.05]	—	—	—	—	—	—	—	—
ϕ_d	0.643	[0.613-0.685]	—	—	—	—	—	—	—	—
β_{rec}	0.473	[0.43-0.515]	—	—	—	—	—	—	—	—
θ_s	0.378	[0.336-0.407]	—	—	—	—	—	—	—	—
θ_r	0.0496	[0.0321-0.0735]	—	—	—	—	—	—	—	—
τ	1.59	[1.46-1.71]	—	—	—	—	—	—	—	—
Constrained										
β_{enc}	—	—	—	—	—	—	—	—	—	—
γ_{FC}	—	—	—	—	—	—	—	—	—	—
γ_{CF}	—	—	—	—	—	—	—	—	—	—
ϕ_s	—	—	6.32	[5.83-6.9]	5.14	[4.66-5.62]	8.3	[7.21-9.78]	8.38	[6.52-10.5]
ϕ_d	—	—	0.883	[0.848-0.914]	0.782	[0.759-0.809]	0.99	[0.941-1.05]	1.02	[0.947-1.08]
β_{rec}	—	—	0.758	[0.736-0.778]	0.855	[0.837-0.872]	0.783	[0.766-0.804]	0.764	[0.737-0.789]
θ_s	—	—	0.355	[0.334-0.376]	0.388	[0.341-0.431]	0.386	[0.359-0.414]	0.356	[0.317-0.396]
θ_r	—	—	0.0545	[0.0437-0.0666]	0.0464	[0.0227-0.0734]	0.038	[0.0239-0.0519]	0.0546	[0.0276-0.0771]
τ	—	—	1.66	[1.55-1.77]	1.53	[1.47-1.6]	1.43	[1.33-1.51]	1.16	[1.02-1.3]

Models were fit simultaneously to Serial Position Curve and lag-Conditional Response Probability curve.