



Disentangling Lexical-level Changes from Pre-lexical Changes in Natural Accent Adaptation

Poster ID: 4276078



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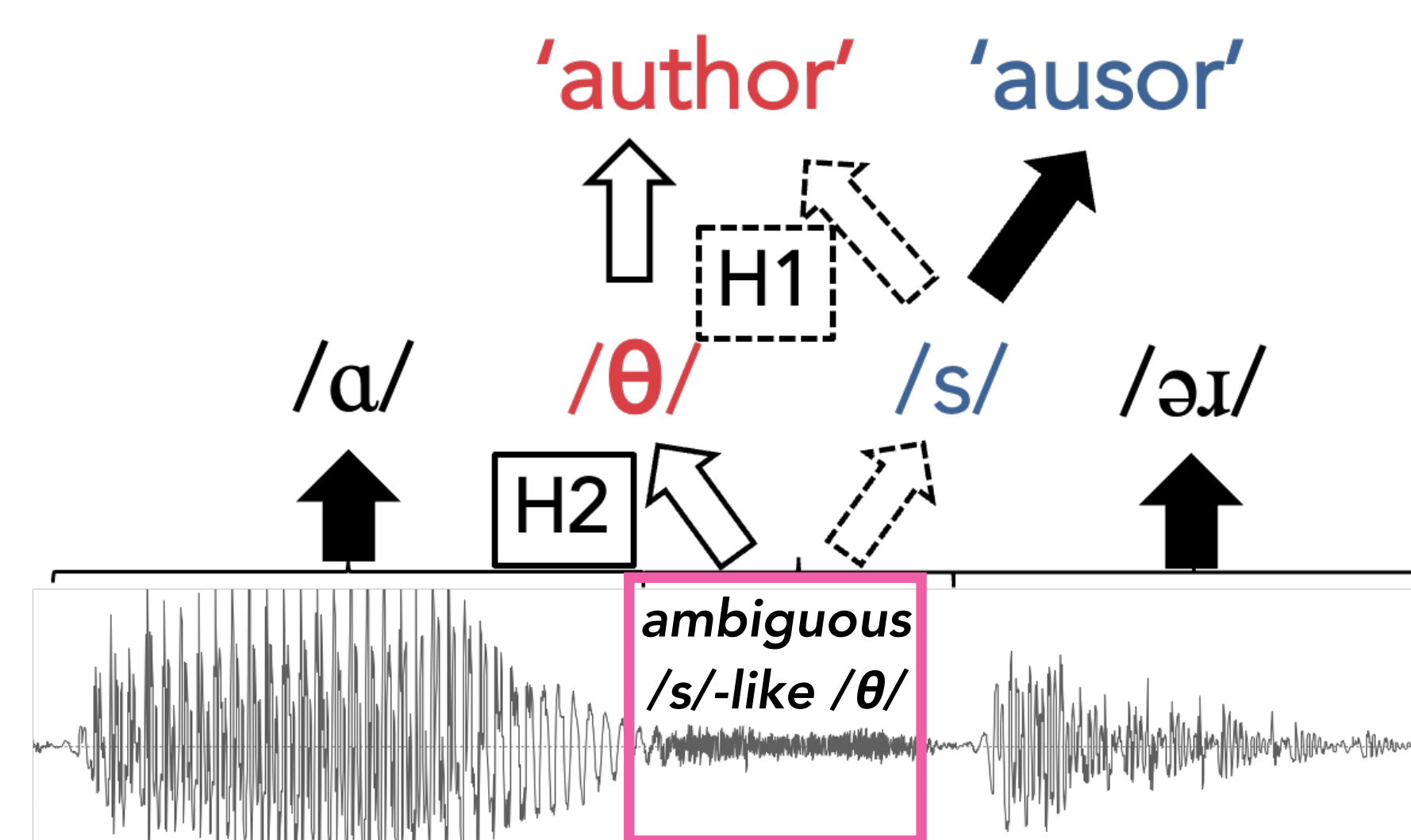
Listeners rapidly adjust to new accents, resulting in better speech recognition.

What changes when they do? Where exactly is the locus of this learning?

Lexical
representations:

Pre-lexical
representations:

Acoustics:



• **H1 (Lexical-level change):** Accent exposure changes how ambiguous tokens support **lexical interpretations**, without altering pre-lexical processing.^{1,2} → Most visibly in tasks that load on explicit lexical access.

• **H2 (Pre-lexical change):** Accent exposure changes phonetic categorization itself.^{3,4,5,6,7} → Same acoustics, different categorization outcome.

E.g., Hearing 'ausor'-like 'author' (a /θ/-biased frame)

• **H1:** Listener accepts this token as 'author'.

• **H2:** The /s/-like acoustics are now categorized as /θ/ → 'ausor' is identified as 'author'.

→ **Both predict increased endorsement of ambiguous tokens as real /θ/-words in Lexical Decision (LD).**

GAP: Prior LD-only work^{8,9} cannot adjudicate H1 vs. H2: Pre-lexical activations feed into lexical access → Both predict the same LD pattern.

OUR APPROACH: Phonetic Categorization (PC) probes phonetic-level changes directly (Minimal-pair continuum [theme-seem]; 5 steps × 6 repetitions; waveform-averaged). If accent exposure only changes **lexical interpretation** (H1), the same acoustics should not yield a different **PC** outcome.

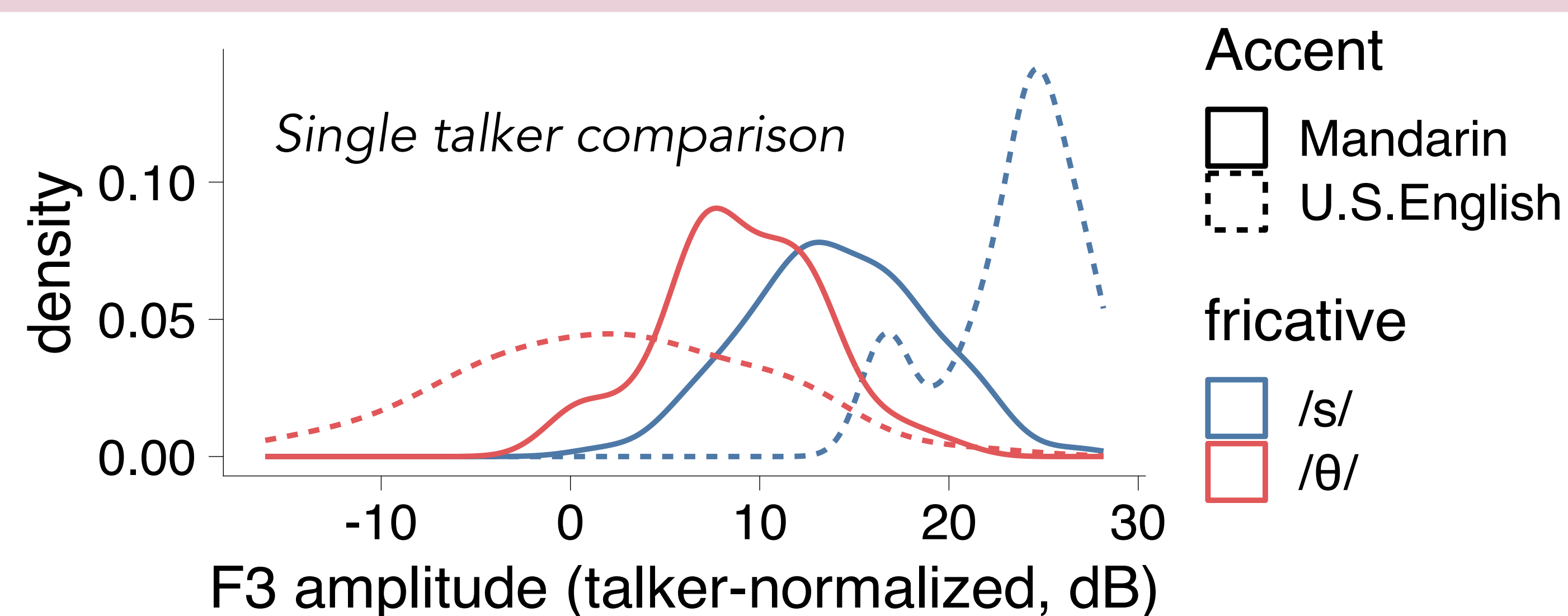
→ **A Pre→Post PC shift supports pre-lexical change (H2).**

* H2: Two mechanistically distinct loci, see **Discussion**.

- H2a (Representational): Accent exposure changes phonetic category representations^{3,4}
- H2b (Non-representational): Accent exposure shifts category-level priors^{5,6} or response bias⁷, without changing phonetic category representations

Why Mandarin-accented /θ/-/s/?

Acoustic overlap
between Mandarin-
accented /θ/-/s/



Design & Predictions

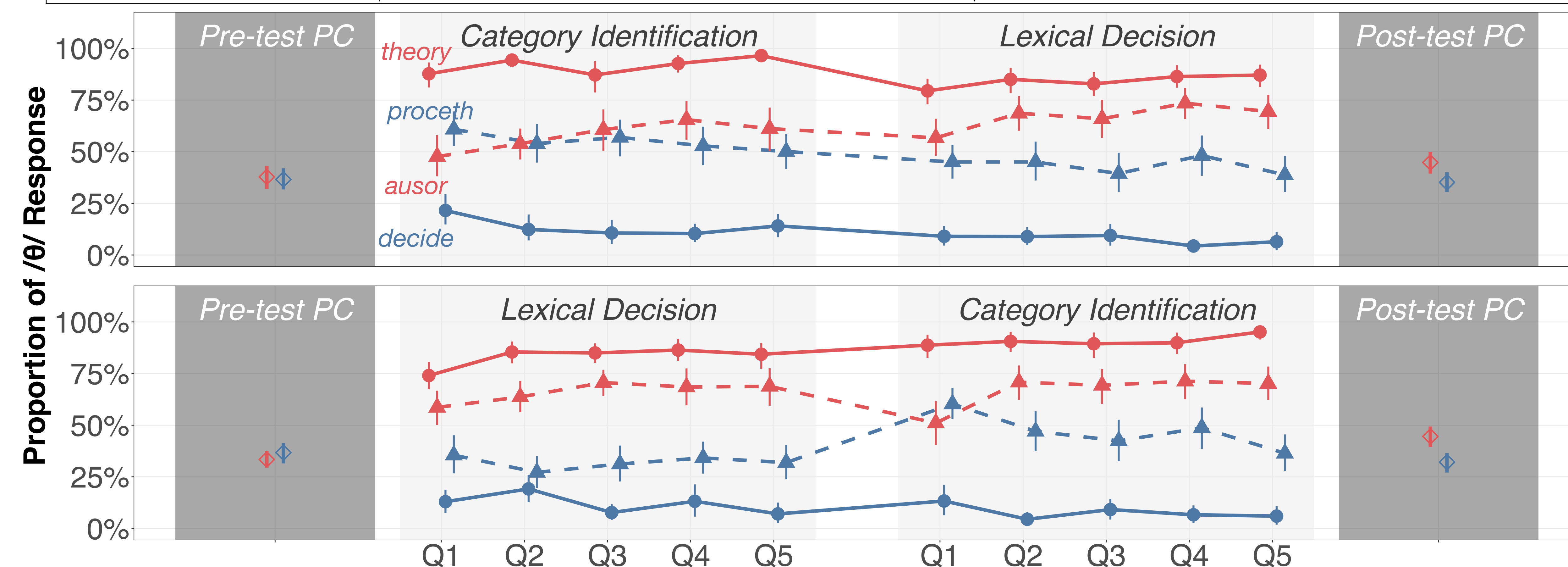
Pre-test PC → Exposure → Post-test PC

CatID + LD *order counterbalanced

Condition	Sound: /θ/	Sound: /s/
/θ/-biased	'theory' (W)	'ausor' (NW)
/s/-biased	'proceth' (NW)	'decide' (W)

2x2 Between-Subjects: /θ/-biased: CatID-first (N=41), LD-first (N=42); /s/-biased: CatID-first (N=42), LD-first (N=39)

Hypothesis	/θ/-biased exposure	/s/-biased exposure
H1 (Lexical)	No PC shift	No PC shift
H2 (Pre-lexical)	Shift toward more /θ/	Shift toward more /s/



Diamonds in PC: mean prop. of /θ/ responses aggregated across all steps

No significant Between-Subj **Post-test PC difference** across task orders

CatID→LD : Pre→Post % /θ/ shift = +7% in /θ/-biased; -1% in /s/-biased;
LD→CatID : Pre→Post % /θ/ shift = +11% in /θ/-biased; -5% in /s/-biased

Significant Pre→Post PC shifts in 3 of 4 cells, in the predicted direction. CatID-first /s/-biased ns; smaller /s/-biased magnitudes likely reflect baseline /s/-preference for ambiguous tokens, orthogonal to H1 vs. H2.

Discussion

1. **Natural accent adaptation involves pre-lexical change.** Pre→Post PC shifts survive across both task orders → **Ruling out a pure H1(Lexical-level change)**. Both H2a and H2b are possible mechanisms^{3,4,5,6,7} → **Premature to conclude that natural accent adaptation requires mechanisms distinct from other types of perceptual learning.**^{10,11}
2. **Task structure modulates lexical-bias effects.** Pre→Post PC shift is marginally larger for LD-first listeners (Phase × Condition × Task Order: $\hat{\beta} = .34$, $SE = .20$, $p = .083$). LD may promote supervised learning¹² or alter attention allocation¹³ for subsequent CatID.

Next Step: In-progress acoustic-cue analyses on **PC** shifts may distinguish between the two **pre-lexical** mechanisms:

- H2a (Representational): Predicts a **Phase × Cue** interaction → **Updates** Cue-to-Category mapping (changed acoustic sensitivity)
- H2b (Non-representational): Predicts **no Phase × Cue** interaction → **Maintains** Cue-to-Category mapping (shifted phonetic decisions at the category level)