Relating Scalar Inference and Alternative Activation:
A view from the Rise-Fall-Rise Tune in American English

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Overarching themes of rise-fall-rise

Has <u>something to do</u> with "higher alternatives"

Uncertainty

Disputability

Contrastive topic

Strategy

Negation

Secondary QUD

Salience

Partial Answer

Ward and Hirschberg (1985,1992), Büring (2003), Constant (2012), Wagner et al. (2013), Westera (2019), de Marneffe and Tonhauser (2019), Göbel (2019), Göbel and Wagner (2022), Buccola and Goodhue (2023), Oshima (2008), Ronai and Göbel (2023)

Testing ground for higher alternatives

Scalar Inference (SI)

Jane ate some of the cookies → some, *but not all* of the cookies

- *<some, all>* comprise a lexical scale (Horn 1972)

Likelihood of SI-enriched interpretations varies → *scalar diversity*
(van Tiel et al. 2016, Gotzner et al. 2018, Ronai 2022, a.o.)

RFR in the context of SI

Has <u>something to do</u> with "higher alternatives"

"Jane ate some of the cookies" . . . *all*
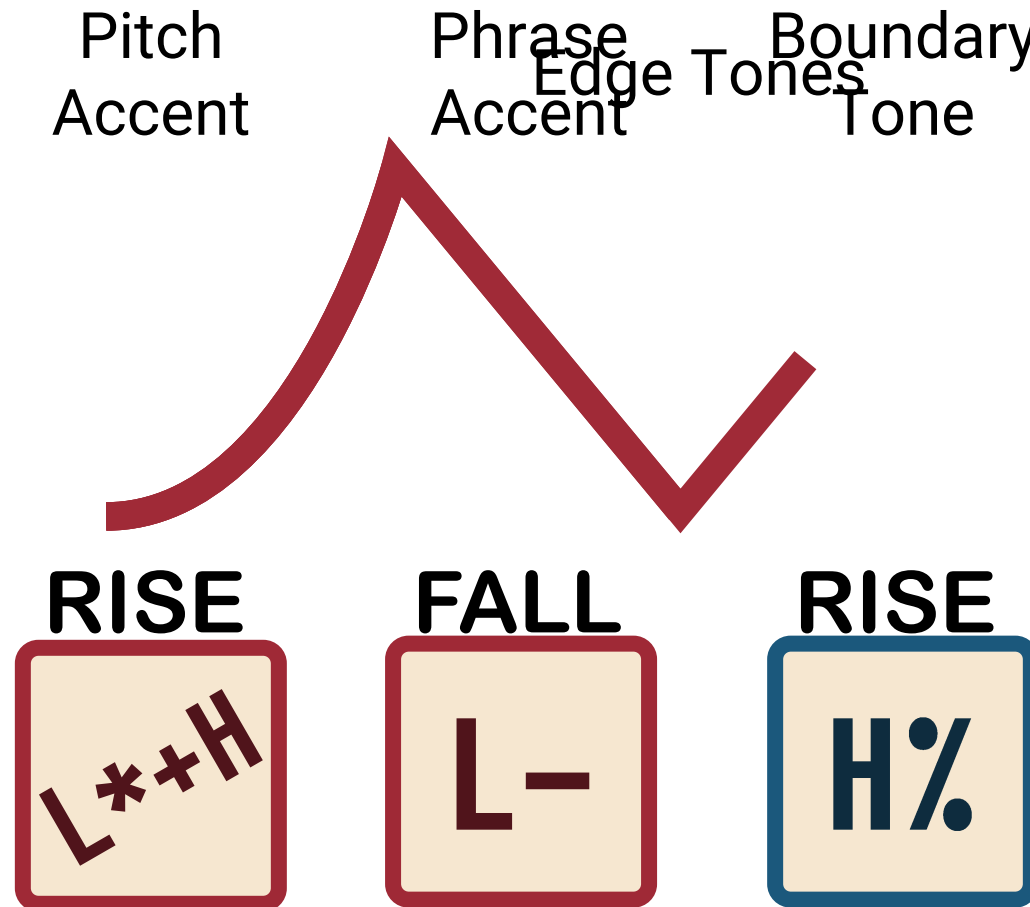
Uncertainty ⟷ **Negation**

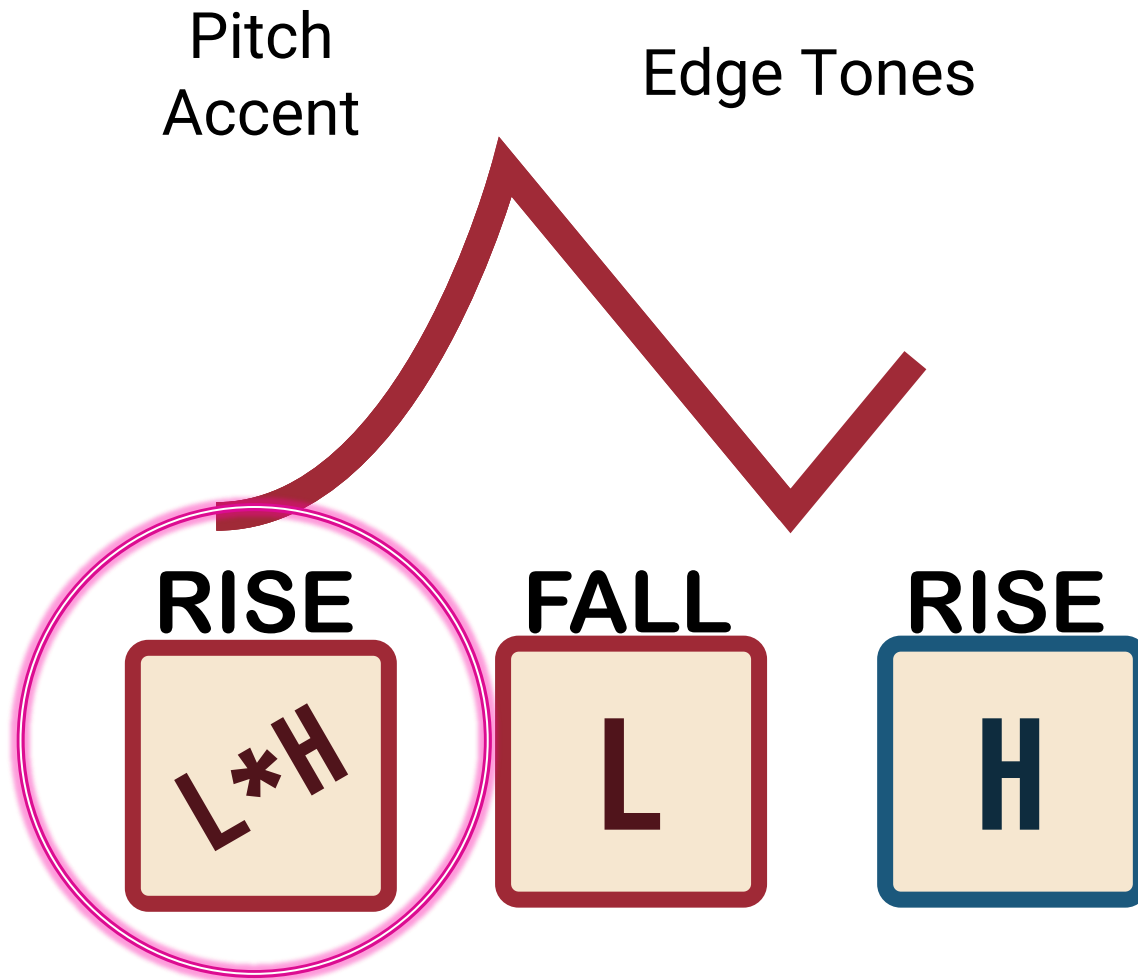?All   Not all

But what is rise-fall-rise?

Ward and Hirschberg (1985,1992), Büring (2003), Constant (2012), Wagner et al. (2013), Westera (2019), de Marneffe and Tonhauser (2019), Göbel (2019), Göbel and Wagner (2022), Buccola and Goodhue (2023), Oshima (2008), Ronai and Göbel (2023)

What is rise-fall-rise?

AM theory gives us building blocks to make intonational tunes

Pitch
Accent

Phrase
Accent

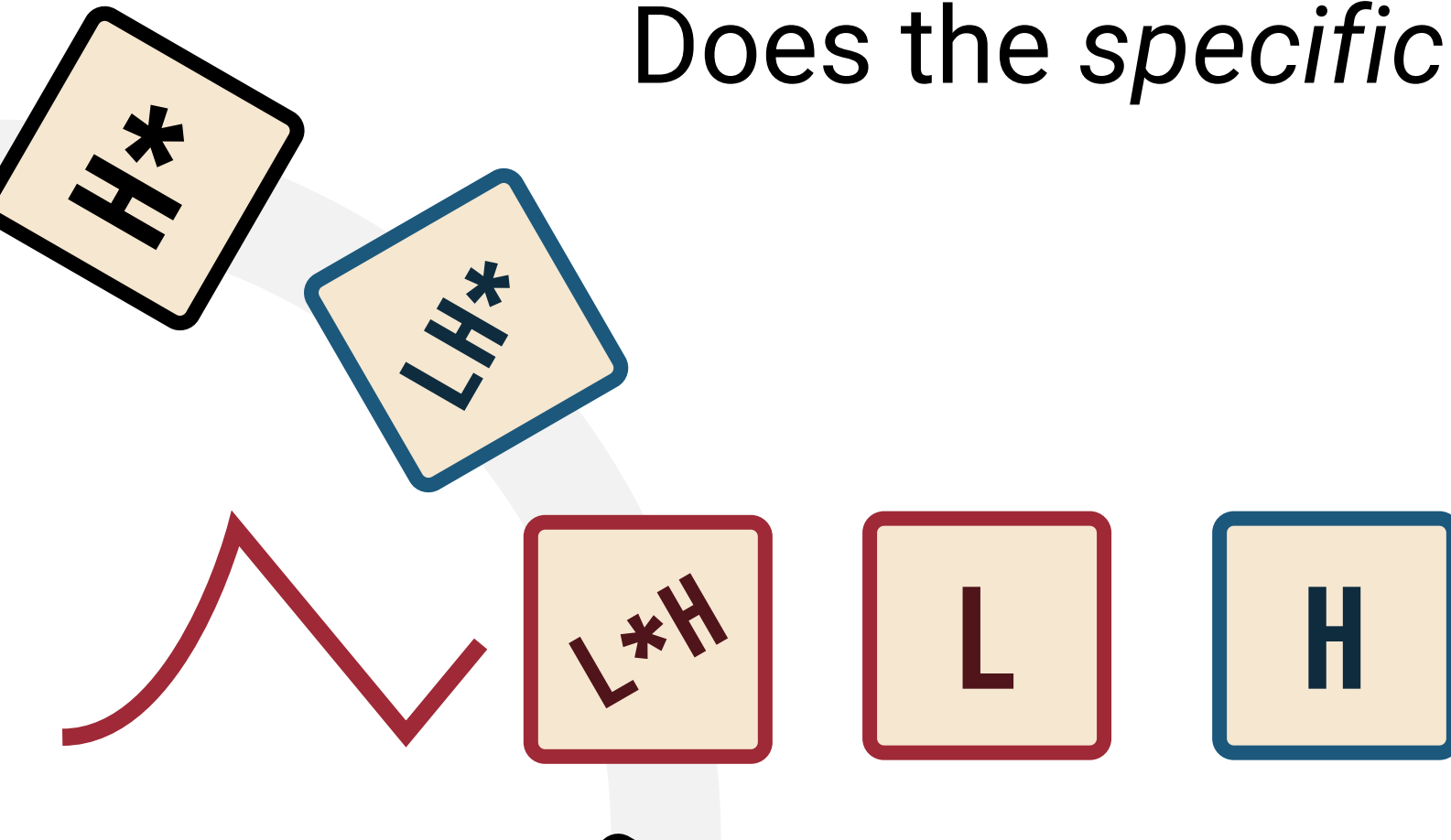Edge Tones

Boundary
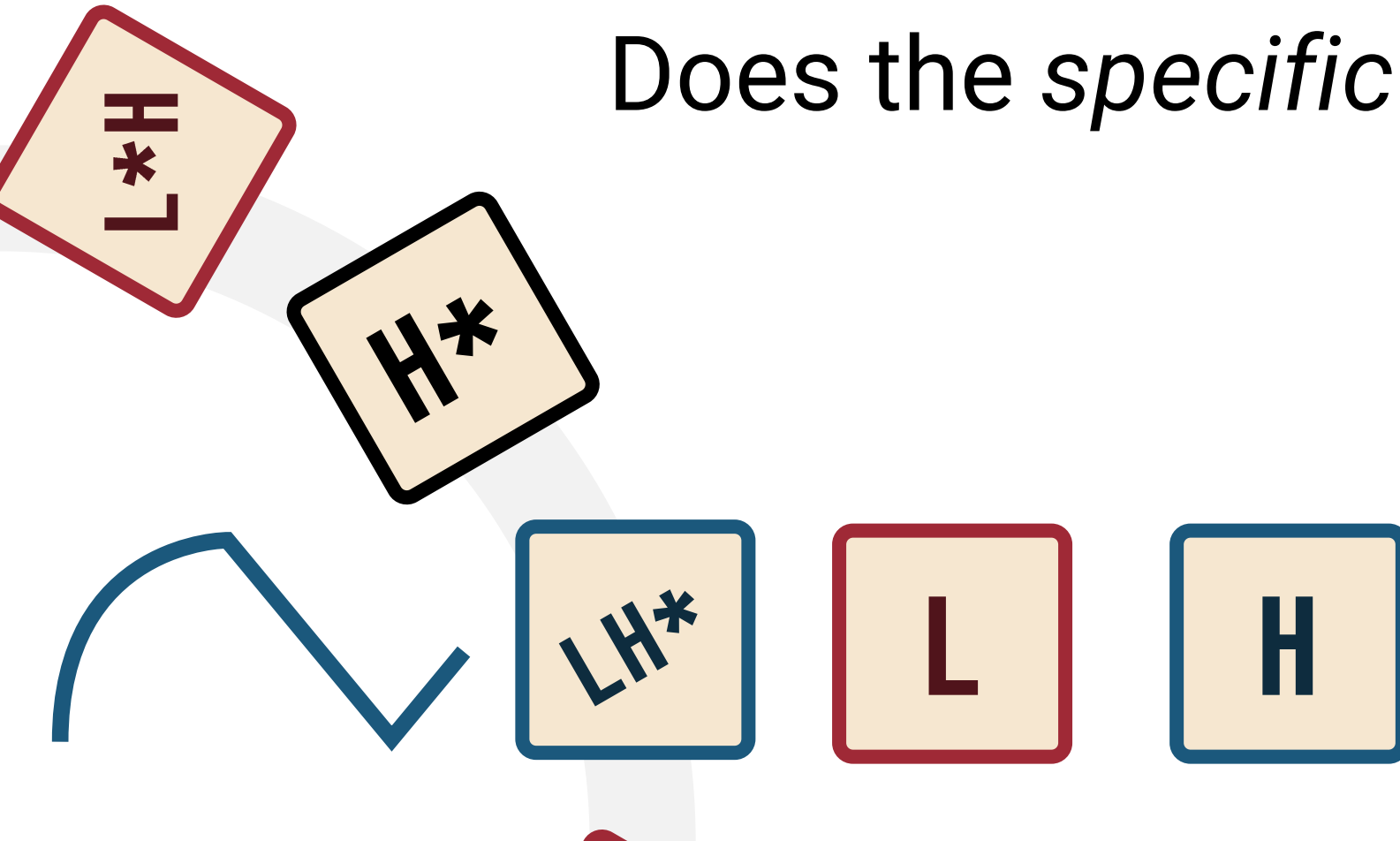Tone

RISE

FALL

RISE

L*+H

L–

H%

Pierrehumbert (1980)
Ward and Hirschberg (1985)
Beckman and Pierrehumbert (1986)

What is rise-fall-rise?

AM theory gives us building blocks to make intonational tunes

Pitch
Accent

Edge Tones

RISE

FALL

RISE

L*H

L

H

Pierrehumbert (1980)
Ward and Hirschberg (1985)
Beckman and Pierrehumbert (1986)

What is rise-fall-rise?

AM theory gives us building blocks to make intonational tunes

Does the *specific* RFR matter?

H*

LH*

L*H

L

H

Pierrehumbert (1980)
Ward and Hirschberg (1985)
Beckman and Pierrehumbert (1986)

What is rise-fall-rise?

AM theory gives us building blocks to make intonational tunes

Does the *specific* RFR matter?

L*H

H*

LH*

L

H

Pierrehumbert (1980)
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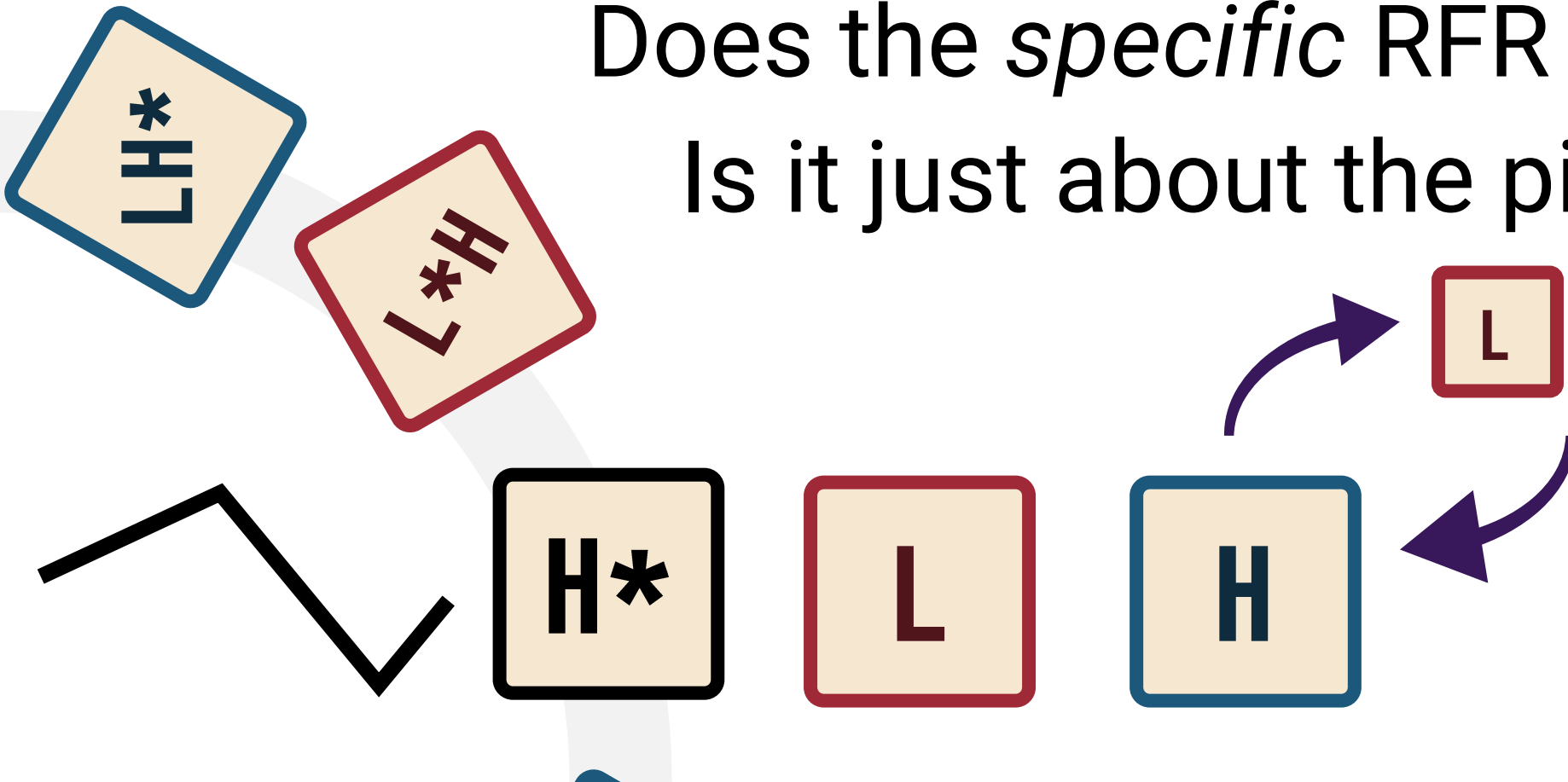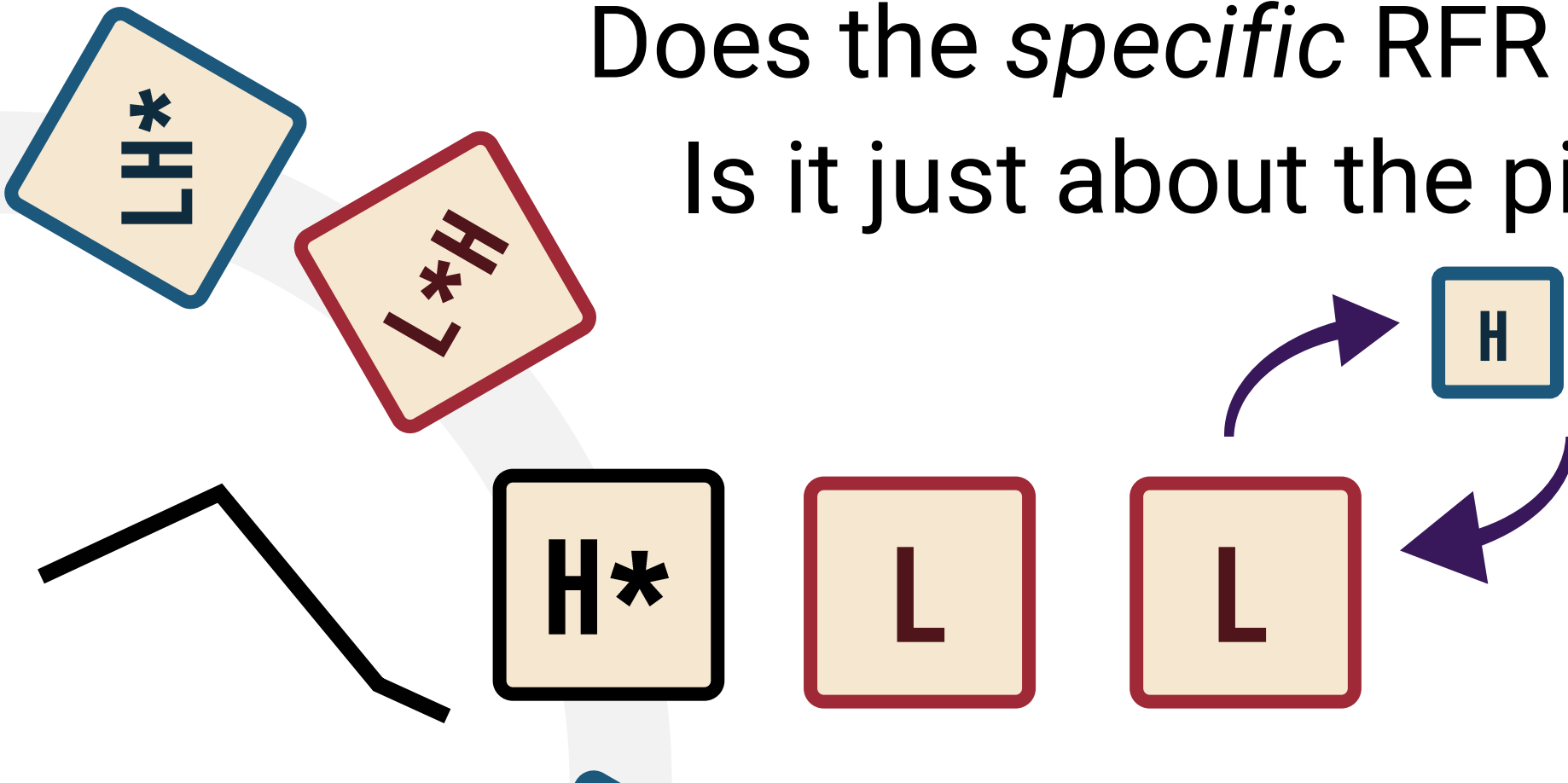Beckman and Pierrehumbert (1986)

What is rise-fall-rise?

AM theory gives us building blocks to make intonational tunes

Does the *specific* RFR matter?

Is it just about the pitch accent?

LH*

L*H

L

H*

L

H

Pierrehumbert (1980)
Ward and Hirschberg (1985)
Beckman and Pierrehumbert (1986)

What is rise-fall-rise?

AM theory gives us building blocks to make intonational tunes

Does the *specific* RFR matter?

Is it just about the pitch accent?
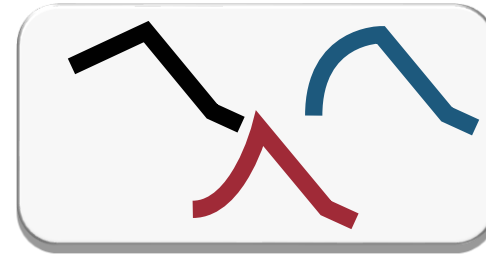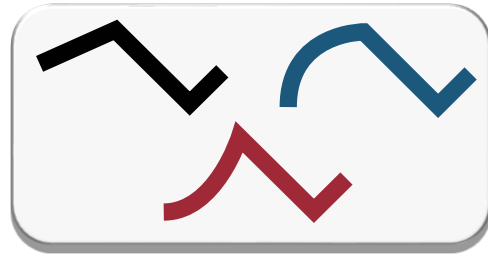
LH*

L*H

H

H*

L

L

Pierrehumbert (1980)
Ward and Hirschberg (1985)
Beckman and Pierrehumbert (1986)
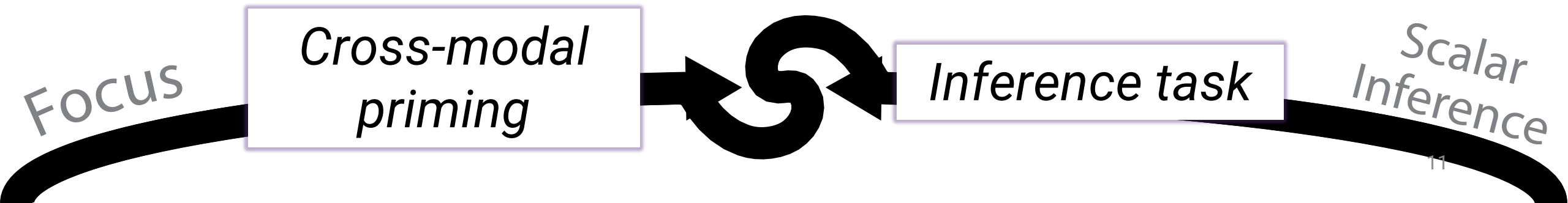
High level questions about RFR

What is the meaning contribution of RFR?
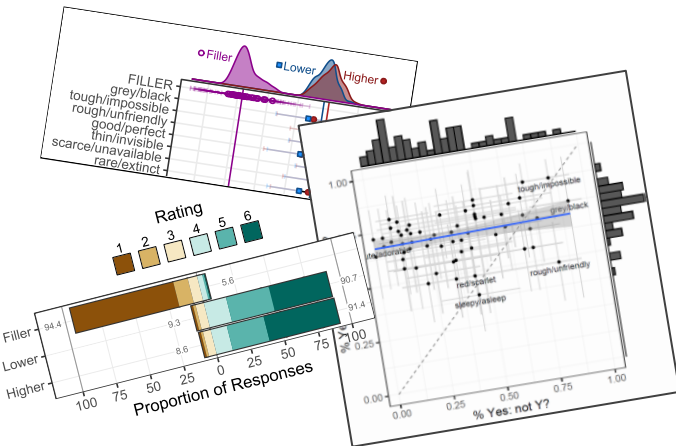Does it have a processing correlate?

One RFR
or any RFR?

Are falls
any different?

Let's exploit adjectival lexical scales in…

Focus

Cross-modal priming

Inference task

Scalar Inference

Inference Task & Material Considerations

Contexts not biased towards or against SI

Did someone leave a window open in the office overnight?

Mentioning *cold* will affect priming task
(Gotzner et al. 2016)
(Yan and Calhoun 2019)

The office feels cool.

RFR can't be used out of the blue

64 adjectival scales in indirect Q/A pairs

Would you conclude that the office does not feel cold?
Yes   No

Inference Task & Material Considerations

Contexts not biased towards or against SI

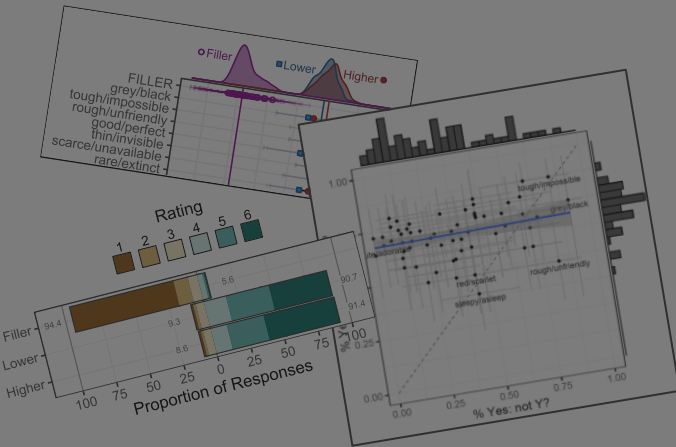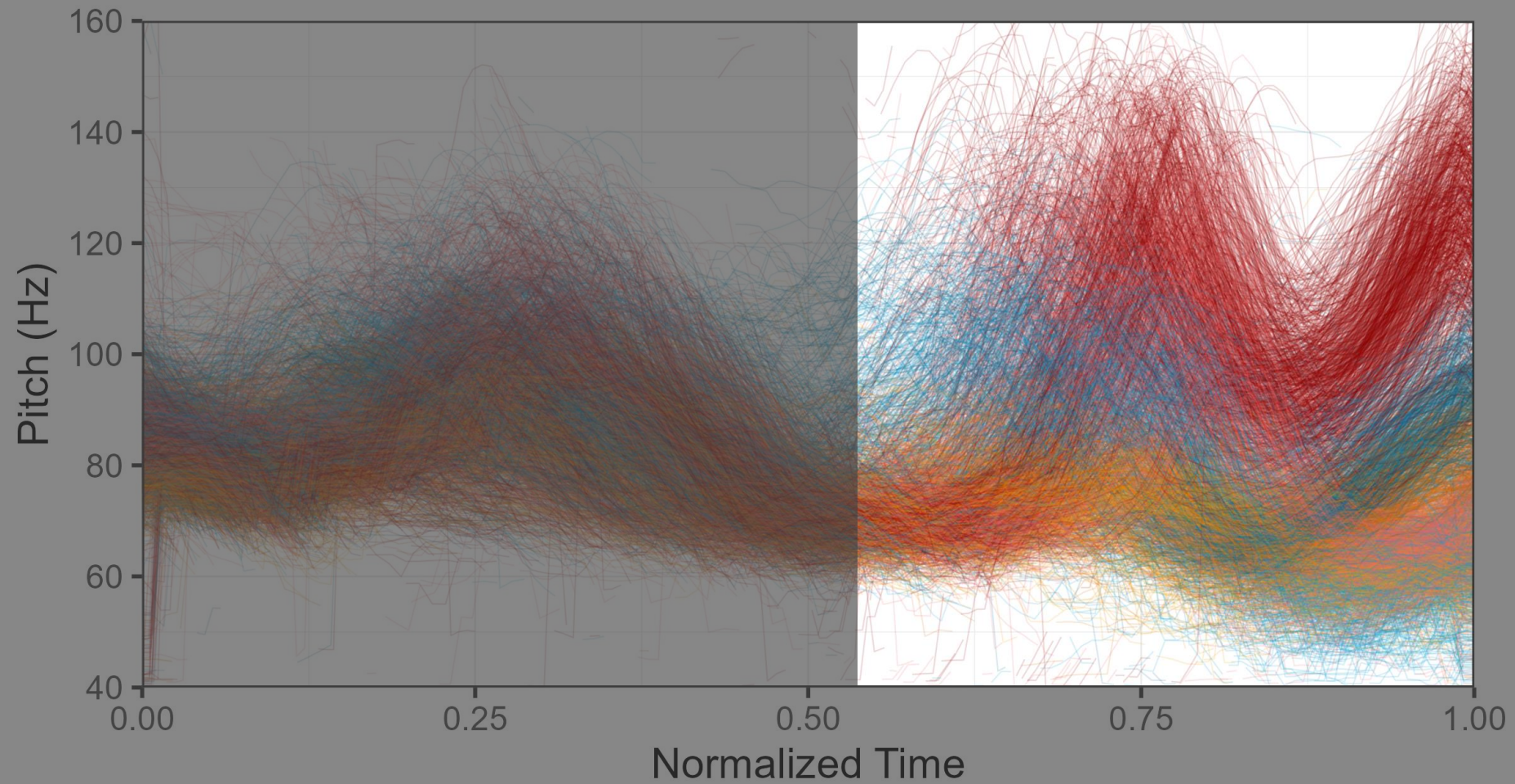*Did someone leave a window open in the office overnight?*

The office feels cool.

Mentioning cold will affect priming task
(Gotzner et al. 2016)
(Yan and Calhoun 2019)

RFR can't be used out of the blue
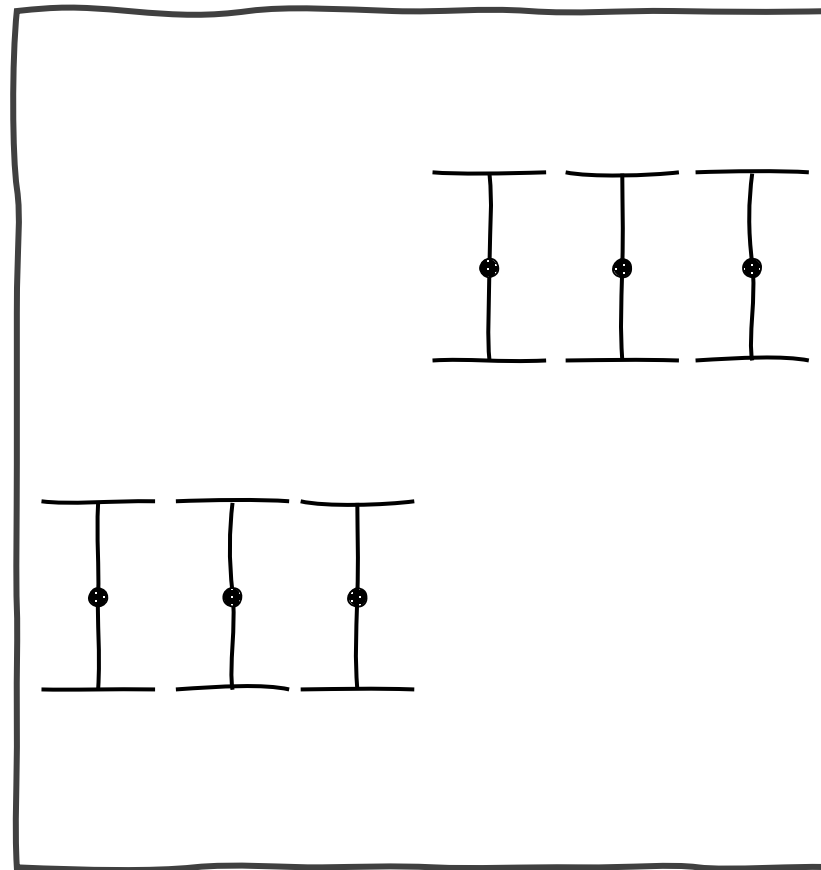
64 adjectival scales in indirect Q/A pairs

Would you conclude that the office does not feel cold?
Yes   No

Audio Materials

Audio Materials
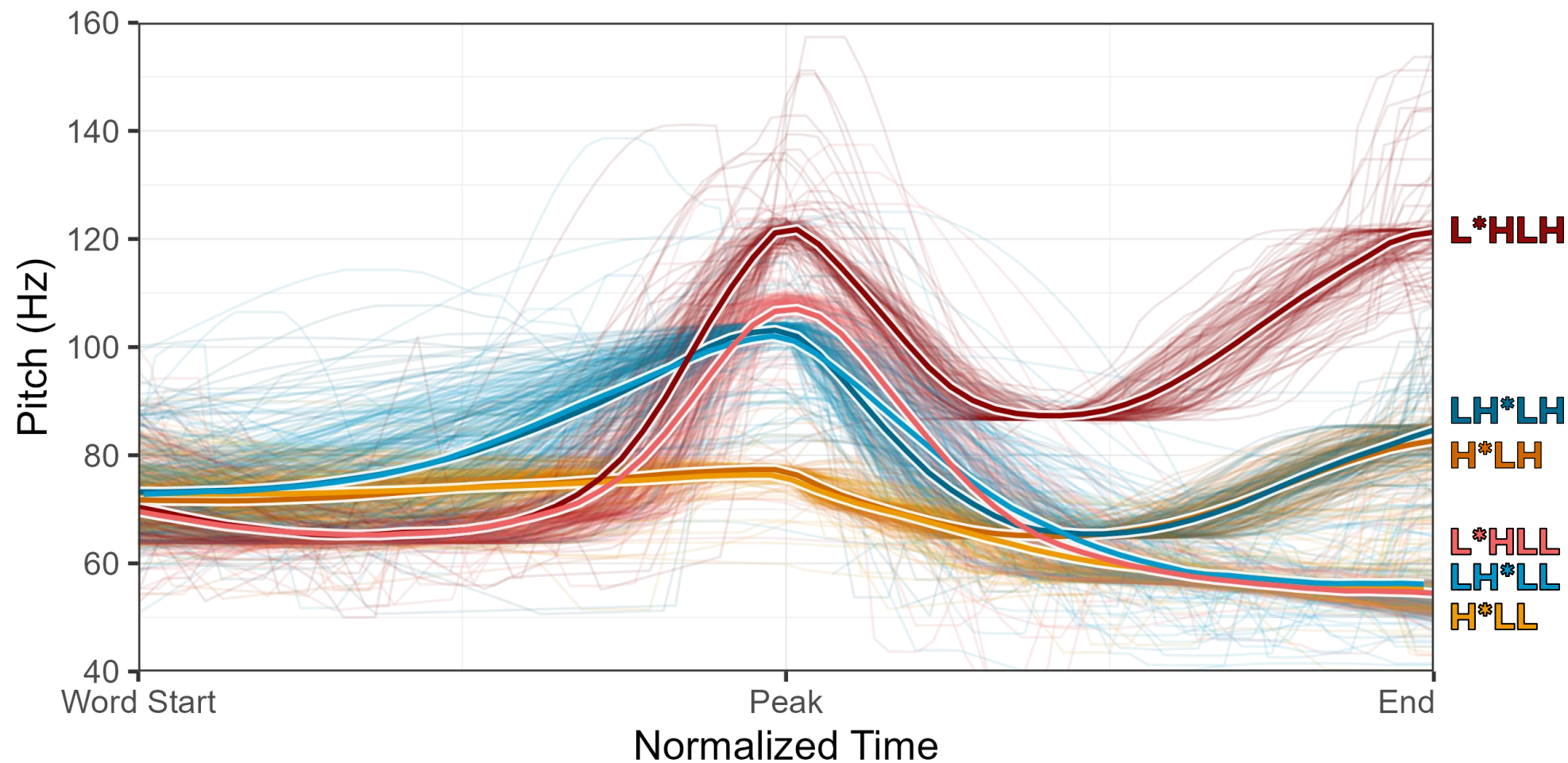
Sketching some predictions

All RFRs > Falls

Average SI
Rate

H^* LH^* L^*H H^* LH^* L^*H
Falls   RFRs

Sketching some predictions

All RFRs > Falls

Bitonal RFRs > Falls

Average SI Rate

H^* LH^* L^*H H^* LH^* L^*H
_____   _____
Falls   **RFRs**

Sketching some predictions

Average SI Rate

H* LH* L*H / Falls

H* LH* L*H / RFRs
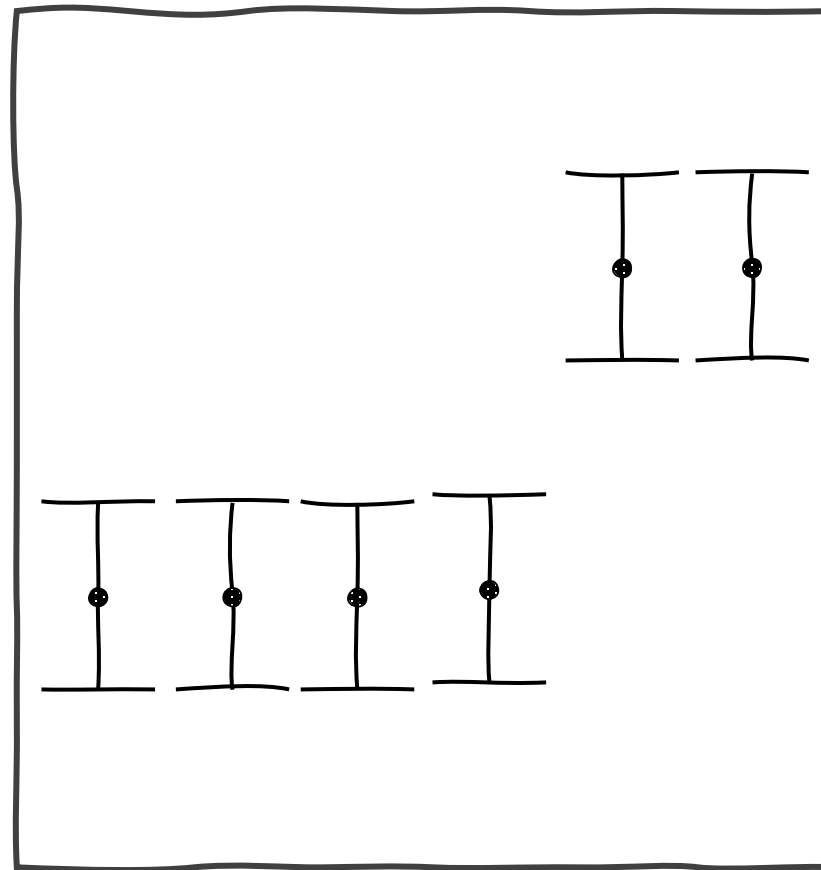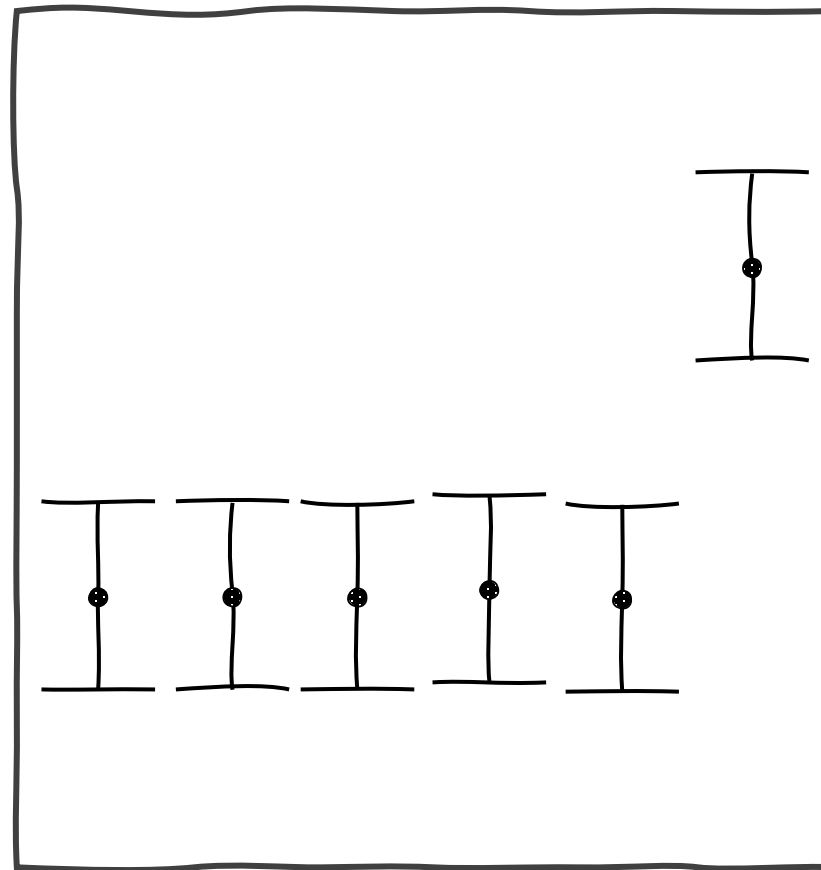
All RFRs > Falls

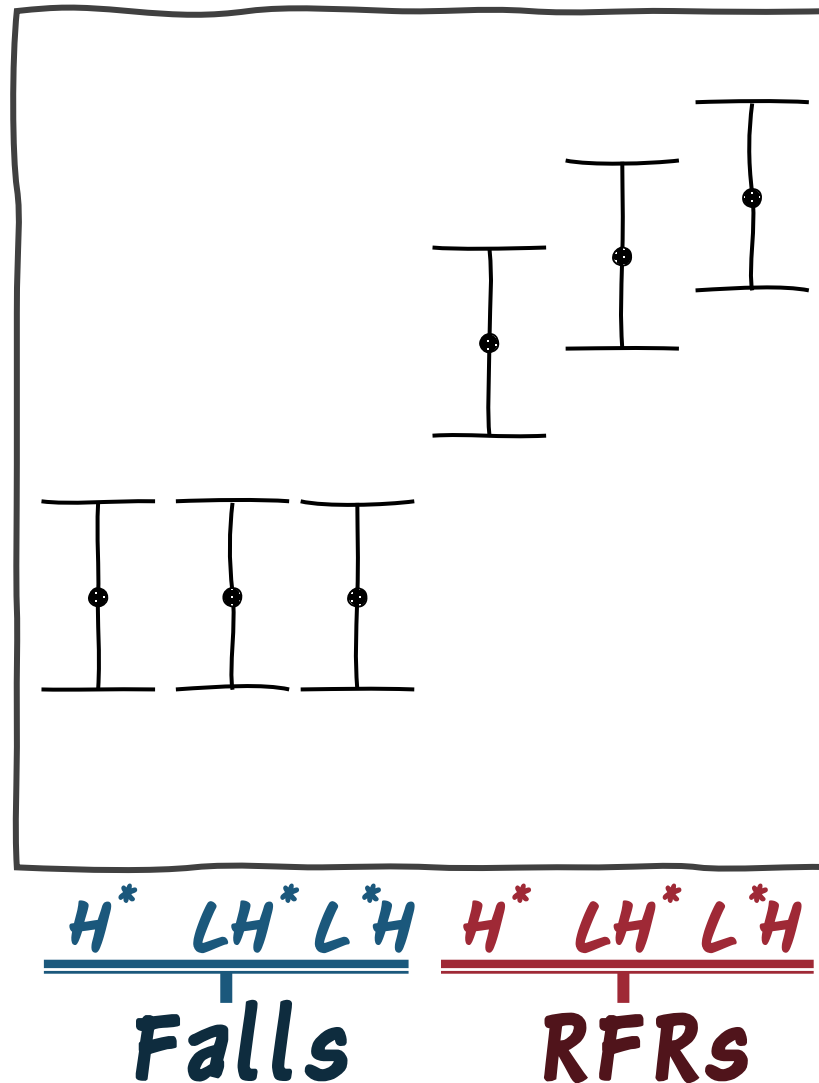Bitonal RFRs > Falls

Largest RFR > Falls

Sketching some predictions

Average SI Rate

H* LH* L*H
Falls

H* LH* L*H
RFRs

All RFRs > Falls

Bitonal RFRs > Falls

Largest RFR > Falls

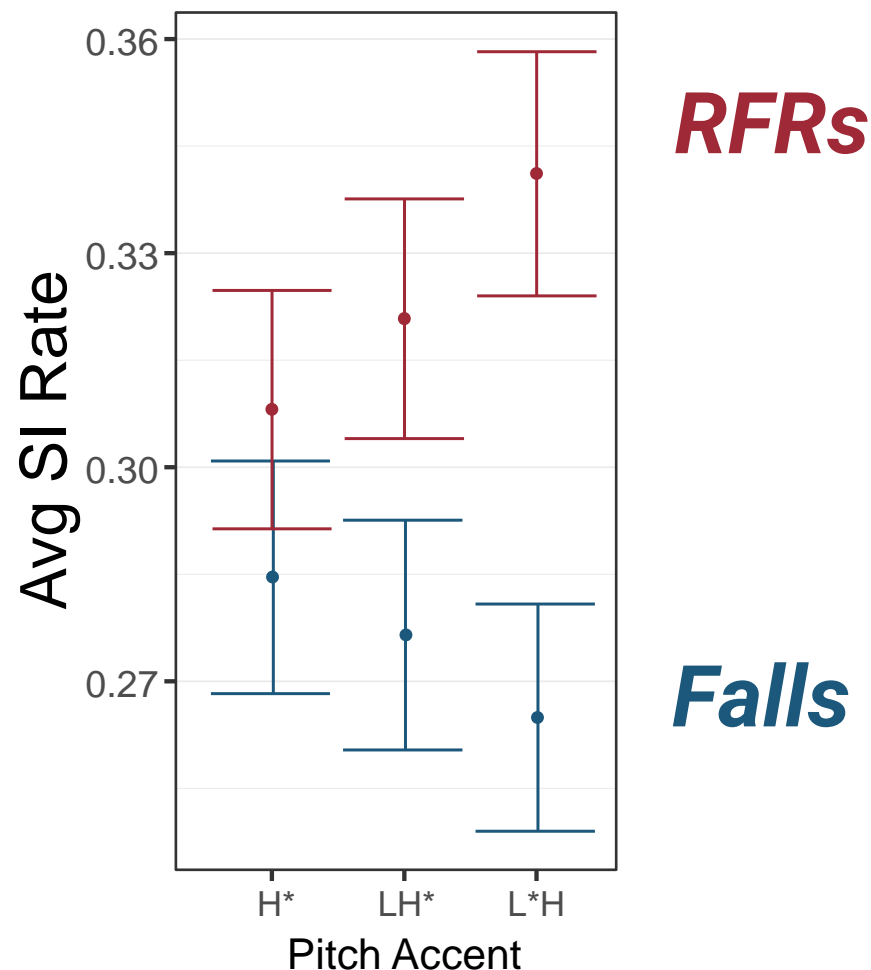Graded RFRs > Falls

RFRs encourage SI calculation
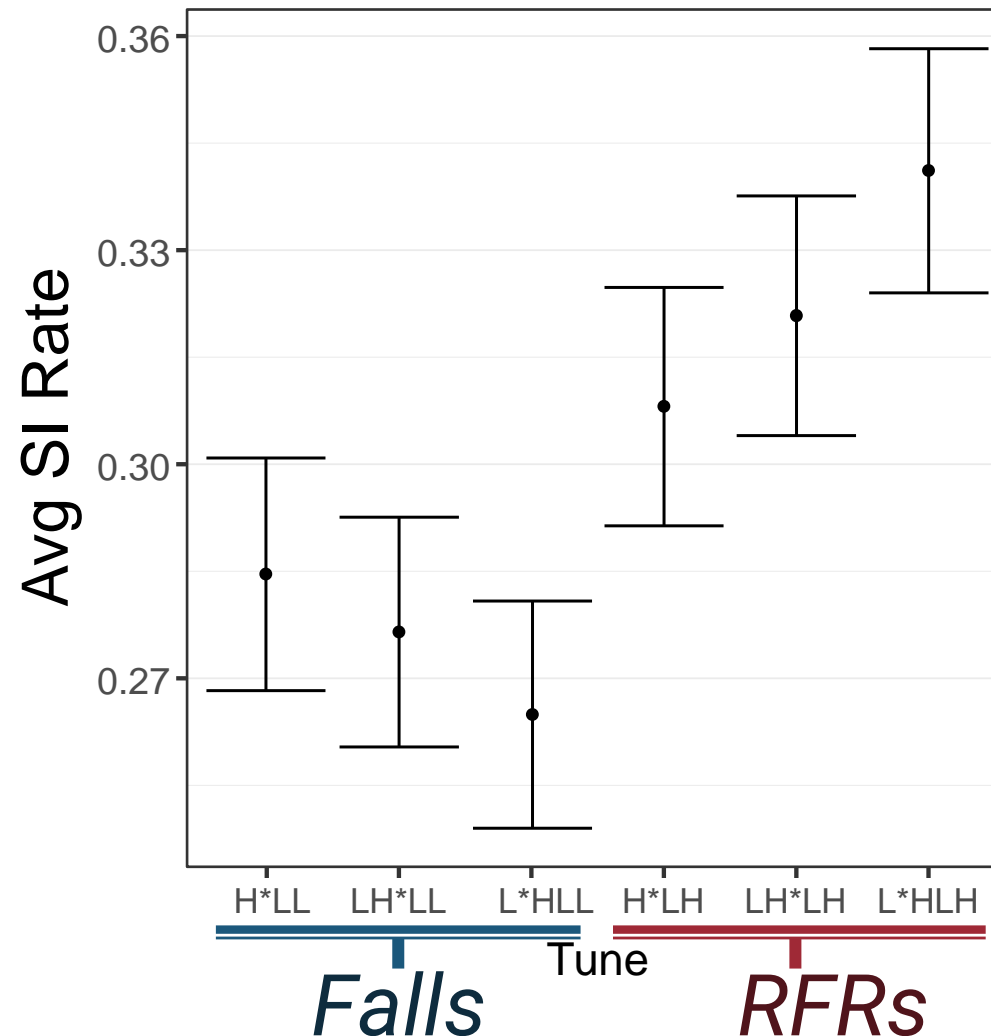
RFRs encourage SI calculation

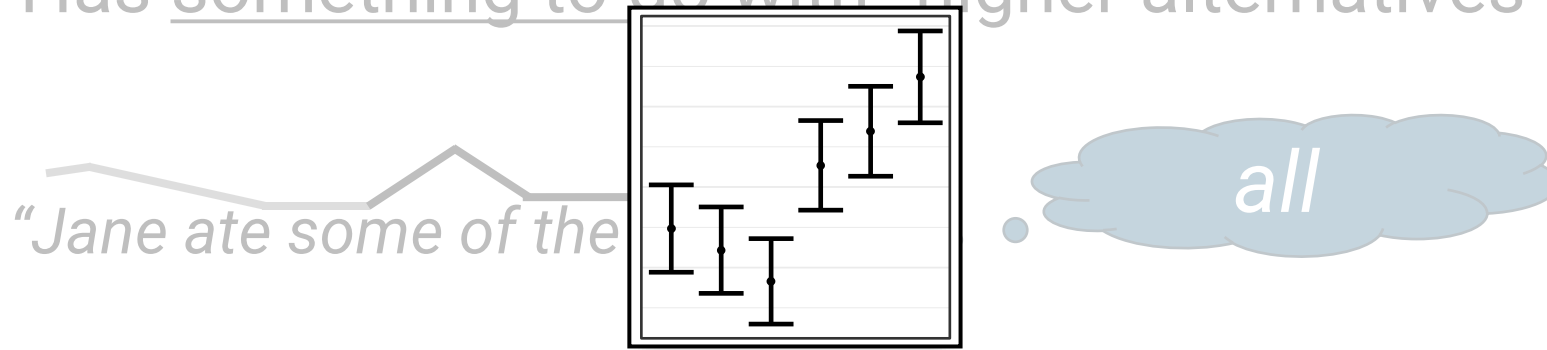All RFRs increase SI rates, but there seems to be **graded distinctions**

The pattern is **reversed** for the falls

We can't attribute things **solely** to the pitch accent

RFRs

Falls

Going back to accounts of RFR

Has something to do with "higher alternatives"

"Jane ate some of the

all

Uncertainty ⟷ Negation

?All   Not all

Next: Do we find a similar
pattern in online processing?

Ward and Hirschberg (1985,1992), Büring (2003), Constant (2012), Wagner et al. (2013), Westera (2019), de Marneffe and Tonhauser (2019), Göbel (2019), Göbel and Wagner (2022), Buccola and Goodhue (2023), Oshima (2008), Ronai and Göbel (2023)

Cross-Modal Lexical Decision

PRIME

🎧

...COOL

TARGET (750ms SOA)

COLD

YES

NO

L   R
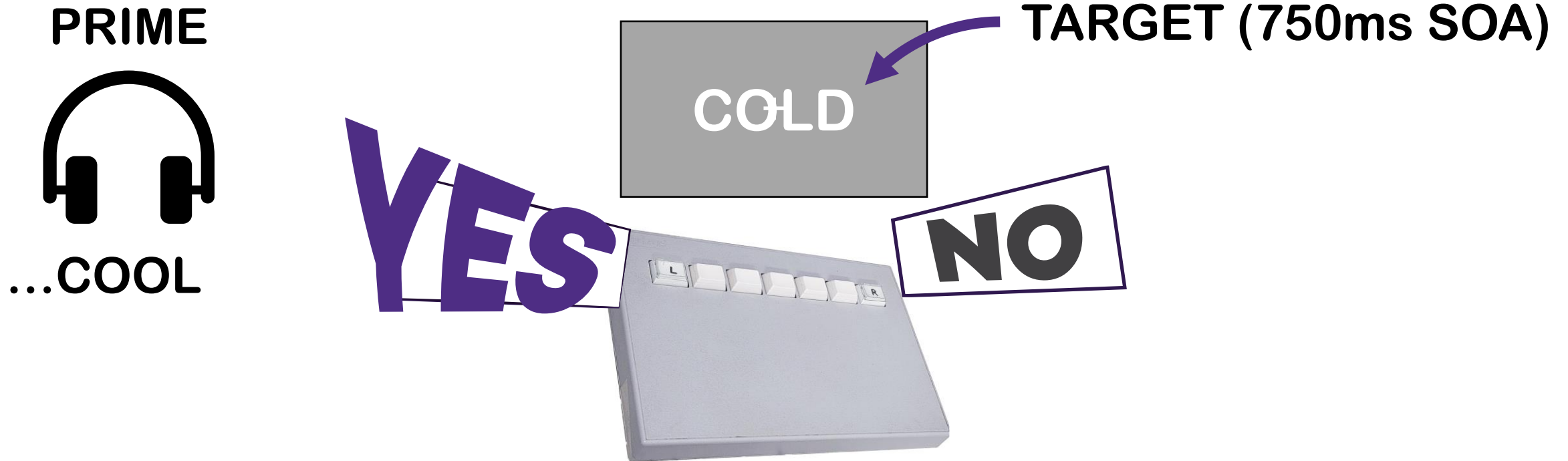
What factors affect the activation status of the target?

(1) The relation between the prime and the target

(2) The prosody used with the auditory prime

Braun and Tagliapietra (2010)
Husband and Ferreira (2016)
Yap et al. (2015) i.a.
Rastle et al. (2010)

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Materials

64 adjectival scales in indirect question-answer pairs
  - Split between hear *cool* and see *cold* or hear *cold* and see *cool*

+ 60 filler dialogues with pseudoword targets (Rastle et al. 2010)

+ 60 filler dialogues testing focus alternatives (Husband and Ferreira 2016)
  - Targets: counterbalanced **contrastive**, **non-contrastive**, or **unrelated**
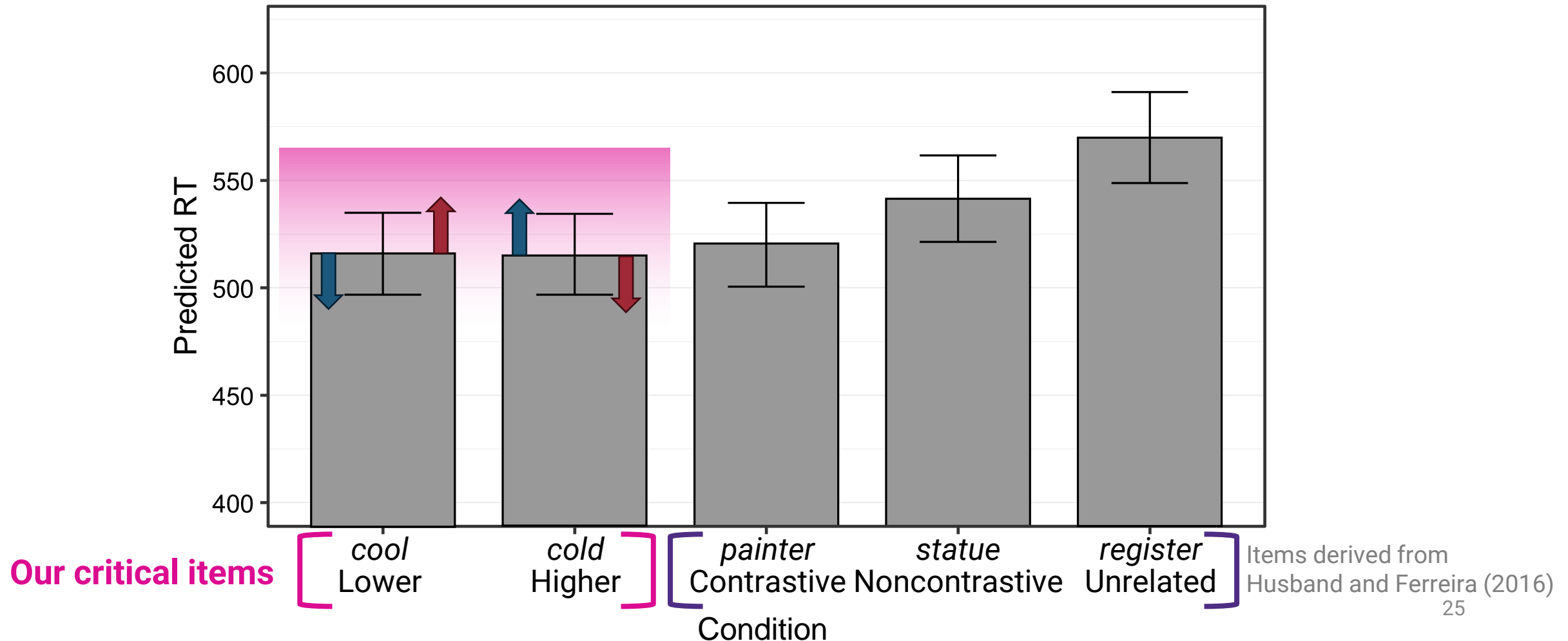
Q: Did the museum deliver any good news?
A: The museum thrilled the **sculptor**

PAINTER
STATUE
REGISTER

High-level view by condition

Scalemates behave like focus alternatives

Items derived from Husband and Ferreira (2016)
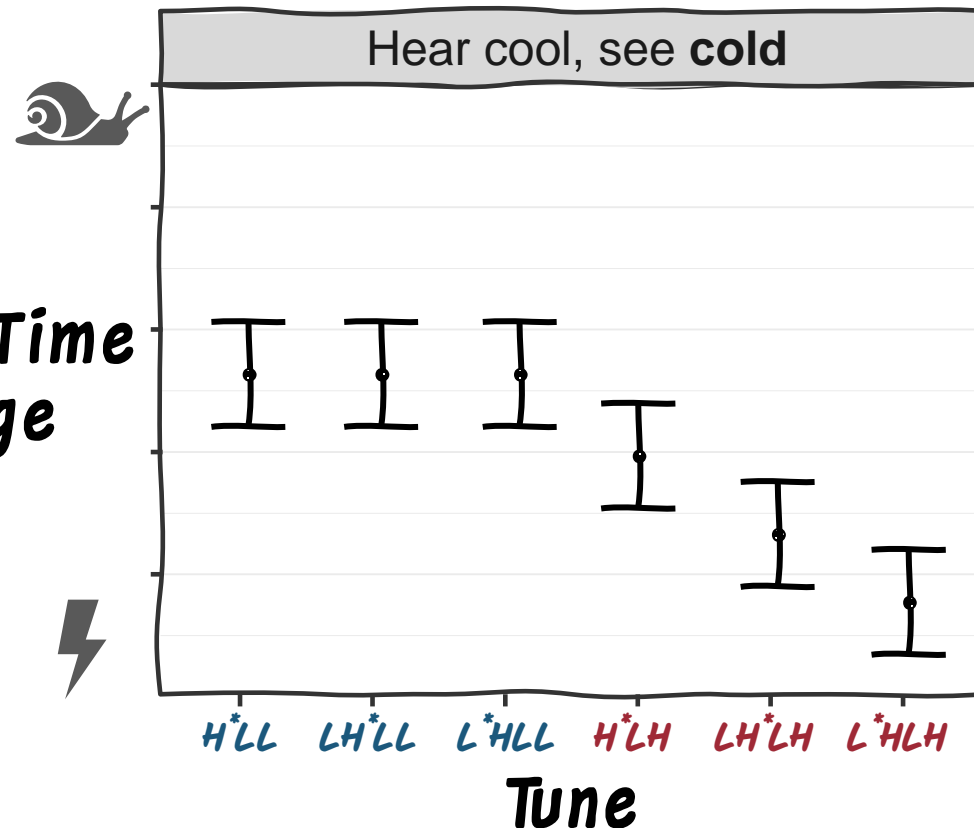
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Sketching Lexical Decision Predictions

Maybe: RFRs that encourage SI more → higher alternative more facilitated

If RFR targets the **higher** alternative, *cool* may not be as facilitated

Cool+RFR = Faster RT for cold?

Cold+RFR = Slower RT for cool?

Hear cool, see **cold**

Reaction Time
% Change

Tune

H*LL   LH*LL   L*HLL   H*LH   LH*LH   L*HLH

Sketching Lexical Decision Predictions

Maybe: RFRs that encourage SI more → higher alternative more facilitated

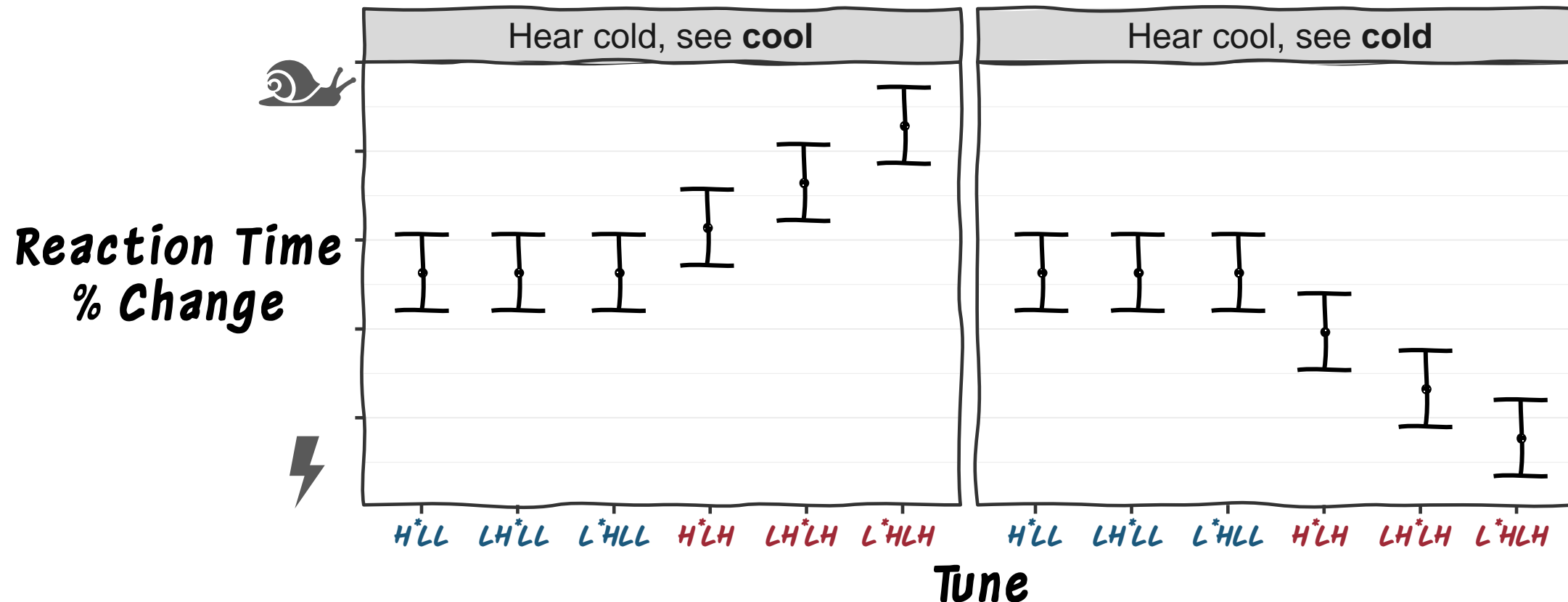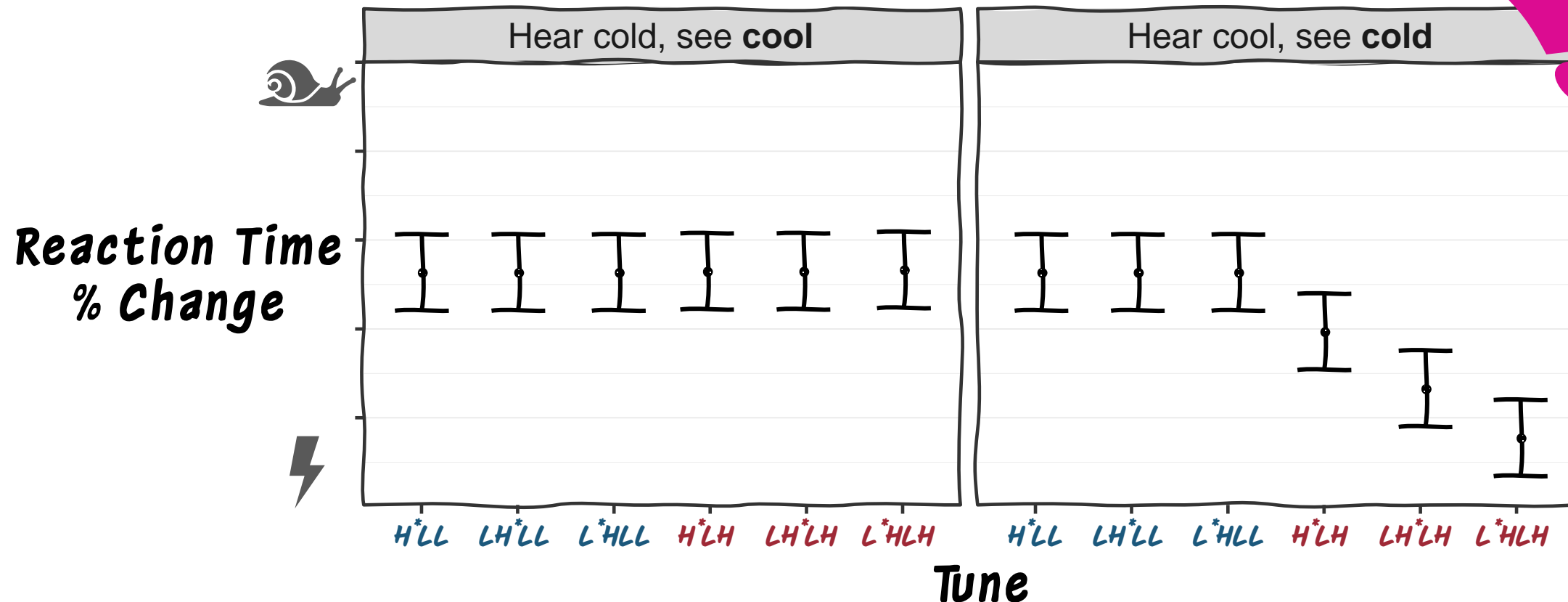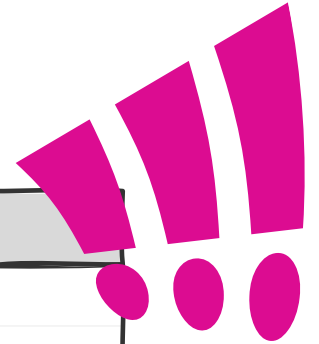If RFR targets the **higher** alternative, *cool* may not be as facilitated
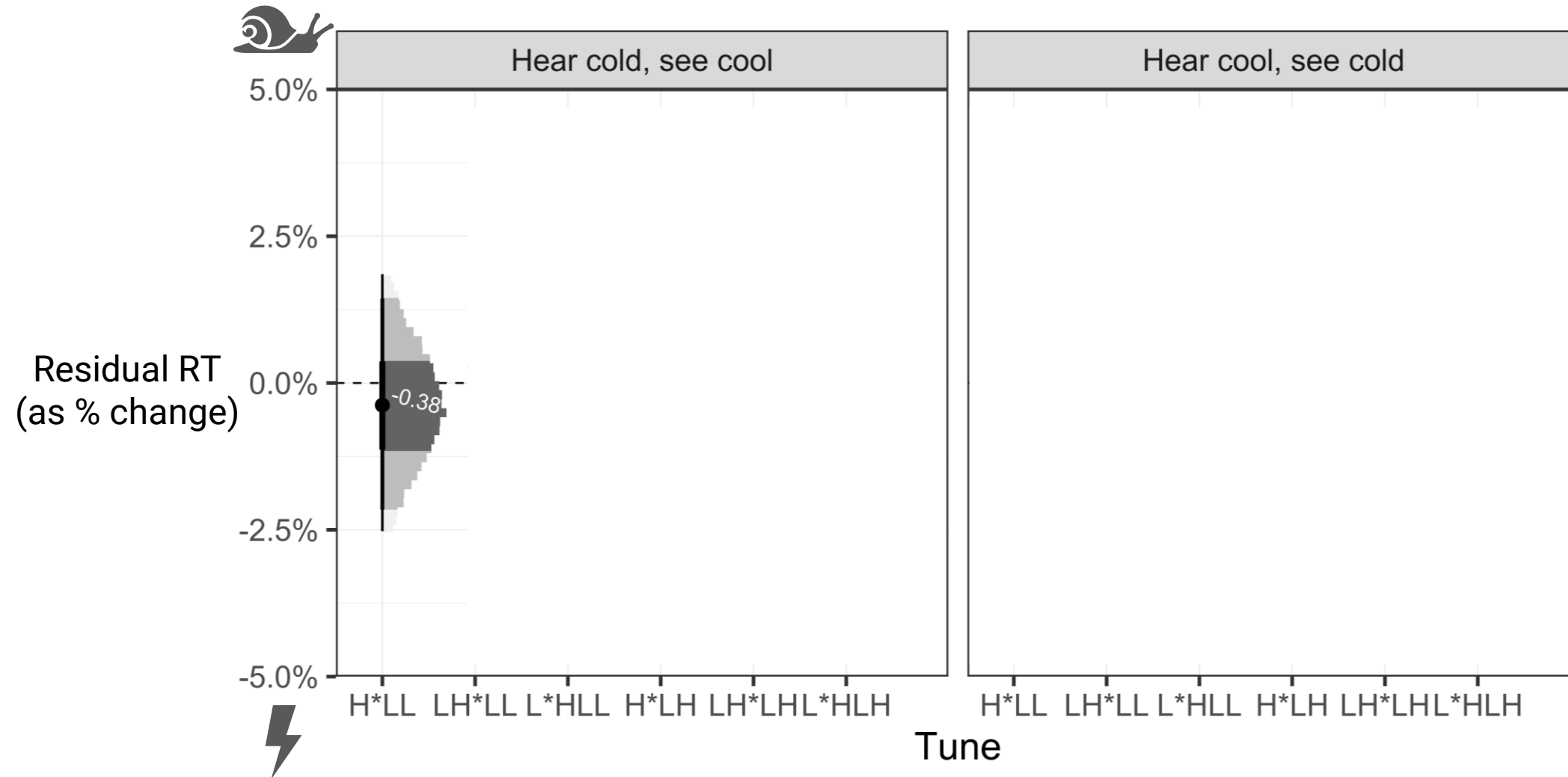
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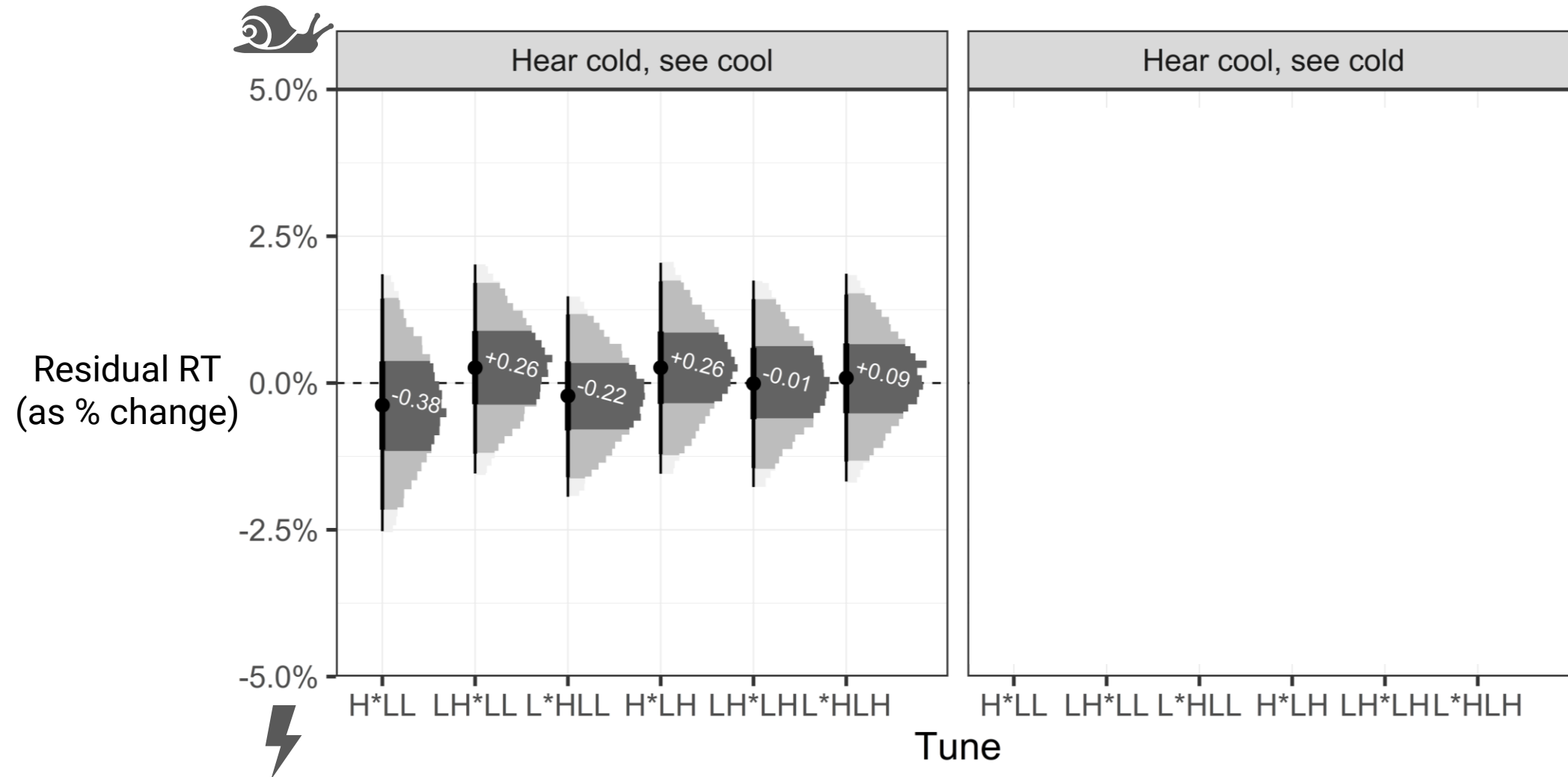
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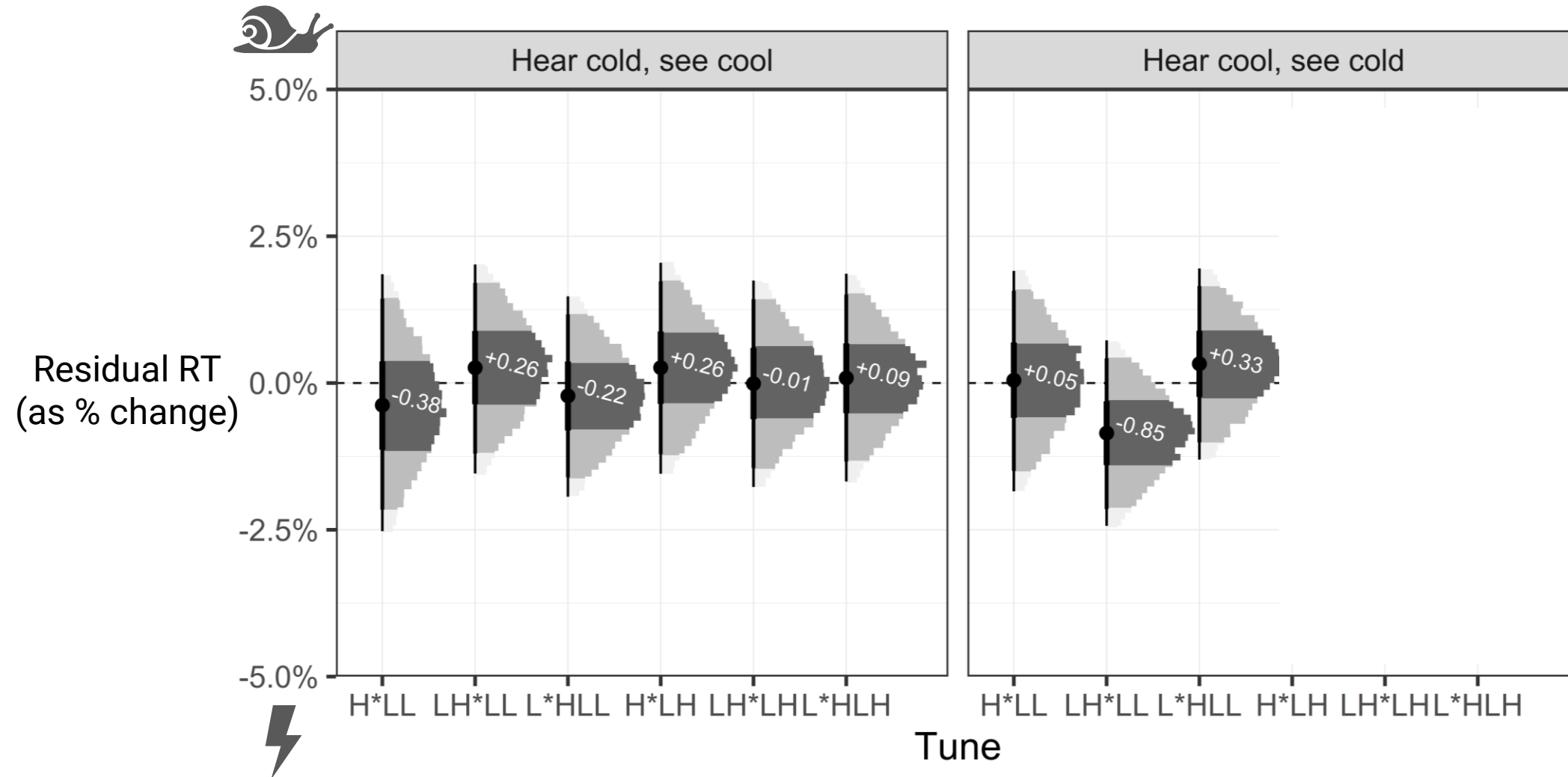# Lexical Decision Results
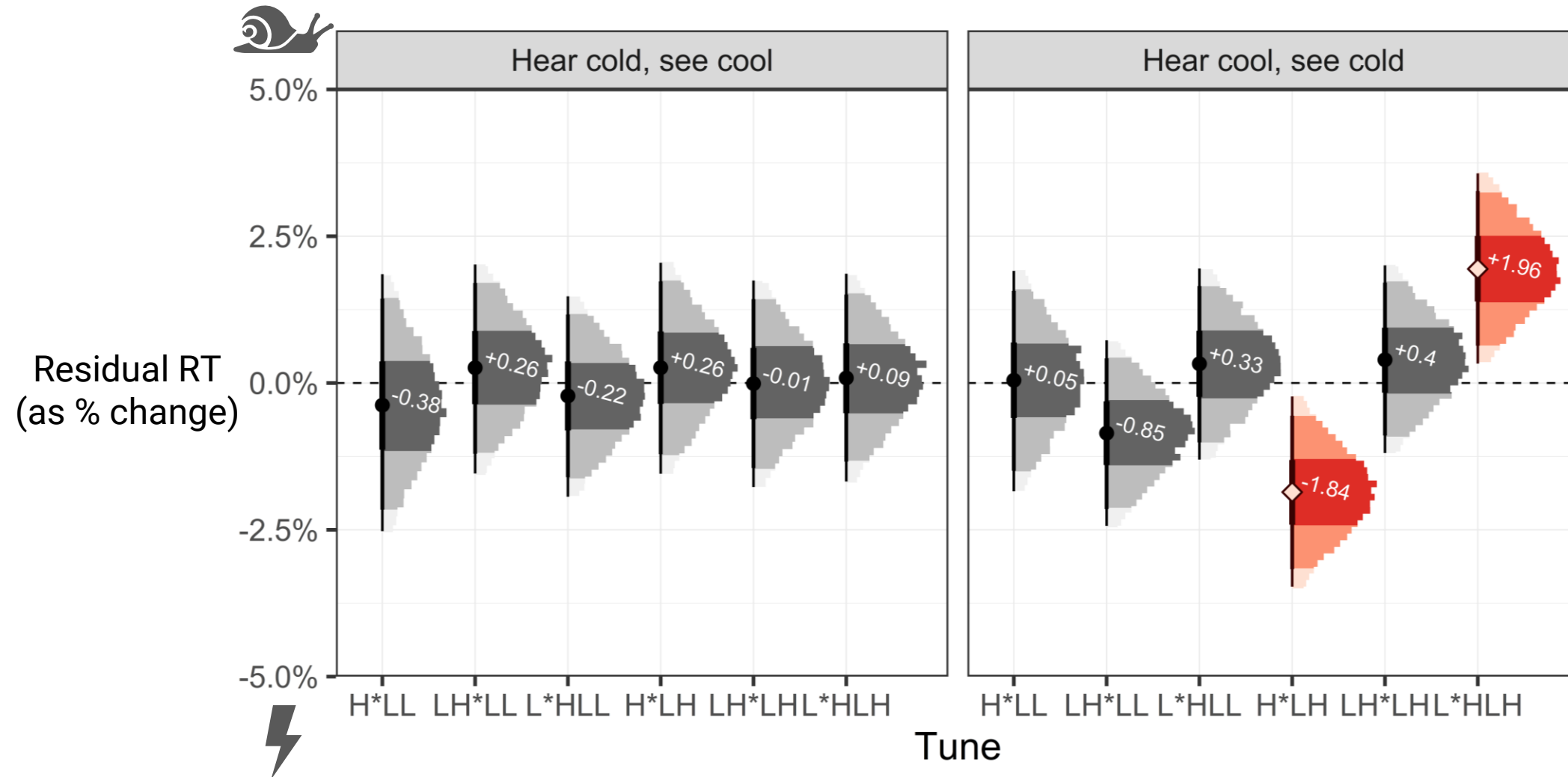
Lexical Decision Results

Lexical Decision Results

Lexical Decision Results

Comparing the two sets of results

The RFR with the highest rate of SI enrichment gives us **less facilitation**

Similar pattern was found recently in text-based priming (Lacina & Gotzner 2024, CogSci)

Patterns don't generalize within pitch accent, analysis needs to be at the *tune* level
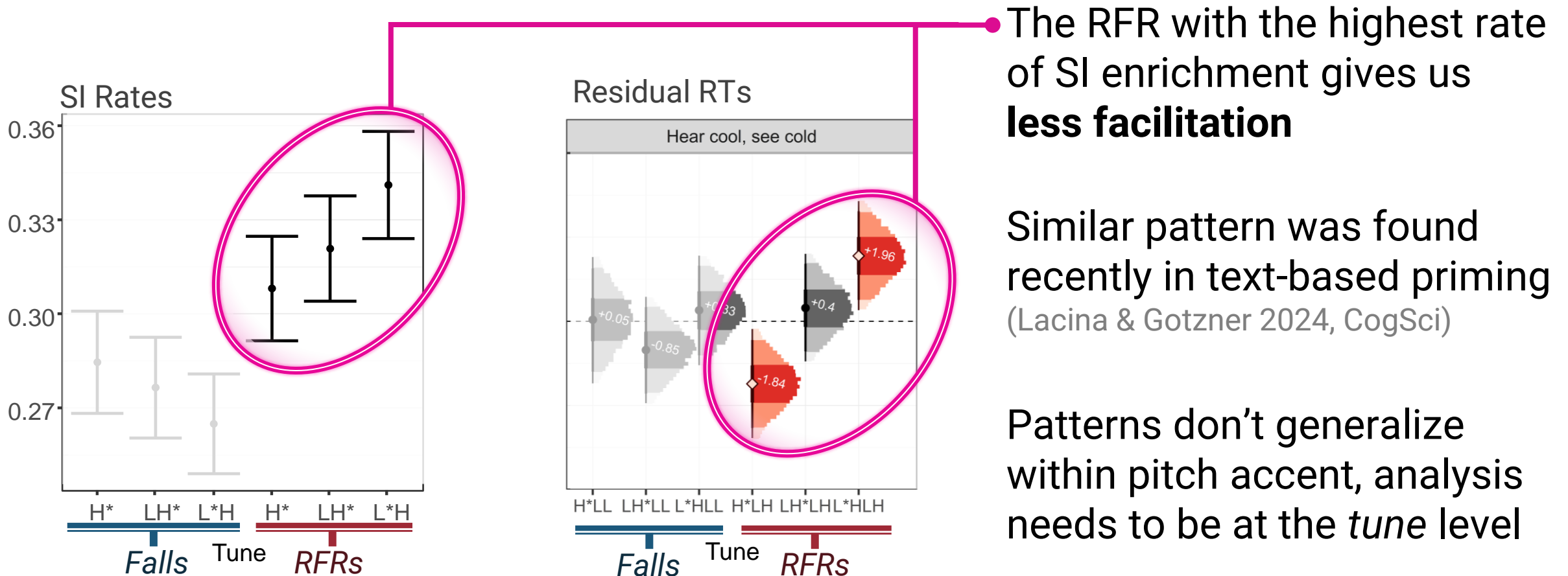
Relationship to pitch range

Competing inferences may be interfering with and masking additional facilitation effects, c.f. what we found for H*LH

"Incredulous"
"Contradictory"

"Vanilla"

Arousal
Effort
Affect
Incredulity
Engagement
Cooperativity

Pitch Range

Ladd et al. (1985)
Gussenhoven (2004)
Hirschberg and Ward (1995)

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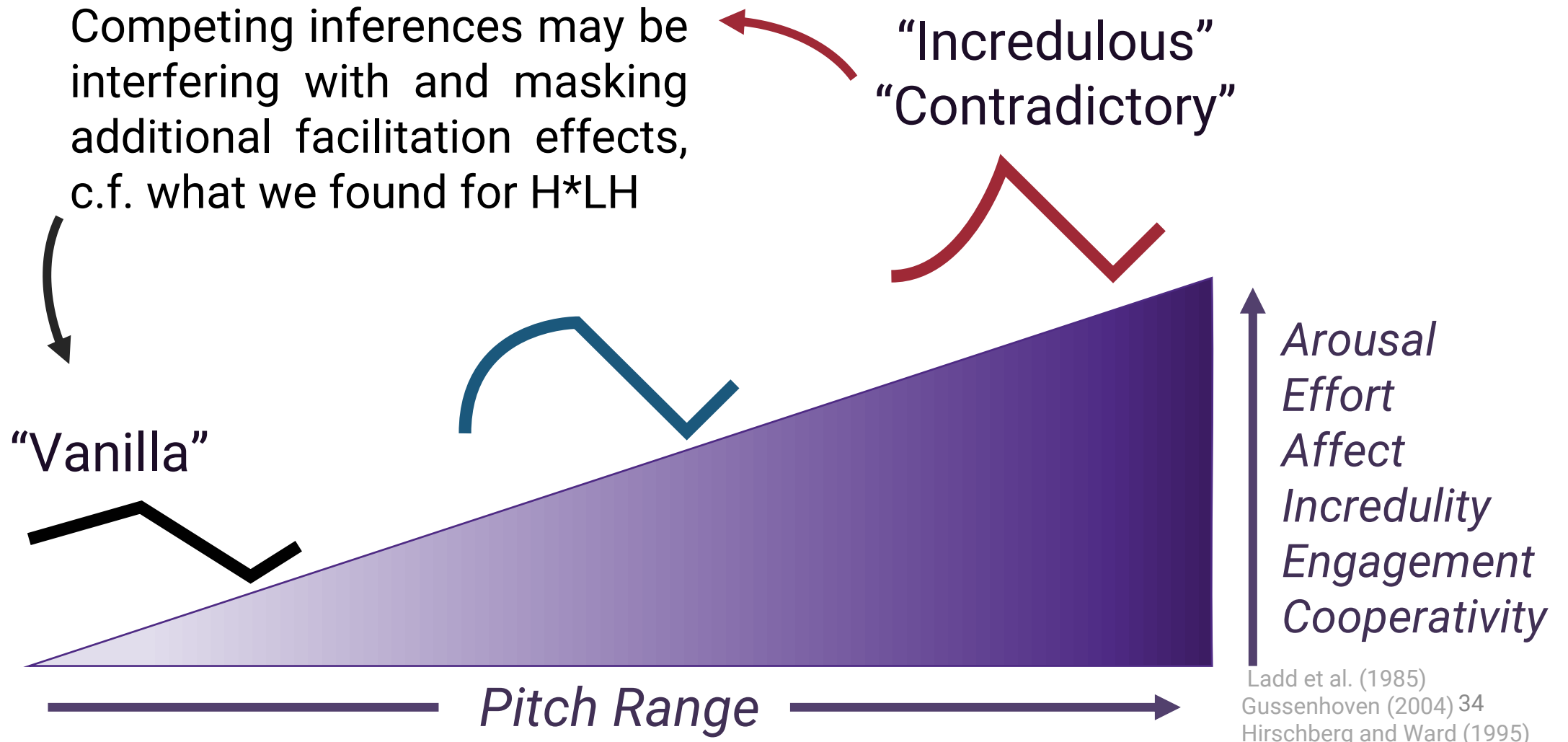
Conclusions

RFRs encourage SI relative to Falls, with small graded distinctions
- Incompatible with uncertainty accounts

Increased likelihood of SI associated with **less** facilitation, not more
- Generally, priming for scalemates is similar to that for contrastive associates

RFRs with larger pitch ranges may be inviting competing inferences

Patterns can't be attributed to the pitch accent or edge tones alone, variation at the level of the tune needs to be accounted for

Ongoing: Can we relate SI rates and priming in a simultaneous dual task?

Acknowledgments

- Gregory Ward & Duane Watson
- Ming Xiang & Chris Kennedy
- Kate Sandberg & Mike Tabatowski
- Chun Chan
- ProSD Lab at Northwestern
- All Prolific & undergraduate participants

Thank you!

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