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## 1. Introduction

- Is perception influenced by knowledge of a phonological process?
  - Yes. It's like the effect of lexical bias on phoneme identification criteria (Ganong 1980) = 'interaction'
  - No. It's like *the lack of an effect of lexical bias on cumulative discriminability* (Kingston *et al.* submitted) = 'autonomy'
  - Contrast of ID and disc. results shows anti-modular ('interactive') models are insufficient
- Modelling influence and the lack thereof: Autonomy
  - Separate auditory and phonetic memory (Pisoni 1973, Pisoni & Tash 1974), Serial OT perception grammars (Boersma & Hamann 2007)
    - Both model types appear to predict response time effects on access of lg. knowledge
  - Dual-route models (Fujisaki & Kawashima 1969, 1970)
  - Parallel OT perception grammars? (e.g. Boersma & Hamann 2007) *Is this model 'interactive'?*

## 2. Phonology in perception

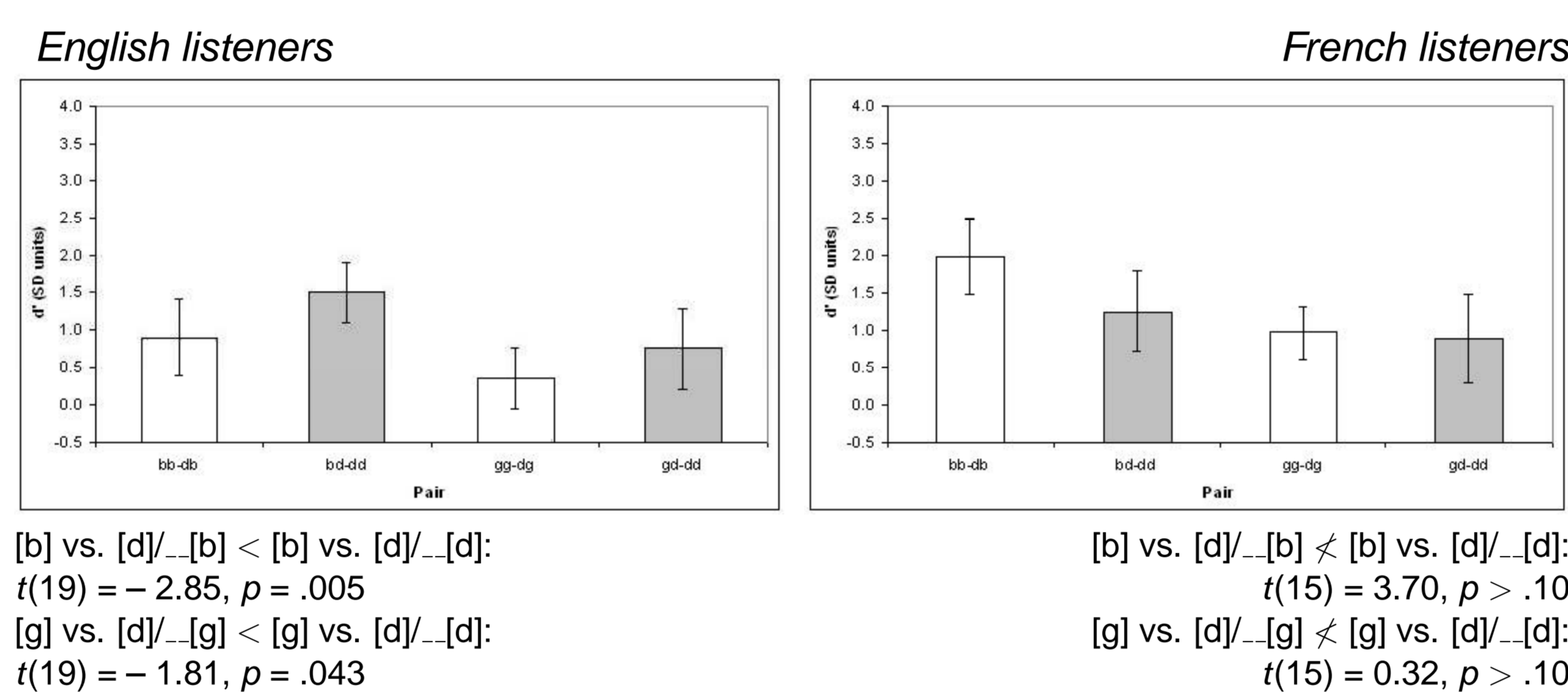
- English place assimilation (EPA) & French voicing assimilation (FVA)
  - EPA: *goo*[g] *girl*, *lea*[m] *bacon* (\**war*[n] *dinner*)
  - FVA: *ro*[p]e *sale* 'dirty dress', *la*[g] *gelé* 'frigid lake' (\**ca*[b]e *neuve* 'new cape')
- Listeners sometimes 'compensate' for effects of assimilation rules
  - Gaskell & Marslen-Wilson (1996): lexical decision study with real words: *Viable context > unviable context*
  - Gaskell & Marslen-Wilson (1998): phoneme monitoring task with non-word stimuli: *Viable context > unviable context*
  - Darcy *et al.* (in press): word detection task examined EPA and FVA by English and French listeners: *Compensation greater for native rule, esp. in viable context*
- Listeners sometimes ignore effects of assimilation rules
  - Mitterer, Csépe, & Blomert (2003): Hungarian [l] → [r] rule by Hung. and Dut. listeners
  - Influence of knowledge of the rule by Hungarian listeners in identification: *No lg. effect in discrimination → Both groups equally poor*
  - Kabak & Idsardi (2003): Korean syllable contact repairs by native listeners: *Viable pairs = disc. unviable pairs*
- What determines whether listeners compensate for assimilation?
  - Darcy *et al.*: 'Discrimination difficult in viable contexts, so listeners may postpone compensation to a later stage' (Comment on Mitterer *et al.*'s disc. results)
  - Listeners make use of different *response strategies* in different kinds of tasks (auditory qualities vs. phonological categories)

## 3. Design

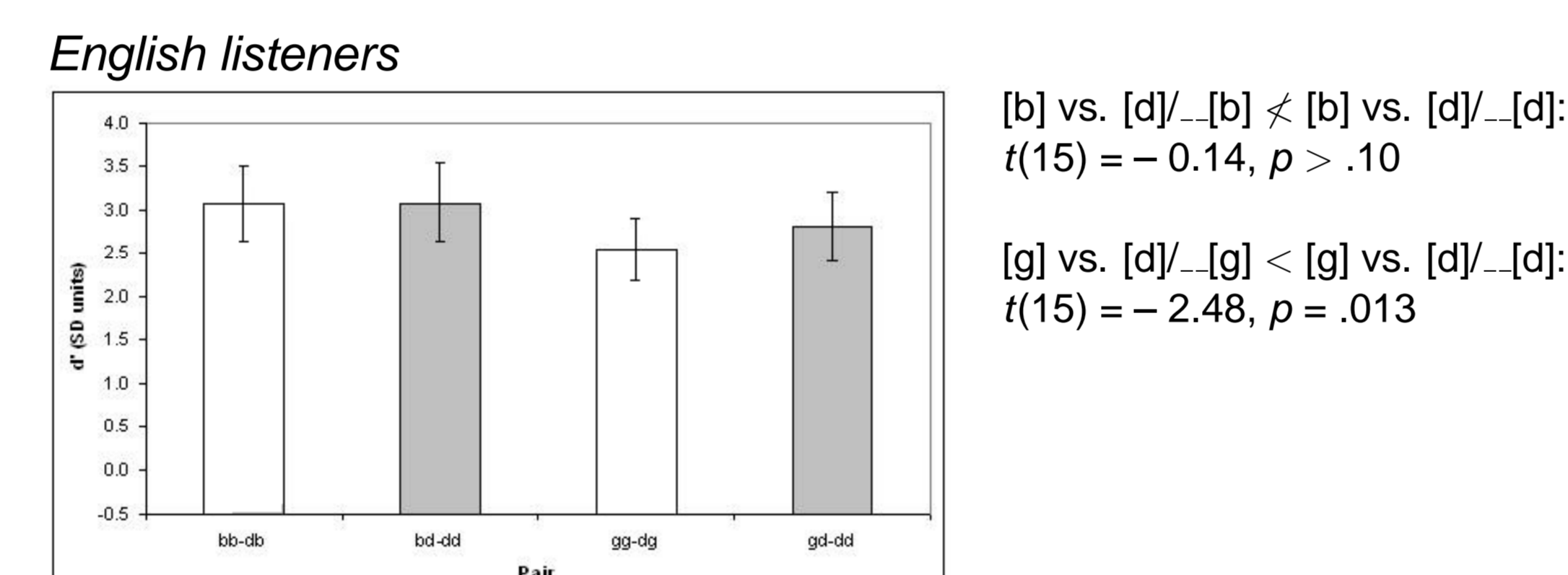
- Does phonological knowledge inhibit discriminability?
  - Yes. Disc. of stimuli that alternate in a viable context (viable pairs) < disc. of stimuli that do not (unviable pairs) for native listeners
  - No. Disc. of stimuli that alternate in a viable context (viable pairs) = disc. of stimuli that do not (unviable pairs)
- Result may be *task dependent*: AX and 4IAX tasks previously shown to induce responses on the basis of different stimulus qualities (Gerrits & Schouten 2004)
- Methods
  - Stimuli: a{b,d,g}.(b,d,g)a (EPA), a{p,b,t,d,k,g}.{f,ʒ,ʃ,v,s,z,l,m}a (FVA); ISI = 500 ms
  - AX and 4IAX disc. of place and voicing contrasts in VC<sub>i</sub>CV-VC<sub>j</sub>CV pairs by Eng. and Fre. listeners

## 4. Results

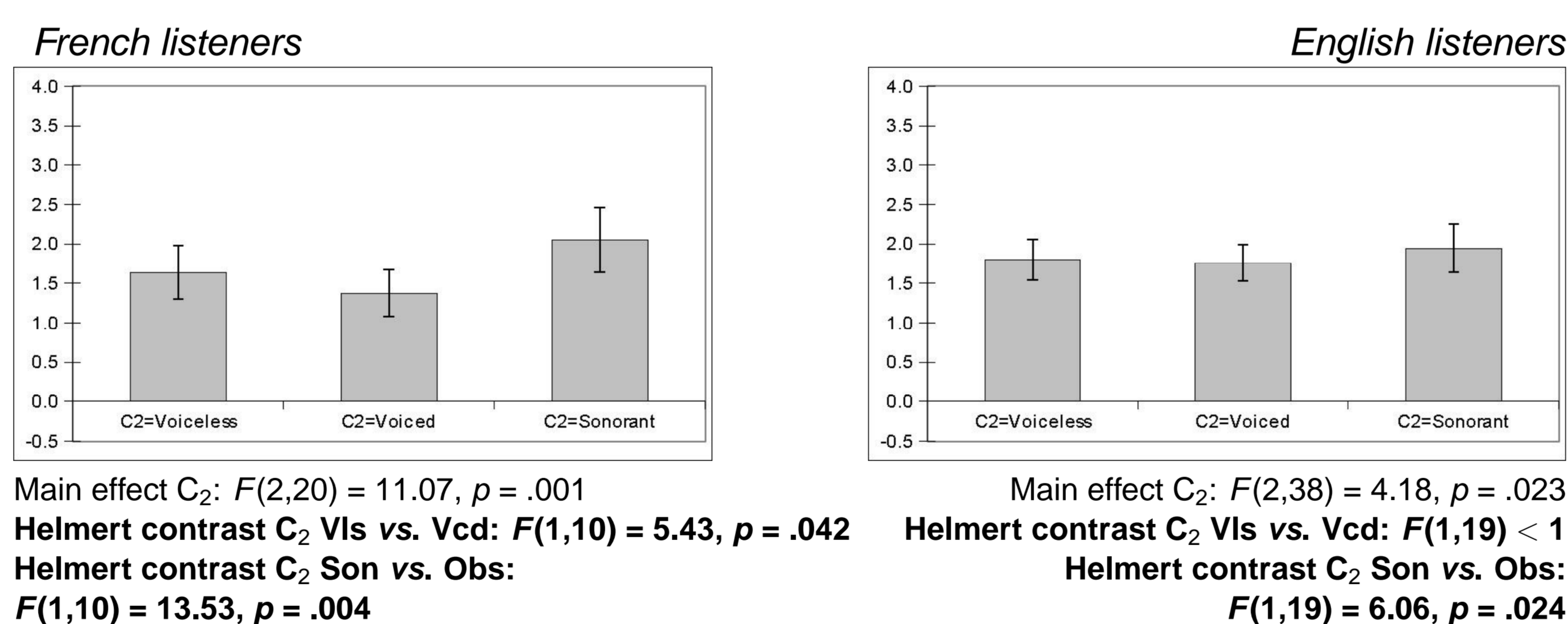
- Crucial pairs
  - e.g. ab.ba-ad.ba (viable context EPA) vs. ab.da-ad.da (unviable context EPA)
  - e.g. ab.ʒa (viable context FVA)-ap.ʒa (viable FVA) vs. ab.la-ap.la (unviable context FVA)
- Disc. in terms of *d'* statistic of Detection Theory (Macmillan and Creelman 2005) assuming the differencing rule for roving designs
- Hypothesis predicts an effect in one direction (i.e. *lower d'* values) for viable pairs, so one-tailed *t*-tests were used for planned comparisons
- Place discrimination as a function of context: AX task



### Place discrimination as a function of context: 4IAX task



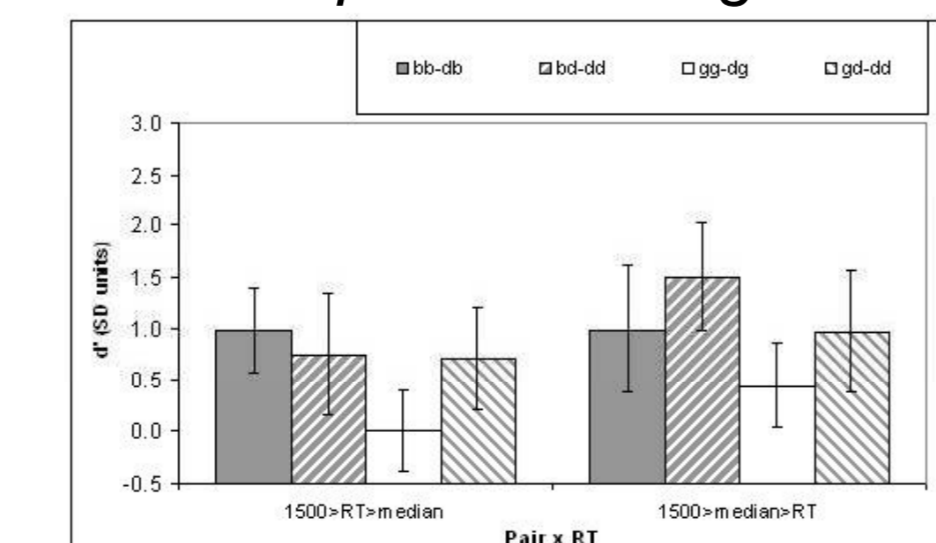
### Voicing discrimination as a function of context: AX task



## 4.1. Response time effects

### Does influence of knowledge of assimilation rules depend on RT?

Median split *d*'s for Eng. listeners: EPA



Slow RTs: [b] vs. [d]...[b] < [b] vs. [d]...[d]:  $t(19) = 0.74, p = > .10$

[g] vs. [d]...[g] < [g] vs. [d]...[d]:  $t(19) = -2.45, p = .012$

Fast RTs: [b] vs. [d]...[b] < [b] vs. [d]...[d]:  $t(19) = -2.30, p = .016$

[g] vs. [d]...[g] < [g] vs. [d]...[d]:  $t(19) = -2.02, p = .029$

	Slow RTs	Fast RTs
Mean <i>d'</i>	0.81	1.37
One-tailed <i>t</i> across all pairs	$t(13) = -6.01, p < .001$	

### Discriminability inversely correlates with RT

## 5. Modelling the results

- Format determines whether phonological knowledge inhibits discrimination
  - In AX, listeners *d'*(viable pairs) - *d'*(unviable pairs) (more) negative for native rule than non-native rule
  - In 4IAX, English listeners *d'*(viable pairs) ≠ *d'*(unviable pairs) in EPA (for bilabials)
    - Unexpectedly low *d*'s on velar-coronal pairs by both groups of listeners - correlates with significantly smaller F2 diff. between [g] and [d] than between [b] and [d] in the EPA stimuli
  - Disc. effects in AX are not due to slow RTs
- Supports a model that allows for influence and the lack thereof
  - Interactive (single-output) models like TRACE cannot account for these results
  - Modular (multi-output) models like MERGE or Race appear to be required
- Expressing modularity: Serial models
  - Serial models like MERGE (Norris *et al.* 2000) express the needed modularity by positing stages with feed-forward connections
  - If we assume a listener's encoding in the auditory module occurs prior to encoding in any subsequent module ...
  - ... then we expect that listeners will be less influenced by lg.-knowledge if they respond quickly
  - This prediction is not borne out by the *d'* × RT results in EPA, which show no difference
- Expressing modularity: Non-serial models
  - Non-serial models like the dual-route model (Fujisaki and Kawashima 1969, 1970) and Race (Cutler and Norris 1979) express modularity by positing separate auditory and phonetic channels
  - Both channels lead to a single decision node, which takes as input information from just one of the channels (the faster one)
  - Non-serial models make no prediction about the influence of lg.-knowledge w.r.t RT
  - Compatible with the idea that different tasks privilege different channels
  - Decision node based on just one channel predicts that adding a new source of influence will not affect responses
- A third possibility: Non-serial merging
  - Separate auditory and phonetic channels
  - Channels lead to a single decision node, which takes as input information from both of the channels, perhaps weighting the information from each differently
  - Predicts gradient effects of stimulus and task manipulations

## 6. Selected references

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## 7. Acknowledgements