Perceptual Grounding for Long-Distance Agreement

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Introduction

A number of theories, including ABC, make use of **explicitly non-local representations** to model long-distance harmony processes (Rose and Walker, 2004; Gallagher, 2010; Kimper, 2011, and others).

- cf. **strict locality** (Clements, 1977; Kiparsky, 1981; Archangeli and Pulleyblank, 1994, and many others).

Strict locality has been claimed to be necessary to maintain phonetic grounding in harmony.

- Assimilation only reduces articulatory effort between adjacent segments.

I argue that adopting explicitly non-local representations does not require surrendering phonetic grounding.

Perceptual Grounding

Harmony confers a perceptual advantage:

- Suomi (1983): Harmony renders difficult contrasts predictable in non-prominent positions.
- Kaun (1995): Harmony gives the listener increased exposure to the relevant cues.
- Gallagher (2010): Harmony ensures that words consistently differ by multiple segments, increasing discriminability.

There is no obvious reason why this advantage would be limited to adjacent segments.

Method

Subjects: Native speakers of North American English (33 for Exp. 1 and 38 for Exp. 2).

Task: Subjects heard nonsense word, followed by a target vowel in isolation (ISI=750ms) and indicated whether or not the target vowel had been part of the preceding word.

Stimuli: CV syllable structure. Vowels: [a, e, i, o, u]. Onsets: [h, g, k, sk]. Targets: [i] or [u].

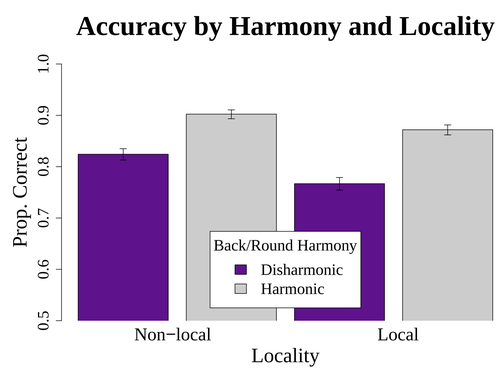
Experiment 1

Trisyllabic; potential targets [e, o, i, u]

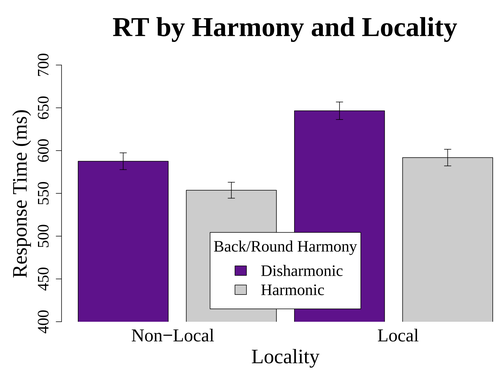
- Either adjacent (followed by [a]) or non-adjacent (with [a] intervening).
- Either agreed or disagreed in colour.

Hypothesis: subjects should be faster and more accurate in harmonic conditions, for both the local and non-local conditions.

- u o a . . . u > u e a . . . u
- u a o . . . u > u a e . . . u



Linear Mixed Effects Model on log-transformed RT, random intercept for subject. Significant effect of harmony for both local ($p < 0.001$) and non-local ($p < 0.05$) conditions. No significant interaction.



Mixed Logit Model on correct responses, random intercept for subject. Significant effect of harmony for both local ($p < 0.001$) and non-local ($p < 0.001$) conditions. No significant interaction.

Experiment 2

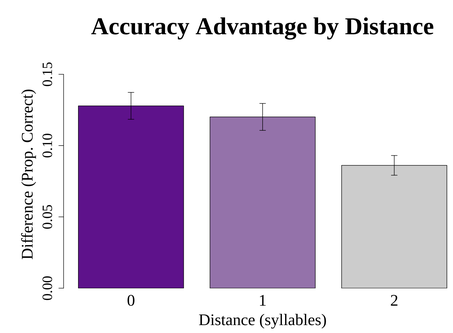
Quadrisyllabic; potential targets [e, o, i, u]

- Either adjacent, separated by one syllable, or separated by two syllables.
- Either agreed or disagreed in colour.

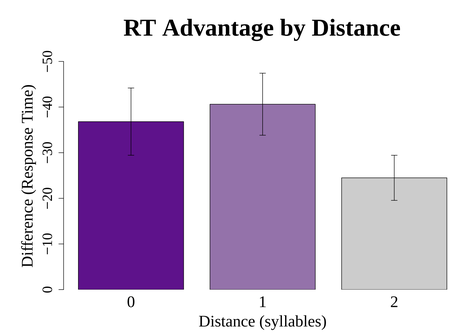
Each vowel combination was paired with one identical *except* for harmony (u o a a ∼ u e a a).

- For each subject for each vowel combination pair, a difference score (representing the advantage of harmony) was calculated on each measure.

Hypotheis: The advantage of harmony will diminish over distance, but persist.



Linear Mixed Effects Model on accuracy difference, with random intercept for subject, Helmert coding for distance. No effect at Dist. 1, significant effect at Dist. 2 ($p < 0.001$).



Linear Mixed Effects Model on response time difference, with random intercept for subject, Helmert coding for distance. No effect at Dist. 1, significant effect at Dist. 2 ($p < 0.001$).

Discussion

Experiments 1 and 2 found a perceptual advantage of harmony even among non-adjacent segments.

- This provides a source of phonetic grounding for theories like ABC which make use of explicitly non-local representations.

Some possible explanations...

- **Priming**. Repetition of a stimulus (in this case, a vowel feature) facilitates subsequent recognition (Tulving and Schacter, 1990; Bergerbest et al., 2004; Badgaiyan et al., 1999, and others).
- **Chunking**. Organising information into chunks (in this case, a single feature value for the whole word) facilitates memory (Miller, 1956; Gobet et al., 2001, and others).

Experiment 2 suggests that **distance** may be more important than **contiguity**, which seems to support a priming approach more than chunking.

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