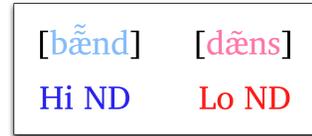


Introduction and Background

In English, nasal coarticulation varies in degree depending on the number of phonological neighbors (Scarborough 2004, in press):

- Words with many phonological neighbors (**Hi Neighborhood Density**, or **Hi ND**) have *more* vowel nasality
- Words with few phonological neighbors (**Lo ND**) are *less* nasal



Do listeners attend to this variation?
Can this systematic variation aid in lexical perception?

Our Experiments

To investigate the effects of neighborhood-conditioned variation on perception, we compared listener responses to words with the **naturally attested degree of nasality** and to the same words with **more or less nasality**.

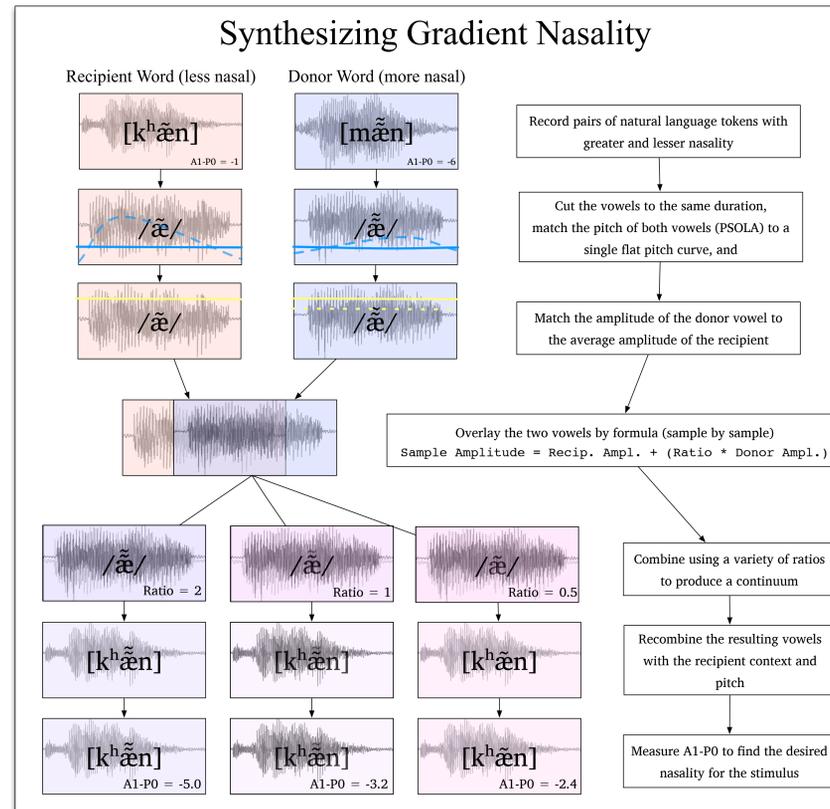


Comparing RTs from **lexical decision** & preference ratings from **forced-choice preference**.

- Is there an effect of degree of nasality (*less* vs. *more*)?
- Is there an interaction between nasality and neighborhood density (natural vs. not)?

Stimuli

- 58 real monosyllabic words: 32 VNs and 26 NVs
- From the top third (**Hi ND**) and the bottom third (**Lo ND**) of nasal monosyllables, by frequency-weighted neighborhood density (the summed log frequencies of a word's neighbors, neighbors differing from the target by only one phoneme)
- 58 nonsense words: phonotactically-permissible nonword neighbors for each real word, matched for ND
- Pairs of tokens with original and modified degrees of nasality were created.

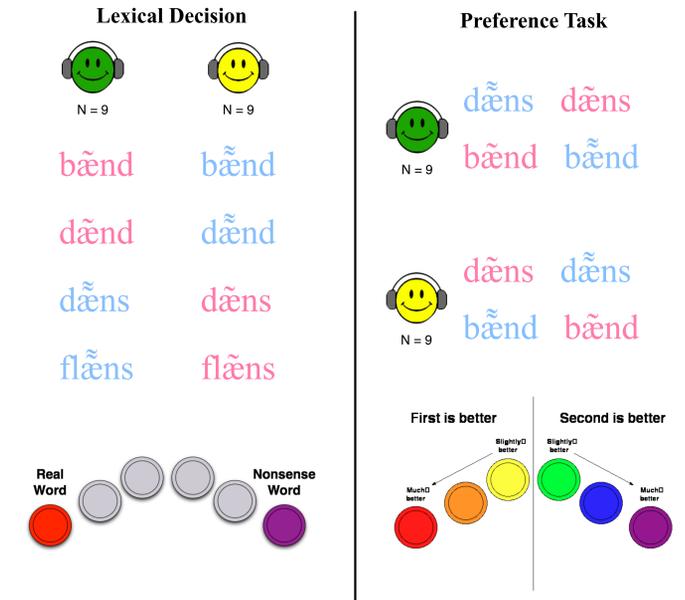


Neutralizing the natural variation

- **Hi ND** words (with more nasality naturally) were modified to have the degree of nasality typical of **Lo ND** words (i.e., nasality was decreased)
- **Lo ND** words (with less nasality naturally) were modified to have the degree of nasality typical of **Hi ND** words (i.e., nasality was increased) i.e., natural differences were neutralized
- The difference between original (ratio=0) and nasal-modified versions was based on measured nasality differences between Lo ND and Hi ND (Scarborough in press)

	"Original"	"Nasal-Modified"
Hi ND	↑ Nasality i.e. A1-P0 = -3.2	↓ Nasality i.e. A1-P0 = -2.3
Lo ND	↓ Nasality i.e. A1-P0 = -1.1	↑ Nasality i.e. A1-P0 = -2.2

Perception Experiments



Experiment Results and Analysis

Lexical Decision Task Results

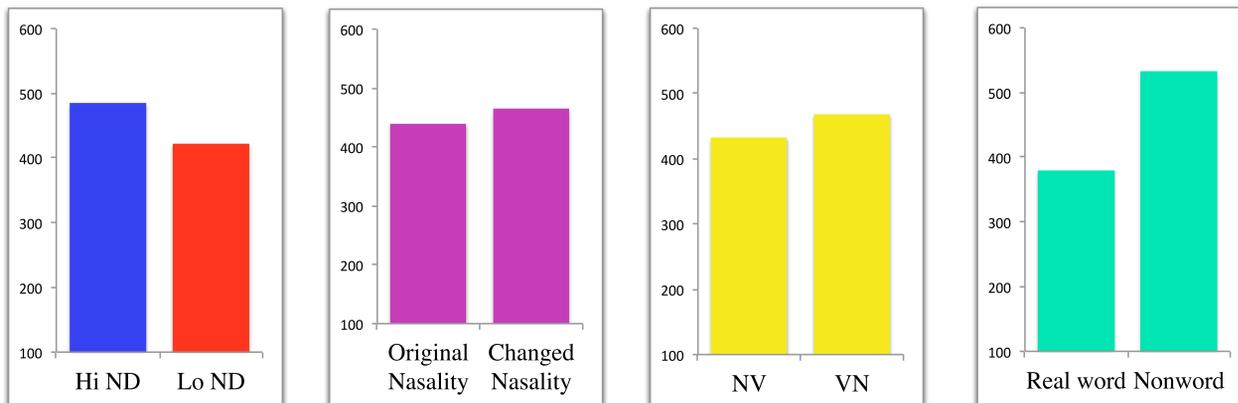


Fig. 1: Faster responses to Lo ND (422 ms) than to Hi ND (485 ms) items

Fig. 2: Faster responses to Original Nasality (440 ms) than to Changed Nasality (465 ms) items

Fig. 3: Faster responses to NV (433 ms) than to VN (469 ms) items

Fig. 4: Faster responses to Real (380 ms) than to Nonsense (532 ms) items

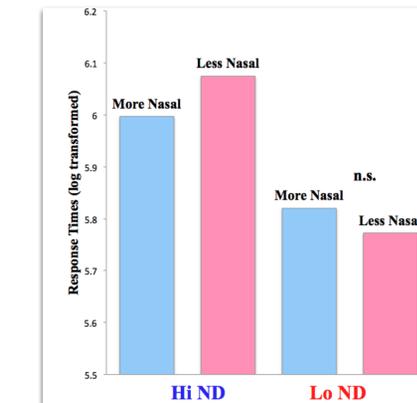


Fig. 5: Nasality by Neighborhood density interaction: Faster responses to more nasal Hi ND items (470 ms) than to less nasal Hi ND items (501 ms); no difference among Lo ND items (432 ms vs. 412 ms)

Preference Task Results

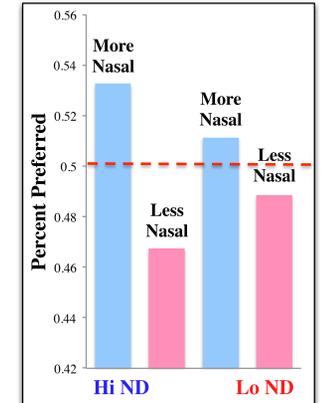


Fig. 6: More nasal Hi ND items preferred over less nasal Hi ND items more frequently than chance (53% vs. 47%); no significant preference among Lo ND items (51% vs. 49%)

Discussion

Listeners are sensitive to neighborhood-conditioned variation.

- Perception was facilitated in Hi ND words when they were more nasal (as in natural Hi ND words).
- i.e., perception mirrors production for Hi ND words

However, this sensitivity is not always evident.

- There were no significant effects of nasality or naturalness in Lo ND words. Why??

• **One possibility:** The benefit of naturalness (found in less nasal Lo ND words) is equal to the benefit of more nasality (found in more nasal Lo ND words). So there are no differences among Lo ND words.

• **Another possibility:** Listeners don't make use of nasality in perceiving Lo ND words because they are already fast and easy to perceive. So differences in nasality do not cause differences among Lo ND words.

Some Questions

- What are the relative contributions of naturalness and nasality (or any other relevant cue) to word perception?
- What is the mechanism by which listeners could ignore nasality in Lo ND words?
- Does other neighborhood-conditioned variation in production have the same perceptual consequences?
- Do the parallels between perception and production result from listeners trying to make use of what speakers do naturally? Or speakers trying to construct speech to be understood?

