INTRODUCTION

"Vowel lengthening" before voiced obstruents in English

Perception

Variable by speaker, vowel quality, consonant place, speaking rate, prosodic position; 13 ms – 150 ms difference

Production

Variable by speaker, vowel quality, consonant place, speaking rate, prosodic position; 13 ms – 150 ms difference

Source?

• Voiceless segments require more intraoral pressure ➔ faster transition ➔ shorter V (Chen 1970)

• (Partial) Temporal Compensation: constant syllable duration: longer C closure ➔ shorter V duration (Chen 1970; Kotraba & Chistovich 1967; Peterson & Lehiste 1960)

• Perceptual Enhancement: durational differences of vowel reinforce durational differences of consonants (Chen 1970; Klumper 1968)

• Auditory Contrast without enhancement

Cross-linguistic typology

• English has phonologized pattern while other languages have phonetic tendency? (Chen 1970)

Problem

• Words in isolation not the same as conversational speech

Production Experiments

Methods:

1. Buckeye Speech Corpus: utterance-final and low-freq CVC
2. OH: metronome (flashing +) 300-1200 words per minute, single CVC word repetition
3. MN: three speaking rates (normal/slow/fast), 5-7 syllable sentences (92 CVC words in initial, medial, final, and isolation)

Perception Experiments

Methods:

Exp A: Comparison OH and MN: isolated words, V manipulation before /t/ and /s/, C manipulation /l/ and /v/ vs /l/ and /v/
Exp B: OH only, C manipulation: (2) randomized word, (3) sequential word (4) carrier phrase
Exp C: OH and MN, Constant CV: rate manipulation of carrier phrase /l/ and /v/ vs /l/ and /v/

Exp A: Words in isolation

• Strong vowel duration effect for both dialects

• Greater consonant duration effect in dialect with final voicing

Exp B (2,3,4): C continua only

Conds 3 (sequential presentation)

Cond 4 (Carrier Phrase “Please say the word ___ to a stranger”)

Exp C: Speaking Rate

• Effect of speaking rate on cross-over point: voiceless proportion increases as rate decreases

• Perceived vowel duration affected more strongly than perceived fricative duration; steeper slope for OH listeners

Summary of Results

Production

• Significant vowel duration differences only at longest absolute durations, especially phrase-finally
  • Production Experiment (both dialects)
  • Corpus Data

Perception

• Final lengthening primarily affects voiceless C and pre-voiced V, creating a probabilistic split between voiced and voiceless

• Consonant duration affects voiced/voiceless judgments

• Perception is also affected by
  • Changes in speaking rate; whether words are heard in isolation or in carrier phrases
  • Whether or not participants hear varying vowel duration during test

Conclusions

• "Voicing" contrast on obstruent codas is cued by both C and V durations (as in word-medial position: Port & Dalby 1982; Denes 1955; Campbell & Just 1991; Summerfield 1981; Ritch 1981)

• Vowel duration alone is only a sufficient cue in absolute phrase-final position, on inherently long (tense) vowels, in CVC words

• Vowel duration differences are potentially epiphenomenon of upper duration threshold for voiced obstruants, partial compensation on vowel, generalization from / exaggeration of phrase-final distribution of VC ratios

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