Articulatory Reduction in Intoxicated Speech
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Motivation

- Many alternations claimed to involve articulatory effort reduction:
  - Intervocalic voicing (Kingston and Diehl 1994)
  - Intervocalic spirantization (Kirchner 2001)
  - Postnasal voicing (Hayes 2004[1999])
  - Final devoicing
- But reasoning about articulatory effort based on abstract models (Hayes 2004[1999]; Kirchner 2001) or indirect measurements
- Effort reduction very hard to observe in action
- Premise of experiment: create conditions in which subjects are likely to produce more ‘easy’ articulations and fewer ‘hard’ ones
- Method: compare intoxicated productions (expected to favor ‘easy’ articulations) with sober ones
  ⇒ Intoxication impairs cognitive and motor function (Chin and Pisoni 1997), produces errors such as deaffrication (Pisoni et al. 1986, 138,144) that could be interpreted as effort reduction

Experimental Design

- Stimuli: syllabic words w/ initial stress
  - 72 words w/ a single intervocalic stop (e.g., buggy)
  - 56 words w/ a nasal-stop cluster (e.g., amber)
- Subjects: seven UCSC students plus one pilot subject (linguistics grad student, subject 00), all naive to purpose of experiment
- Each subject recorded in two conditions: intoxicated and sober
  - Two conditions on separate days (except subject 00); order varied across subjects
  - Intoxicated condition: recording made with BAC between 0.10 and 0.12
- Stimuli read in frame sentence “I SAID ___ already.”

Quantities measured:
- Consonant Duration for intervocalic and postnasal stops; duration of latter measured from end of vowel (separate nasal was not always identifiable)
- Voicing Duration for intervocalic and postnasal stops and for [d] of said in frame sentence
- Burst Duration for intervocalic stops
- Burst Intensity for intervocalic stops, after running burst through a high-pass filter (1700 Hz and up) to eliminate voicing
- Slope of Intensity Contour for intervocalic stops: largest slope of intensity contour between minimum in consonant and maximum in following vowel (Kingston 2008)

Results

- Each graph shows one measure for a representative subject
  - Each point: one stimulus word
  - Plotting symbol: target consonant (initial consonant for word-final voicing)
  - X-axis: sober; y-axis: intoxicated (averaged over two repetitions)
    - Purple: voiceless; green: voiced; gray: outliers (removed from final models)
  - Dashed lines: x = y; solid lines: regression lines from linear mixed-effects model
    ⇒ Predicts intoxicated measure from sober measure, with by-subject slopes and intercepts
  - For all graphs shown, slope of regression line is $< 1$ and $> 0$ at $\alpha = .05$

Discussion

- Two basic patterns:
  - Shift: regression line (almost) entirely above or below $x = y$
  - X-pattern: regression line shallower than $x = y$, cross in middle of data
- Shift: intoxication induces change in a single direction
  - Less intense bursts
  - Longer intervocalic stops
- X-pattern: intoxication induces regression to mean
  - Voicing duration intervocally, postnasally, word-ﬁnally
  ⇒ But postnasal results may be parasitic on X-pattern for overall postnasal consonant duration, and word-ﬁnal correlations are weak
  - Burst duration
  - Maximum slope of intensity contour
- Do these results look like effort reduction? Plausibly:
  - Shift: favor long consonants with weak bursts
  - X-pattern: compression of articulatory space
- Does effort reduction look like lenition? Not exactly:
  - Unidirectional patterns such as intervocalic voicing, final devoicing favor one type of production over another; corresponding ‘X-patterns’ don’t

References

Robert Kirchner. An Effort Based Approach to Consonant Lenition. Outstanding Disserta-

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