Is the phonetic encoding of grammatical boundaries based on form or function?

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Morphology & allophones

- Southern British English
  - ‘Roland’ [ˈrəuldənd] vs. ‘rolling’ [ˈrɔlɪŋ]
- Belfast English
  - ‘spider’ [ˈspɛɪdər] vs. ‘wid#er’ [ˈwɛɪdər]
- Scottish English
  - ‘brood’ [brʉd] vs. ‘brew#ed’ [brʉːd]

  *# = morpheme boundary (e.g. Borowsky 1993)*
Morphology and phonetics

- Finer-grained patterns too...
  - Smith (under review) – word/morpheme boundaries
  - Baker et al. (2007) – prefixes vs. pseudo-prefixes
  - Jones (2007) – glottals in northern English

- ...and not just English
  - Korean (Cho 2001) – palatalisation before /i/
  - Lheidli (Bird 2004) – duration of consonants

- Morphological boundaries can have phonetic effects
Significance

- Role in perception examined
  - can listeners make use of these effects?
  - results mixed: Smith (under review)

- Role in production less clear
  - where do these effects come from?
    - boundary – gestural cohesion
  - not very robust perceptually, speakers vary
    - suggest no external target – internally emergent?
  - exemplars – ‘vertical’ paradigmatic effects: cumulative activation
    - largely passive(?), except for attention and memory
    - more active speaker role in ‘horizontal’ syntagmatic patterns?
Sources of patterns

- How much leeway do speakers have?
  - subphonemic differences
  - subtle, fine-grained

- Are effects dictated by
  - kind of boundary – morpheme, word?
  - recognition of boundary?

- Might explain speaker variability…
Morphological encoding

- Focus in this study: English clitic <’s>
  - Obvious potential boundary (hopefully)
    - marked in orthography
    - post-lexical
  - Multiple functions, e.g. Emma’s
    - Emma’s (possessive)
    - Auxiliary reduction
      - Emma’s < Emma has
      - Emma’s < Emma is (active vs. passive)

- Here: look at ‘has’ vs. passive ‘is’ forms
Research questions

- Is encoding of the clitic boundary down to *form*?
  - i.e. same basic segmental structure + same kind of boundary
  - Or does *function* play a role?

- Do all speakers do the same thing?
  - is the target (likely to be) acquired from the ambient language?

- What is the source of the patterns?
  - gestural blending / schemas – could ‘has’ vs. ‘is’ play a role?
Final vowel in ‘Emma’ overlaps with vowel of auxiliary
  ○ vowel longer and more centralised in ‘has’ case
    • effect of /h/ (non-lingual, probably voiced) negligible
    • effect of [ə] + [ə] = [ə]-like
  ○ vowel shorter and more peripheral (high, front) in ‘is’ case
    • effect of [ə] + [ɪ] = [ə]-like
English ’s clitic

- Subjects complete a sentence verbally
  - completion itself is ambiguous “…Emma’s rowed ashore”
  - disambiguating context *not* elicited

- “The coastguard pulls her into the boat and…”
  - Response: Emma’s rowed ashore (= Emma is)

- “She’s taken up the oars and…”
  - Response: Emma’s rowed ashore (= Emma has)

- 5 repetitions of each; 4 speakers analysed so far
Analysis

- Looked at vowel only
  - may be effects elsewhere – not immediately relevant
    - blending / schema

- Specifically:
  - ‘has’ form – vowel longer and more central?
  - ‘is’ form – vowel shorter and more peripheral?

- Vowel durations and formant frequencies (F1-F3)
  - Emma’s & Anna’s data
Duration significant $F(1, 7) = 13.00$, $p = 0.009$
Individual results
Individual results

- * FS2: $t(9) = 1.84, p < 0.5$ (one-tailed)
- * MS1: $t(9) = 4.46, p < 0.5$ (one-tailed)
- FS1: $t(9) = 1.56, p < 0.5$ (one-tailed)
- MS2: $t(9) = 1.62, p < 0.5$ (one-tailed)

- Trend for average ‘is’ duration to be longer than ‘has’
- No subject has *shorter* average duration in ‘is’ than ‘has’
  - contrary to hypothesis, but *function* not *form*
Formants

- Hypothesis:
  - In the ‘is’ condition
    - F1 should be lower, i.e. higher vowel than ‘has’
    - F2 should be higher, i.e. more front vowel than ‘has’

- Not borne out overall
  - Two subjects only have this pattern (non-significant, p > 0.05)
    - FS1 (Anna condition)
    - MS2 (Emma condition)
  - Differences are slight (4-47 Hz)

- No evidence for blending / colouring from non-contracted auxiliary
Formants

F1 non-significant $F(1, 7) = .104, p = .757$
F2 non-significant $F(1, 7) = .888, p = .377$
F3 non-significant $F(1, 7) = 2.242, p = .178$
Discussion

- all subjects essentially the same so far
  - suggests realisations could be acquired
    - possessives look different, however…

- no evidence for blending /schema effects
  - not an online process or a fossil form (has > ‘as > ‘s)
    - polysystematic approach? (Ogden 1999)
  - longer processing for passive ‘is’ forms?
    - data for possessive beginning to suggest NO
    - might only be two possibilities available…
Future work

- Data from possessive <’s> clitic
  - analysis mostly complete – effects varied
- Passive vs. active ‘is’
  - Emma’s taking (a photograph)
  - Emma’s taken (on holiday)
- Monomorphemic words (surnames)
  - Jones vs. Joan’s (has/is/poss)
  - Peters vs. Peter’s (has/is/poss)
    - How many patterns?
- Nonsense words
  - test emergence
  - effects of segmental constraints
Conclusion

- Boundary is not hard-wired
  - different functions create different patterns

- In this case, patterns may be acquired
  - but possessive ‘s’ shows alignment with one or other
References

- Smith, Rachel. (under review). “Production and perception of speaker-specific word detail at word boundaries.”