Lexical and Articulatory Influences on the Perception and Production of Words in Taiwan Sign Language

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Overview
Can articulation be phonologized? That is, does it play a role in mental processing separate from mere physics and its historical residue in the lexicon? Is this so even in sign languages, where physical articulation is so overt? We addressed these issues in Taiwan Sign Language (TSL), using regression to analyze the effects of response modality (perception vs. production), lexical factors (frequency and typicality), and articulatory difficulty. Our results confirm the phonologization of articulation:

- Lexical factors and articulatory difficulty had independent effects on phonological processing.
- Articulation affected both production and perception.
- Articulation had a stronger effect in the perceptual task, which required holding signs in working memory.

Articulation and the lexicon
Ann (2006) gives scores quantifying articulatory difficulty of handshapes based on hand physiology:

The lexical frequency of TSL words was estimated via subjective familiarity judgments by TSL signers, and via Web hits for their Chinese and English translations (see Bates et al., 2003, for cross-language frequency effects).

Handshape type frequency was computed from a TSL dictionary (Smith & Ting, 1978, 1984). This measure reflects lexical typicality, conflating phonotactic probability and neighborhood density (Bailey & Hahn, 2001).

Handshape type frequency is inversely correlated with articulatory difficulty: articulation affects word coinage.

Perception: Results
Analysis: Linear mixed effects modeling (LME, a form of repeated-measures multiple regression)

- Frequency sped up response times (even for frequencies estimated from English).
- Handshape type frequency sped up response times.
- Articulatory difficulty slowed down response times, independently of the other factors.

Production: Results
Analysis: LME on both RT measurements

- Overall pattern the same as for perception.
- Handshape type frequency effects were consistent.
- Frequency and articulatory difficulty effects were as before, but only reliable in video record of onset signing.

Lift-off response times:

Articulation effects across tasks
Articulatory difficulty had a significantly greater effect in the perceptual task than in the production task.

This counterintuitive result may follow from differences in the role of working memory across the two tasks:

- Same-different task: First sign held in working memory.
- Shadowing task: Sign need not be held in memory.

This result relates to the visuospatial phonological loop known to be used by signers (Wilson & Emmorey, 1997).

References

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