

# 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

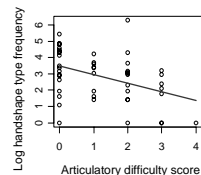
Ann (2006) gives scores quantifying **articulatory difficulty** of handshapes based on hand physiology:



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



## Sign perception

### Same-different judgment task

Signers see two signs, must decide if they are identical



**Participants:** 34 fluent deaf adult signers of TSL (mean length of experience: 33 years)

**Materials:** 38 "different" and 38 "same" pairs of TSL signs

**Response times:** Measured by button press, analyzed only "same" pairs

## Sign production

### Shadowing (repetition naming) task

Signers see one sign, and must repeat it immediately



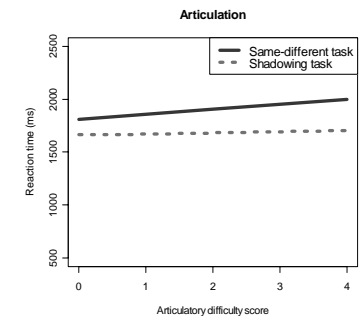
**Participants:** Same as in perception experiment

**Materials:** 127 TSL signs, including all items shown in perception experiment

**Response times:** Measured by hands lifting off keyboard (initial access of phonological forms; Myers, Lee, & Tsay, 2005), supplemented by video record of onset of signing

## 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:

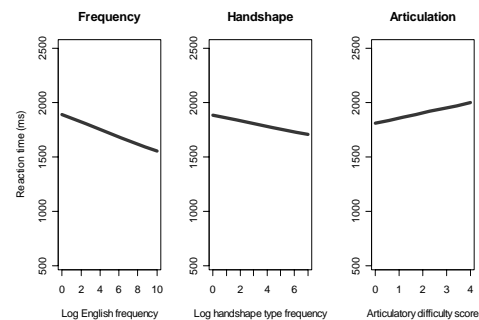
- **Same-different task:** First sign held in working memory
- **Shadowing task:** Sign need not be held in memory

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

## 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

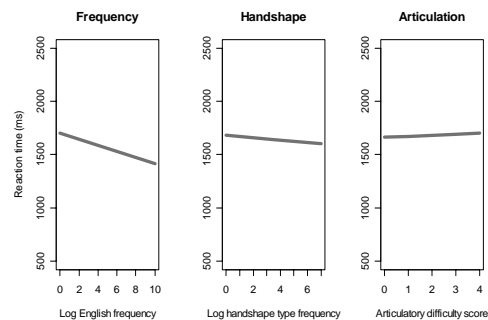


## Production: Results

**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 sign onsets

### Lift-off response times:



## References

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## Acknowledgements

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