

The timing of ASL fingerspelling

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Using a corpus of ASL fingerspelling, we measured the temporal properties of ASL fingerspelling and we found considerable variation of segment length based on position in the word, type of word, phonological features, and signer.

Past work

Most previous studies of the temporal properties of fingerspelling have been limited because they: measured rate as duration of word/number of letters, analyzed data from manually coded English settings, or measured a small number of words with limited formational properties.

Reported fingerspelling rates have considerable variation: there's a lower bound of ~125 msec per letter, an upper bound of ~300 msec per letter (this study found ~100 msec for holds and ~200 msec for transitions) (Quinto-Pozos, 2010; Bornstein 1965; Hanson, 1981; Wilcox, 1992; Geer, 2010)

Questions

1. How long are segments?
2. Do they vary by position?
3. Do they vary by (letter) identity?
4. Do they vary by signer?
5. Do they vary by wordtype?

Method

Hold and transition identification

1. We recorded 3 native ASL signers and 1 early learner fingerspelling a total of 4,800 words and 21,453 segments.
2. We coded *holds* as the time periods where the entire hand configuration is stable. And *transitions* were calculated as the time periods between holds within the word.

Results

For these four signers the general timing properties are:

1. holds are ~40 msec (word medial)
2. transitions are ~100 msec

Using a mixed effects linear regression model, we found statistically significant differences in the following predictors:

1. First and last letters are significantly longer.
2. For the medial letters, holds tend to be held for less time in later positions in words.
3. Letters with movement and orientation changes are held longer.
4. Signers vary greatly.
5. Non-English words have longer holds and transitions.

Implications

This work dispels the generally accepted idea that fingerspelling is always rhythmic, with each letter begin held for approximately the same time within a word. Additionally, counter Wilcox (1992), the transitions are not always the vast majority of the fingerspelling signal: holds can be up to 65% of words.

Finally, timing information is important for:

1. establishing language learning and acquisition norms.
2. creating stimuli for fingerspelling perception studies.
3. an input into models of fingerspelling production.

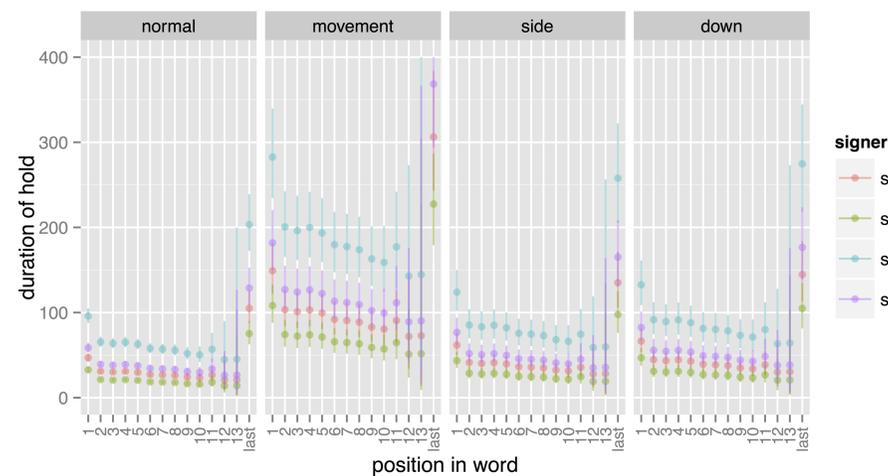


Figure 1: Model predictions for holds based on position, phonological (orientation or movement) group, and signer.

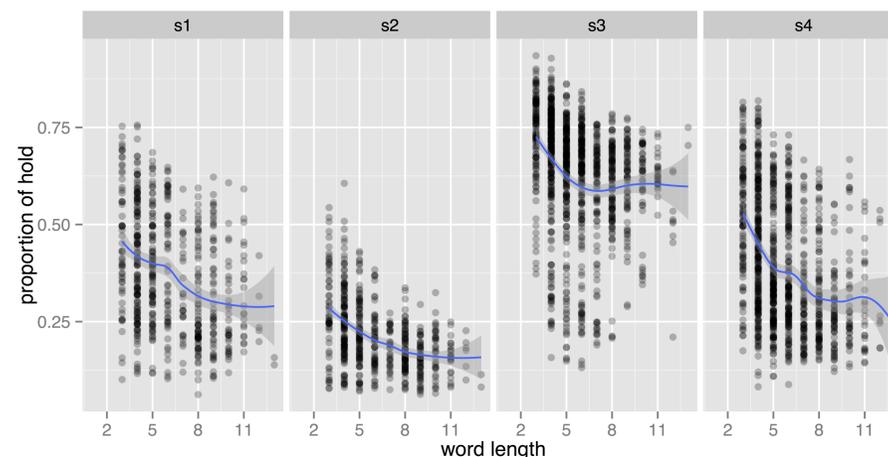


Figure 2: A plot of the proportion of hold for all words based on word length and signer.

Bornstein, Harry. 1965. Reading the manual alphabet: A research program for developing a filmed program for teaching the manual alphabet. Centennial Series 2. Gallaudet College Press. Geer, Leah. 2010. ASL fingerspelling: Comparing native and non-native signers. Unpublished manuscript Gallaudet University; Washington, DC. Hanson, V.L. 1981. When a word is not the sum of its letters: Fingerspelling and spelling. Teaching American sign language as a second/foreign language. proceedings of the third national symposium on sign language research and teaching. Boston, ma. october 26-30, 1980. ed. by F. Caccamise, M. Garretson, and U. Bellugi, 176-85. Quinto-Pozos, David. 2010. Rates of fingerspelling in American sign language. Poster at 10th Theoretical Issues in Sign Language Research conference, West Lafayette, Indiana. Reich, Peter A., and Margaret Bick. 1977. How visible is visible English? Sign Language Studies 14.59-72. Wilcox, Sherman. 1992. The phonetics of fingerspelling, chap. 4: Targets and Transitions. John Benjamins Publishing Company.

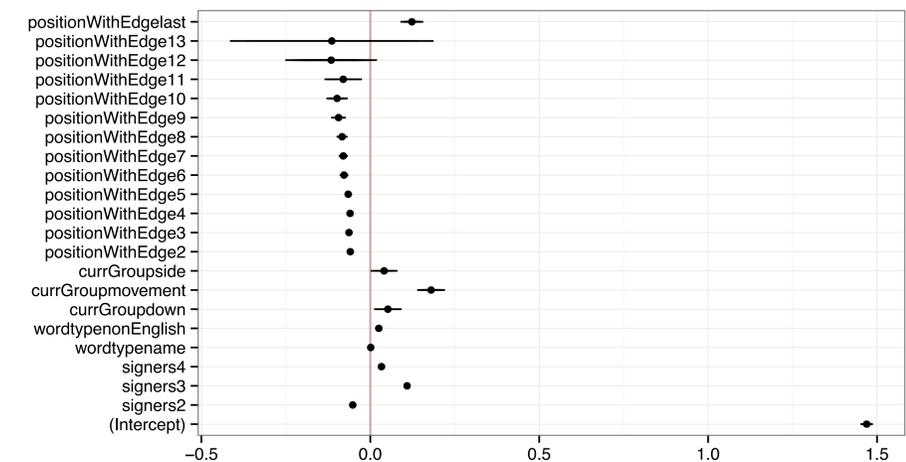


Figure 3: coefficient plot for hold duration for all letters (hold values transformed by 10th root).

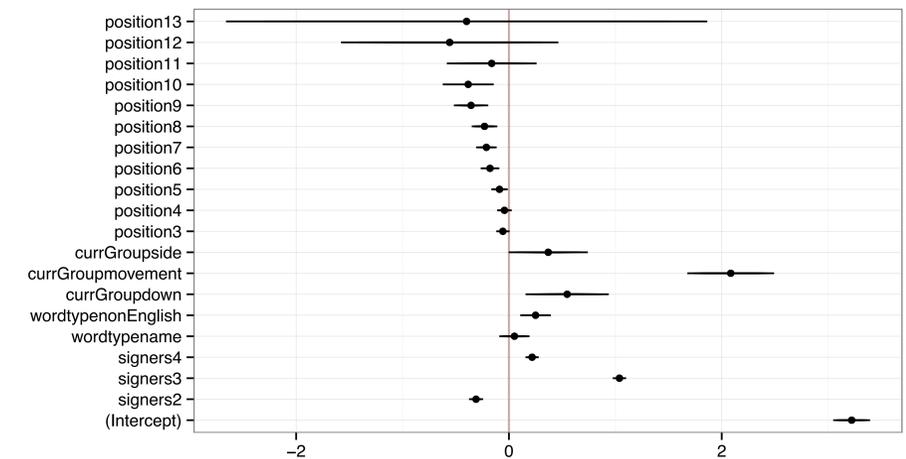


Figure 4: coefficient plot for hold duration word medial letters only (hold values transformed by 3rd root).

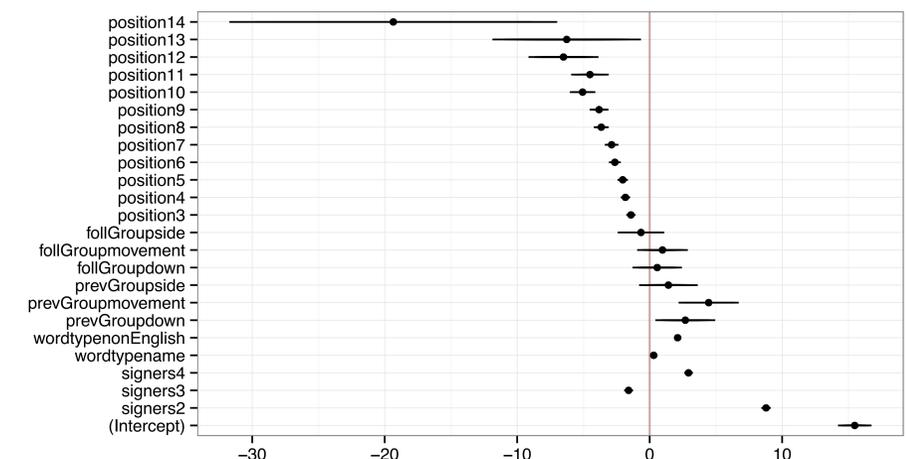


Figure 5: coefficient plot for transition duration for all letters (transition values transformed by 5/3rd root).