HOLDS OR TRANSITIONS: WHICH IS MORE IMPORTANT?

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Goals of this talk

1. Take a new look at the perception of fingerspelling
2. Propose a methodology for testing the relative importance of different parts of the fingerspelling signal
3. Determine which part of the fingerspelling signal (the holds or transitions) is more important for successful fingerspelling perception by early second language learners
What is fingerspelling?
A basic description of fingerspelling

- Simple: a set of static (except for -j- and -z-) handshapes strung together sequentially, where each maps on to one letter in an English word.

- Many (WilcoxD, 1992 and Akamatsu, 1985) note that this description is not quite accurate. Rather signers perceive overall contours, not individual handshapes.

- Fingerspelling makes up anywhere from 12–35% of ASL discourse. Padden (1991); Padden and Gunsauls (2003)
What fingerspelling looks like

media/data.mp4
Misconceptions about the timing and perception of fingerspelling
Perception of fingerspelling

There has been little work on the perception of fingerspelling.

- Akamatsu (1985) proposes that perception is based on movement envelopes.

- Wilcox (1992) claims that the transitions are the most important part of fingerspelling perception because they are temporally longer.
Stimuli data collection

- 4 native signers, 1 early learner (4 coded so far) produced
- 600 unique words
- repeating each word twice
- being recorded by 2 or 3 video cameras
- recording at 60 FPS
- for a total of 4,800 words, and 21,453 letters
C-O-S-T

media/cost1212.mp4
Holds and transitions

*Holds* the time periods where the entire hand configuration is stable

*Transitions* the time periods between holds
Holds and transitions

- C- 149ms
- O- 83ms
- S- 116ms
- T- 166ms

<p>| 51ms | 34ms | 101ms |</p>
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media/cost1212.mp4
fingerspelling   time/perception   methods   results

**timing properties (Keane et al., 2013, 2014)**

- holds are \( \sim 40 \text{msec} \)
- transitions are \( \sim 100 \text{msec} \)
- first and last letters are significantly longer
- for the medial letters, they tend to be held for less time in later positions in words
- letters with movement and orientation changes are held longer
- signers vary greatly
Proportion of holds to transitions

![Graph showing the proportion of holds to transitions for different subjects (s1, s2, s3, s4) across various word lengths. The x-axis represents word length, and the y-axis represents the proportion of hold. There are trend lines for each subject, indicating the decreasing proportion of holds as word length increases.](image-url)
Predictions

Because duration and visual cues are orthogonal, duration of holds/ transitions is not the only predictor of successful fingerspelling perception. Thus, we hypothesize:

When given only holds or only transitions, the holds will yield more successful perception, especially when the holds/ transitions are approximately equal in duration.
Methods
What stimuli look like
What stimuli look like: control

media/sortSlow.mp4
What stimuli look like: holds only

media/sortHoldsOnly.mp4
What stimuli look like: transitions only

media/sortTransOnly.mp4
Experimental data collection

- To make the stimuli, the words were slowed down to half speed and repeated twice.

- 16 ASL 2 students from UT were presented with stimuli using PsychoPy:
  - in a quiet room
  - starting with 4 practice items
  - followed by three blocks: control, holds only, transitions only.
  - stimuli were presented
  - the participants were prompted to type the word

- Only responses that matched the stimulus exactly were counted as correct.
Results
Results (Geer and Keane, forthcoming)

- Overall, accuracy is about 50%
- *Holds only* condition had significantly more accurate responses than *transitions only*
- There is a slight trend for the *holds only* condition to be more accurate than the control condition.
Model predictions

- **Model predictions**

![Graph showing model predictions with conditions: control, holds, and trans. The y-axis represents probability (correct), and the x-axis represents condition.]
Conclusions

- previous work (eg by Wilcox) suggests transitions provide more rich information because they are temporally longer
- when this confound is controlled for, we see transitions are not in fact privileged with more perceptual information
- the holds in fingerspelling convey the most perceptual information for the student perceiver
Future directions

- more participants
- randomizing stimuli across blocks
- randomizing the experimental blocks
- varying language backgrounds
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Padden, Carol, and Darline Clark Gunsauls. 2003. How the alphabet came to be used in a sign language. Sign Language Studies 4.10–33.