Impact of manual **American Sign Language** parameters on **intelligibility**

University of Colorado Boulder

Taylor Fahey, BA & Allison Hilger, PhD, CCC-SLP

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Background

American Sign Language (ASL) conveys lexical information through **parameters**: handshape, palm orientation, location, movement and facial expression. The first four parameters listed are manual parameters, whereas expression is a nonmanual parameter. Every sign must contain all 4 manual components but not all signs contain a nonmanual component (Mohr, 2014). This study focuses only on manual parameters.

Parameters

- **Handshape**
- **Palm Orientation**
- **Location**
- **Movement**
- Facial Expression

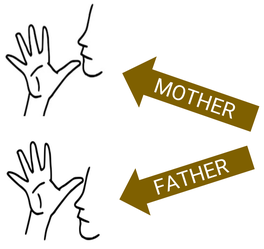
Example:

- Handshape: f handshape
- Palm Orientation: left/right side
- Location: front of body
- Movement: linking

Intelligibility

Intelligibility is the percentage of words or signs accurately identified in a spoken or signed language.

Minimal Pairs



Minimal pairs in ASL are signs that **differ only by one manual parameter**. For example, the signs mother and father have the same handshape, palm orientation, movement but different locations.

Research Objectives

The purpose of this study is to determine which **manual parameter/s** have the **greatest impact on intelligibility** by isolating parameters using minimal pairs to collect data objectively. This research can lay the foundation to understanding the intricate impact of movement disorders on ASL intelligibility.

Methods

Healthy participants, over the age of 18, and fluent in ASL are asked to watch 40 short videos with visual noise and the carrier phase **"I forgot ____ yesterday"**. The participant is asked to type the target sign in the provided textbox. Participants can replay videos as many times as needed.

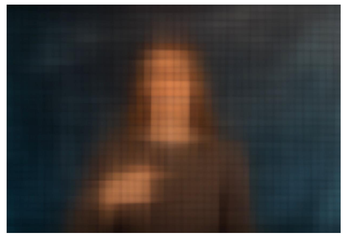
Handshape:

CUTE/SWEET
HOME/DORM
RESTURANT/TWIN
PLEASE/SORRY
WHITE/LIKE

Palm Orientation:

STARS/SOCKS
BOTHER/PSYHOLOGY
SCOLD/WHERE
MAYBE/BALANCE
MORNING/AFTERNOON

5 minimal pairs for each parameter are represented in the 40 videos.



Picture example of visual noise for the sign I/ME
Adobe After Effects: CC Ball and CC Cross Blur effects

Movement:

EVENT/EXCITED
STOP/SOME
PAPER/SCHOOL
MAKE/COFFEE
GAME/CHALLENEGE

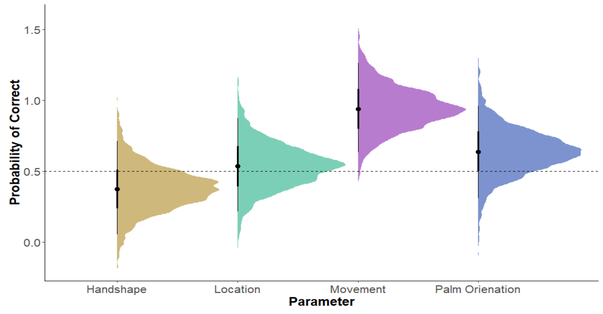
Location:

UGLY/DRY
ONION/APPLE
MOM/DAD
KNOW/DOCTOR
HISTORY/HOH

Results

Results received from 3 participants: 1 hearing, 2 deaf
*preliminary results

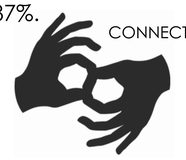
Probability of correct sign identification based on minimal pair parameter



Preliminary results from Bayesian mixed effects regression model of the **median estimate** (black dot), 66% credible interval (dark line), 95% credible interval (light line), and density plot for **each parameter by the probability of correct identification**.

Results Continued

Handshape parameter minimal pairs were **identified with the lowest accuracy** for all participants and **movement parameter** minimal pairs were **identified with the highest accuracy** for all participants. Only one handshape parameter minimal pair was identified correctly, and it was the same across all participants; PLEASE/SORRY. The average percentage of minimal pairs with both signs accurately identified are as follows; handshape: 20%, palm orientation: 40%, location: 47%, and movement 87%.



Lowest Accuracy

- **Handshape: f handshape**
- Palm Orientation: left/right side
- Location: front of body
- **Movement: linking**

Highest Accuracy

The **deaf signers** identified the **movement parameter minimal pairs** with **100% accuracy**, whereas the hearing signer identified with 80% accuracy. This was consistent across all parameters; the data from the 2 deaf signers are in more agreement than the data from the hearing signer.

When a sign was identified incorrectly, 30% of the time, participants identified the minimal pair of the target sign for the **handshape parameter**. For example, for the handshape **minimal pair WHITE/LIKE**, if WHITE was the target sign, participants identified LIKE 30% of the time. The most common handshape minimal pair misidentified were WHITE/LIKE, HOME/DORM and RESTURANT/TWIN. In contrast, **no participants incorrectly identified a minimal pair of the target sign for the movement parameter.**

Conclusions

*This study is still underway, but while waiting for further data, preliminary conclusions can be made with the present data.

When visual noise is present, the **handshape parameter** is the **most difficult to identify**. Further, the handshape parameter is the most likely parameter to have signs incorrectly identified as their minimal pair. Since intelligibility is the percentage of words or signs that are correctly identified in speech or sign language, according to this data, the handshape parameter decreases intelligibility. In contrast, **movement parameter** minimal pairs are the **least difficult to identify** when visual noise is present, therefore this parameter increases intelligibility.

Mohr, S. (2014). Non-manuals in Sign Languages – Theoretical Background. In *Mouth Actions in Sign Languages: An Empirical Study of Irish Sign Language* (1st ed., pp. 31–63). De Gruyter. http://www.jstor.org/stable/j.ctvbkjx0v.10

Taylor.Fahey@colorado.edu