M2L2 Accent: ASL Phonological Development in M2L2 Learners

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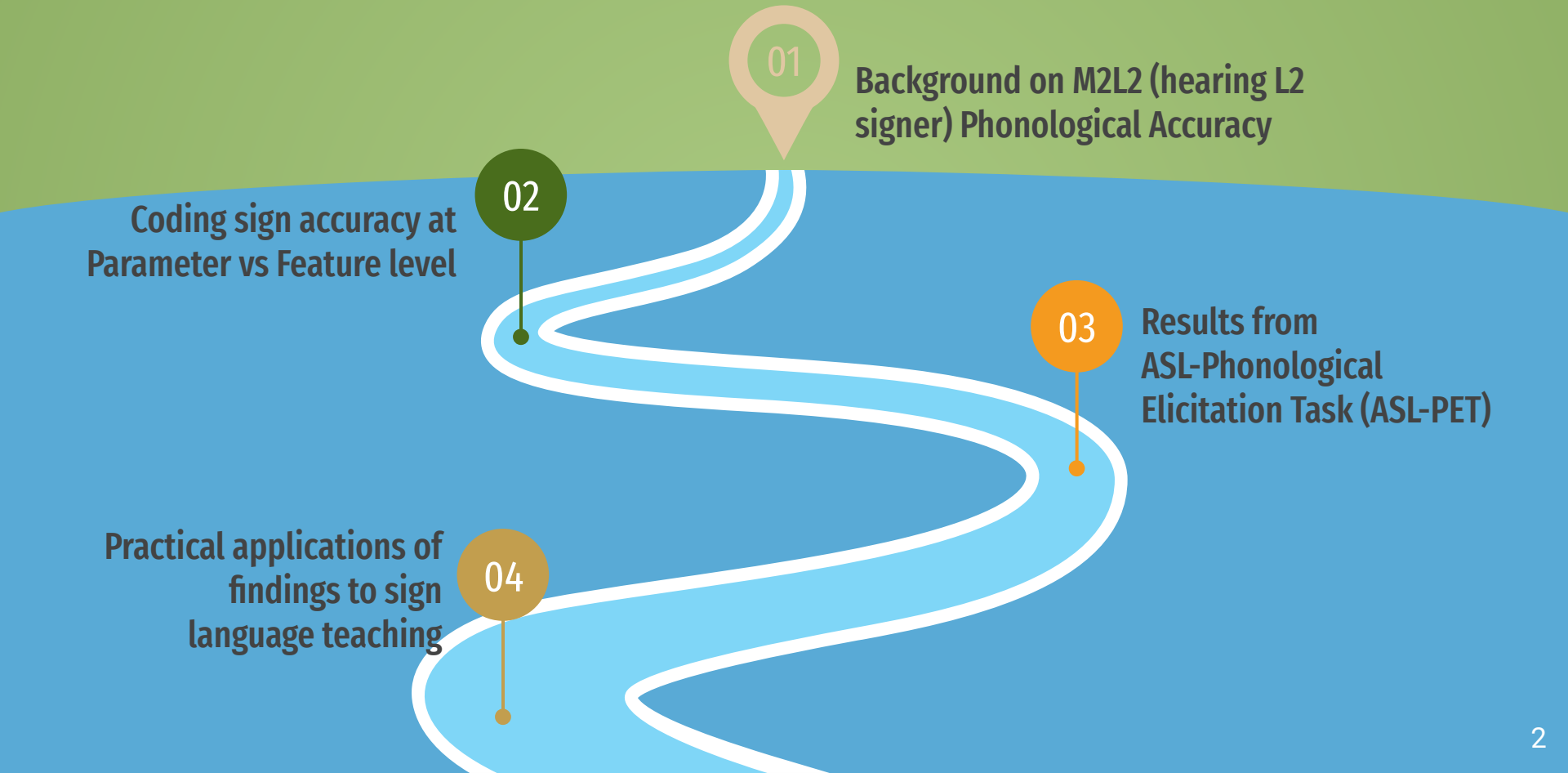
Roadmap for this talk



Clarifying some key terminology

Phonologically complex signs

Signs that involve simultaneous or sequential movements and/or changes in hand configuration.

Parameter-level vs. Feature-level coding

Defining errors according to entire parameters (e.g. wrong handshape) vs. individual aspects of parameters (e.g. wrong thumb position).

Iconicity

Subjective judgment (from 1-7) by hearing participants on "how much a sign looks like its meaning."

Background

M2L2 phonology in the lab

- More errors for complex signs, and for movement and handshape (location produced most accurately) (e.g. ASL: Chen Pichler 2011; BSL: Ortega & Morgan 2015; NGT: Jissink 2005).
- Poor visual discrimination of signed forms, especially movement (ASL: Bochner et al., 2011; Williams & Newman, 2016).
- Highly iconic signs are reproduced less accurately (BSL: Ortega & Morgan, 2015).

Background

M2L2 phonology in the classroom

- Beginner M2L2 students produce the most errors in handshape and movement (Auslan: Willoughby et al. 2015)
- Handshape and movement errors also elicited the most instructor corrections (ASL: Gil & Collins 2022).
- Accuracy improves with instruction, but movement errors are persistent (ASL: Schlehofer & Tyler 2016).

Research Questions

1. What aspects of signs are most error-prone for M2L2 signers?

2. How is M2L2 phonological accuracy affected by phonological complexity, iconicity and ASL level?

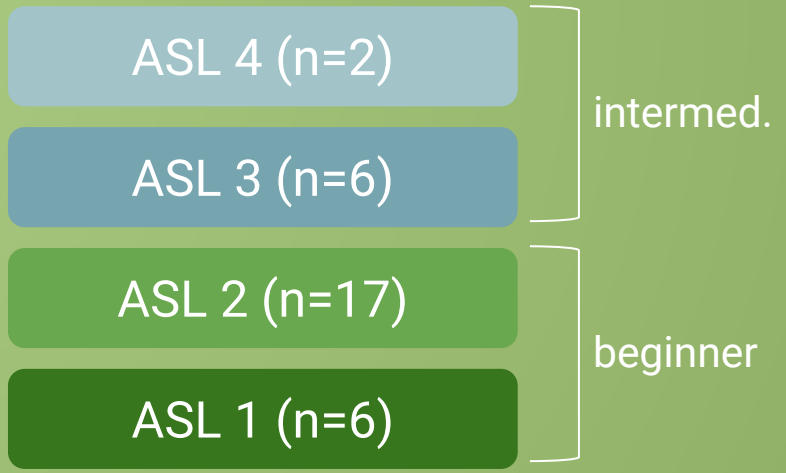
3. How does a feature-based coding system compare with parameter-based coding system for identifying M2L2 phonological errors?

Methodology: Task & Participants

ASL Phonological Elicitation Task (ASL-PET)
(Gu et al., 2022)

- Videos of 12 ASL signs varying in complexity and iconicity (ASL-LEX)
- "...copy her sign as accurately as you can."
- Separate familiarity & iconicity ranking task

Remote testing (Zoom) of 31 M2L2 learners from hearing universities on the East coast of the US



Methodology: Coding & Analysis

- Each sign coded for accuracy on features (cf. next slide)
- Two trained coders for each video; intensive discussion to resolve all discrepancies
- Strict adherence to features of model, even if somewhat unusual

HOME: Location error in Height/Side for second point of contact

Sign accuracy at 3 levels

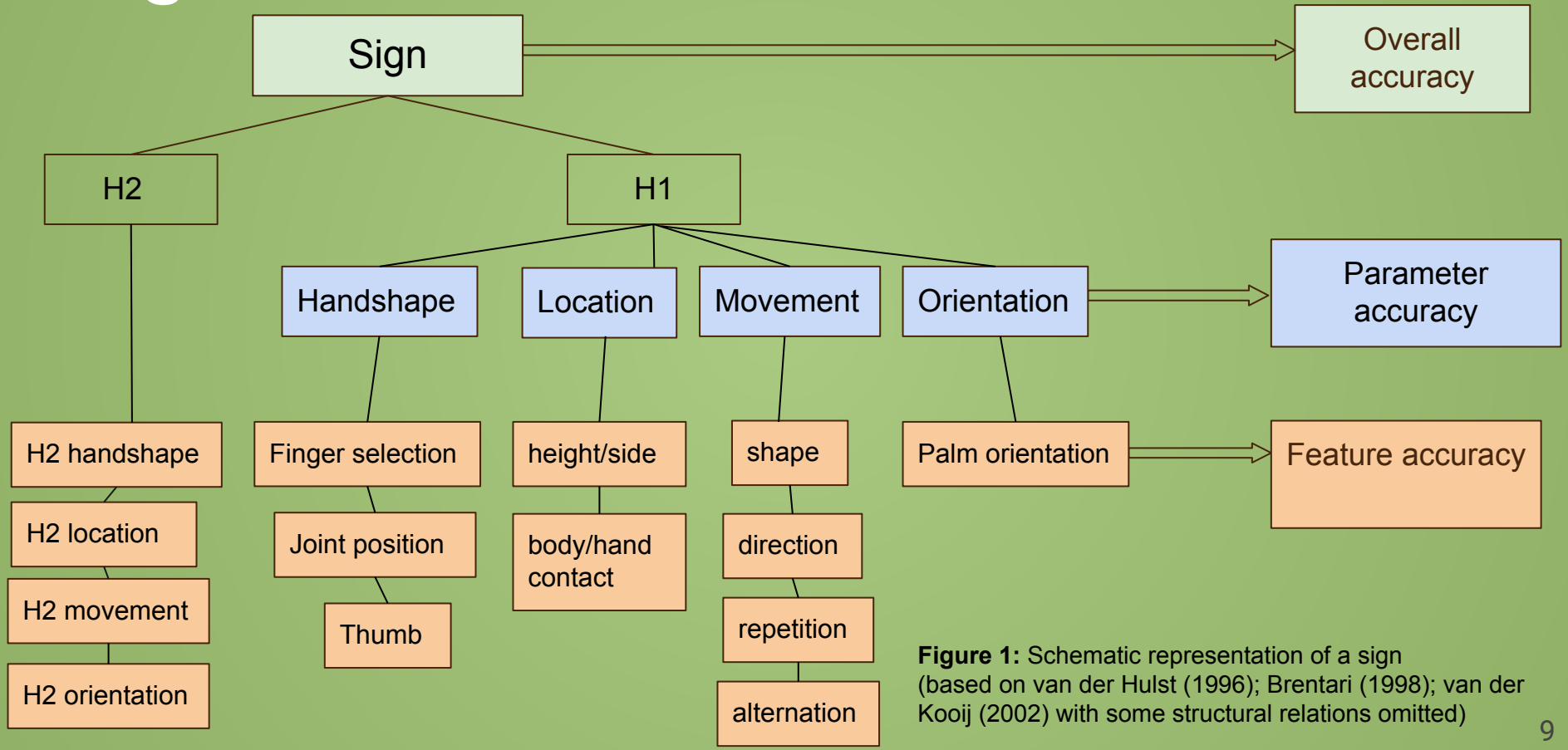
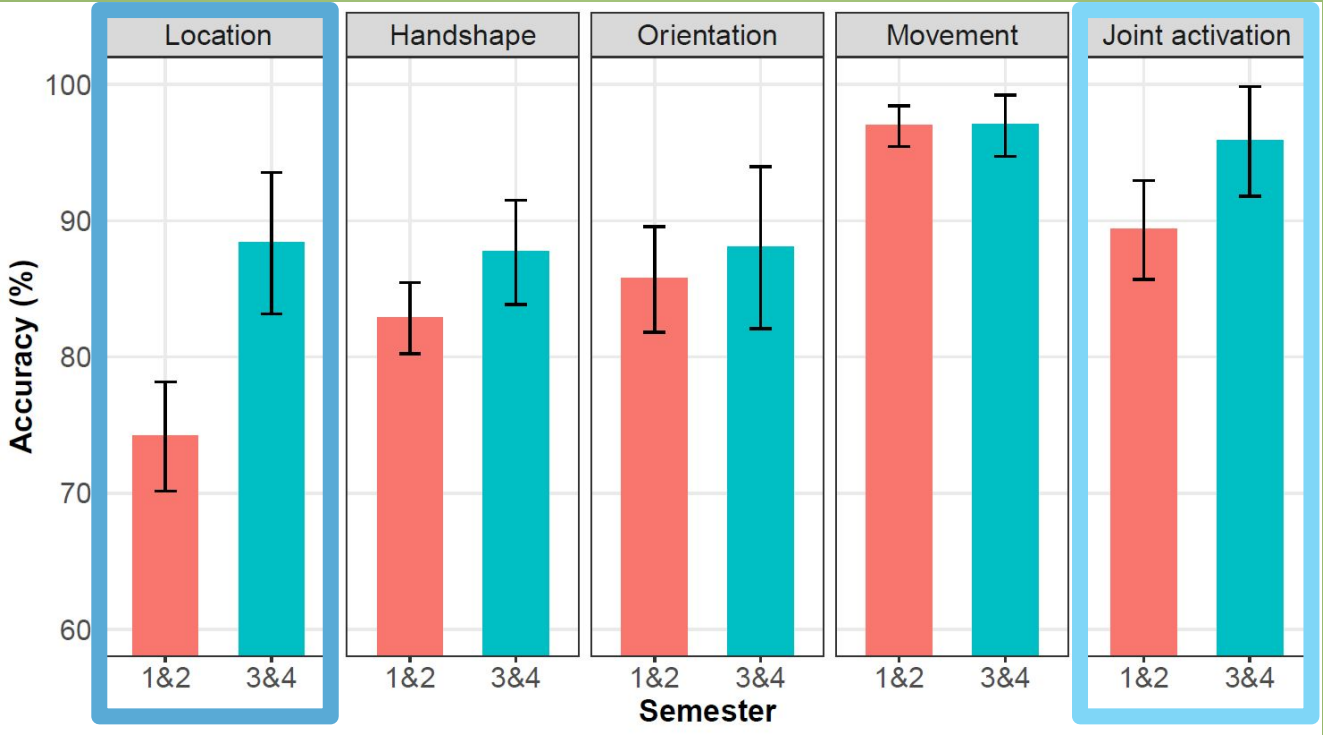
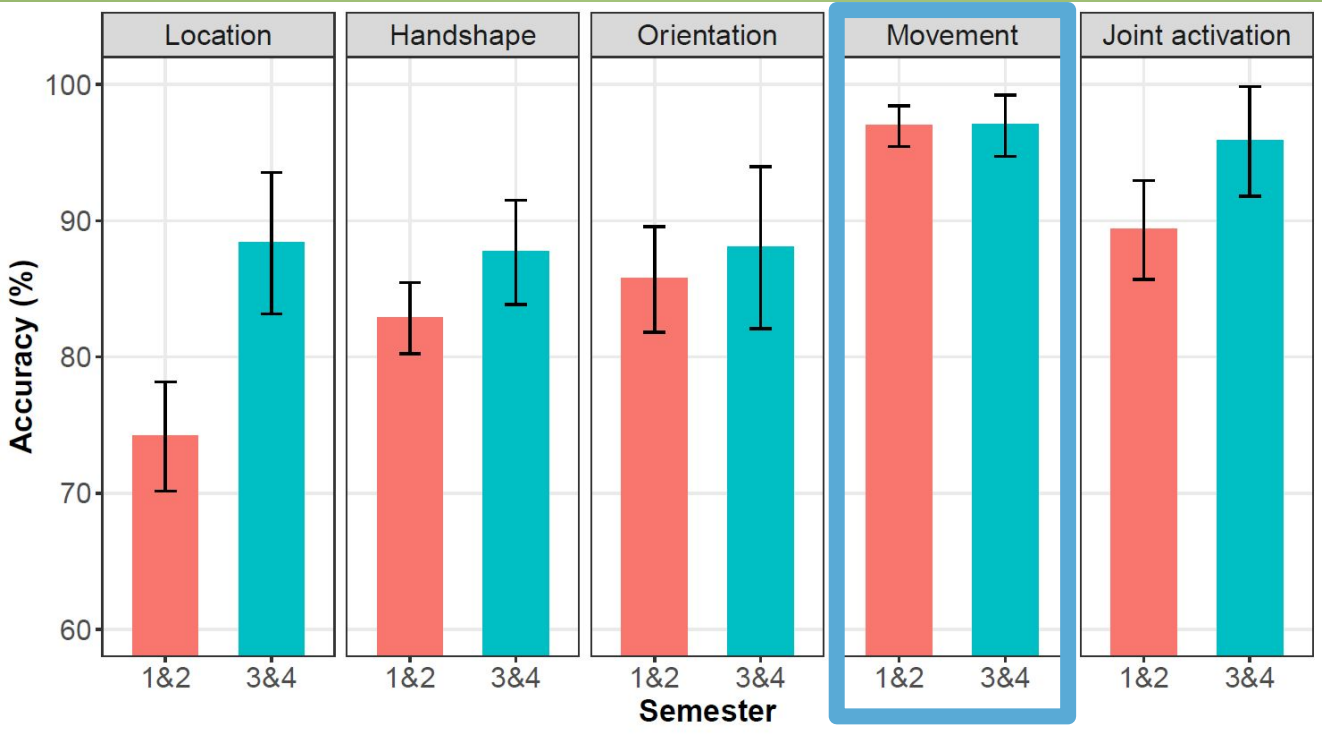


Figure 1: Schematic representation of a sign (based on van der Hulst (1996); Brentari (1998); van der Kooij (2002) with some structural relations omitted)

Results: Errors by Parameter



Results: Errors by Parameter

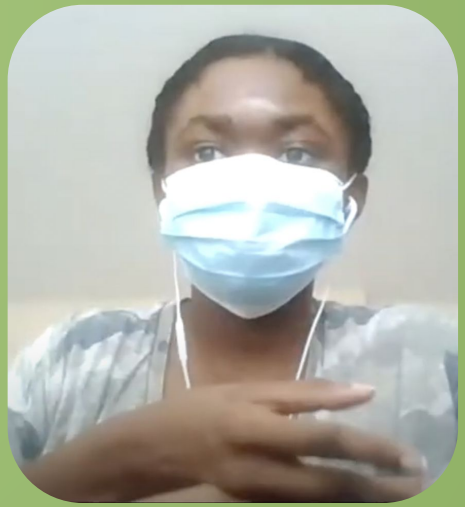


Results: Errors by Feature

Parameter	Feature	Average accuracy (N=31)	Parameter	Feature	Average accuracy (N=31)
Handshape (avg accuracy=83.3%)	H1 finger selection	99.2%	**Movement** (avg accuracy=96.4%)	H1 movement direction	95.2%
	H1 joint position	84.4%		H1 movement shape	96.8%
	H1 thumb	**74.7%**		H1 movement repetition	98.9%
	H2 handshape (incl thumb)	**70.6%**		H2 movement	89.2%
Location (avg accuracy=78.7%)	**H1 height/side**	**64.8%**		Movement alternation	100%
	H1 body/hand contact	98.4%	**Orientation** (avg accuracy=84.4%)	H1 orientation	85.5%
	H2 location	**79.8%**		H2 orientation	82.7%
Joint activation (avg accuracy=88.4%)	H1 joint activation	90.9%		**H2 joint activation**	**78.5%**

Handshape errors involving thumb

Thumb: error in abduction/adduction (BOOK)
(Also location error in sign height)

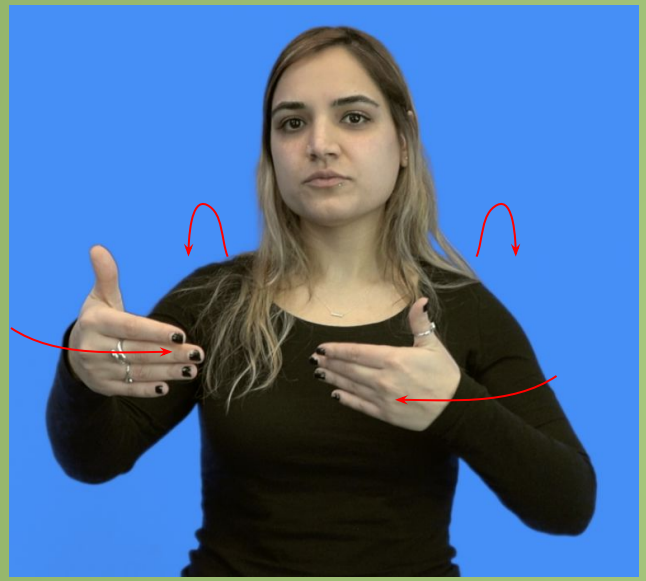


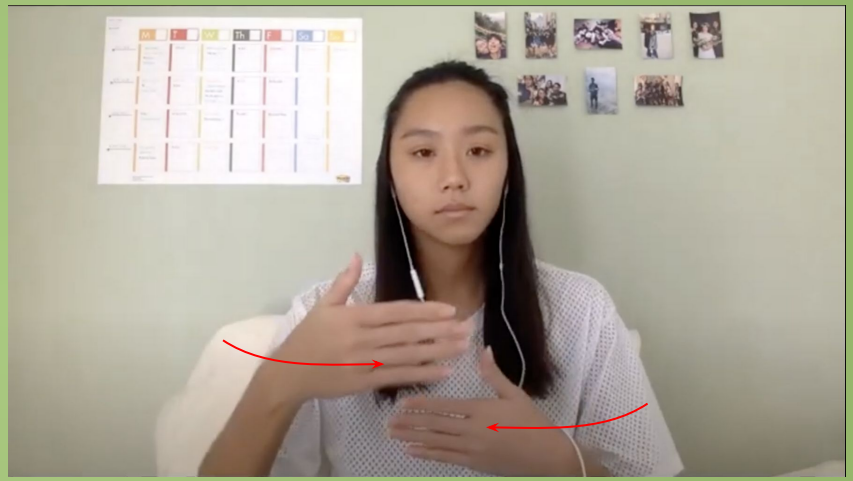
Thumb: error in opposition (SON)

Location errors of height/side

Location: error in height or side that results in hands overlapping (ROOM)

Joint activation errors on H2





ROOM: Omission of final bouncing movement (missing activation of shoulders)

Effects of iconicity, complexity and ASL level

Phon. complexity x Accuracy:	Negative correlation
ASL level x Accuracy:	Positive correlation
Sign iconicity x Accuracy:	No correlation

Conclusions & Applications - I

What aspects of signs are most error-prone for M2L2 signers?

Height/side of signs and thumb position.

Conclusions & Applications - 2

How is the M2L2 accuracy affected by phonological complexity, iconicity and ASL level?

Phonologically complex signs show more errors.

Location and Joint Activation accuracy improve with ASL level (but not Thumb); other features already accurate at beginner levels.

No correlation with sign iconicity rating (from ASL-LEX).

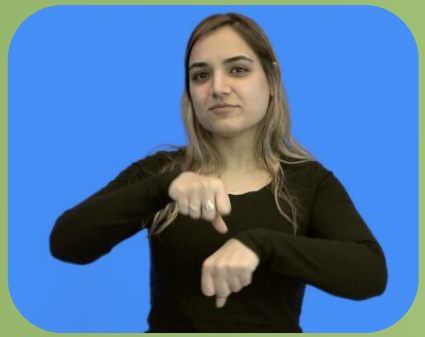
Conclusions & Applications - 3

How does a feature-based coding system compare with parameter-based coding system for identifying M2L2 phonological errors?

Feature-based analysis reveals useful details that refine our understanding of phonological development.

E.g. previous findings of elevated ‘handshape errors’ may be largely due to thumb, elevated 'movement errors' may be due to joint activation.

Future directions/refinements



BICYCLE

NEW

Expanded Joint position

Applied only to hand joints, but extending to all joints would capture elbows either raised or tucked in too tightly (cf. Chen Pichler et al. 2016).

Future directions/refinements

Remote data collection via Zoom worked surprisingly well. However:

- Limitation of a single camera with low-quality video, exacerbated by variable lighting conditions, made coding of joint activation very difficult.
- Angle of participant's camera sometimes too low; made sign height difficulty to judge and may have impacted sign production.

THANKS!

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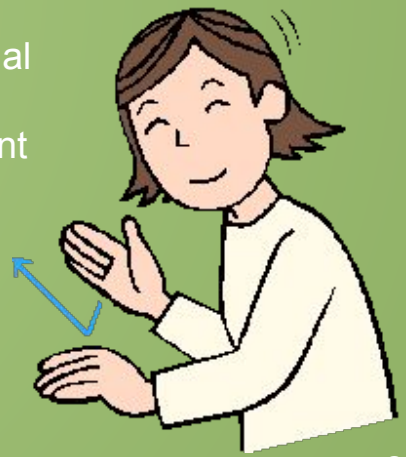

http://www7a.biglobe.ne.jp/~siki/kihonn.htm

SELECTED REFERENCES

- Bochner et al. (2011). When is a difference really different? Learners' discrimination of linguistic contrasts in American Sign Language. Language Learning, 61(4), 1302-1327.
- Campbell, R., Martin, P., & White, T. (1992). Forced choice recognition of sign in novice learners of British Sign Language. Applied Linguistics, 13(2), 185-201.
- Chen Pichler (2011). Sources of handshape error in first-time signers of ASL. In Deaf around the world: The impact of language, 96-121.
- Ortega & Morgan (2015). Phonological development in hearing learners of a sign language: The influence of phonological parameters, sign complexity, and iconicity. Language Learning, 65(3), 660-688.
- Ortega et al. (2019). Hearing non-signers use their gestures to predict iconic form-meaning mappings at first exposure to signs. Cognition, 191, 103996.

Extra slides for Q&A

Joint activation errors on H2

ROOM: Omission of bouncing movement (missing activation of shoulders)

Finding: accuracy and ASL-learning experience

- Three levels of accuracy:
  - Overall
  - Sub-lexical (parameter): location, handshape, movement, orientation, and activation of joints
  - Featural:

- No significant difference in any levels of accuracy by ASL semester years (1 vs. 2, or 3 vs. 4)

Feature-based scoring

	Handshape	Location	Movement	Orientation
H1	finger selection, thumb, joint position	height/side	direction, repetition	orientation
		body/hand contact	shape, alternation	
H2	handshape	location	movement	orientation

Table 1 Properties coded in feature-based scoring

- Signs categorized by number of hands, body/hand contact, alternation, and special shape in path movement (e.g., circular, arc, zigzag), marked in gray
- Due to asymmetry between H1 and H2 (Battison, 1978; van der Hulst, 1996; Brentari, 1998), each H1 property contributes 1 point, while corresponding H2 properties are collapsed and scored by parameter, each contributing 1 point
- Joints of activation on H1 and H2 each contributes 1 point
- Accuracy score (range: 0) = $\frac{\text{number of the properties repeated correctly}}{\text{number of all properties involved in a sign}}$.

Discussion: What features improve as students take more ASL classes?

Significant improvement

Strong hand Location:
- Height/Side, Body/Hand Contact

Strong hand Handshape:
- Finger Selection

Strong hand Orientation

(Marginal improvement)
Weak hand location

No improvement

Strong hand Movement:
- Shape, Direction, Repetition

Strong hand Handshape:
- Thumb, Joint Position

Weak hand:
- Movement, Handshape, Orientation