



# The Cross-Linguistic Distribution of Sign Language Parameters

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# Outline

- 1) Overview
- 2) Background
- 3) Methodology
- 4) Findings
- 5) Discussion

# Outline

## 1) **Overview**

- Research questions

## 2) Background

## 3) Methodology

## 4) Findings

## 5) Discussion

# Overview: Research Questions

- Informed by background in spoken language phonetics and phonology
- Primary question: How are parameters (the sub-lexical units of sign, similar to phonological features) distributed across the world's signed languages?
  - Note: “Parameters” in this sense is unrelated to “principles and parameters”
- Secondary questions:
  - Are any/some/all parameters universal cross-linguistically?
  - How do parameters pattern together?
  - Are any parameters highly marked?
  - What *isn't* used as a parameter?

# Outline

1) Overview

2) **Background**

- Parameters: history and evidence
- Markedness
- Cross-linguistic investigations

3) Methodology

4) Findings

5) Discussion

6) Future work

# Background:

## Parameters: History and evidence

- Parameters are the sub-lexical units used to encode meaning in sign languages. Many signs differ only by a single parameter.

Parameter	Proposed By	Minimal Pair (from ASL)
Movement	Stokoe (1960)	SIT – CHAIR - TRAIN
Handshape	Stokoe (1960)	SOUR – APPLE
Location	Stokoe (1960)	APPLE – ONION
Number of Hands	Bellugi & Fischer (1972)	PARTY – PURPLE
Non-Manual Component (Lexical facial expressions)	Lidell (1978)	LATE – NOT YET
Contact	Klima & Bellugi (1979)	WINE – ?WINE(away from cheek)
Palm Orientation	Friedman (1975)	MAYBE – BALANCE

# Background: Markedness

- “Markedness” has been used in a variety of contexts, including:
  - Phonological systems
  - Historical linguistics
  - Language processing
  - L1 and L2 acquisition
  - Language disorders
  - Cross-linguistic distribution
  - See Haspelmath (2006) and Rice (2007) for further discussion
- For the purposes of this project, “more marked” is taken to mean
  - “rarer cross-linguistically”, after Crothers (1978)
  - higher in an implicational hierarchy, after Greenberg (1966)

# Background:

## Cross-linguistic investigations

- There have been cross-linguistic investigations of phoneme/feature distribution in spoken languages:
  - The World Atlas of Linguistic Structure (Dryer & Haspelmath 2013)
    - Zeshen (2013) looked signed languages, but not the distribution of parameters
  - The Phonetics Information Base and Lexicon (Moran & Wright 2009).
- There have also been some cross-linguistic investigation of parameters sign language
  - Comparison of handshape inventories between signed languages (e.g. Rozelle 2003, Mandel 1979)
- But there has been no previous study looking specifically at how the parameters *themselves* are distributed, i.e. does a sign language use handshape or not?



# Outline

- 1) Overview
- 2) Background
- 3) **Methodology**
  - The SLAY database
  - Advantages and limitations
- 4) Findings
- 5) Discussion
- 6) Future work

# Methodology:

## The SLAY Database

- This project used the information in the Signed Language AnalYses (SLAY) Database (Tatman 2014)
- SLAY contains information on the parameters of 87 signed languages, taken from various academic sources
- SLAY is publicly available through SQLShare, courtesy of the University of Washington (Howe et al. 2012)

# Methodology:

## Advantages and Limitations

- Advantages:

- Good coverage (over 60% of signed languages included)
- Works from a variety of disciplines and traditions provide converging evidence
- Coding of present/ absent/ not discussed for each parameter

- Limitations:

- Includes only secondary sources
- Not all analyses done by trained linguists
- Differing terminology necessitated some additional input analysis

# Outline

1) Overview

2) Background

3) Methodology

4) **Findings**

- Overview

- Distribution & Universals

- Parameter patterns (implicational hierarchy)

- Highly marked parameters

5) Discussion

6) Future work

# Findings: Overview

- Research questions:
  - How are parameters (the sub-lexical units of sign) distributed across the world's signed languages?
  - Are any/some/all parameters universal cross-linguistically?
  - How do parameters pattern together?
  - Are any parameters highly marked?
  - What *isn't* used as a parameter?

# Findings: Overview

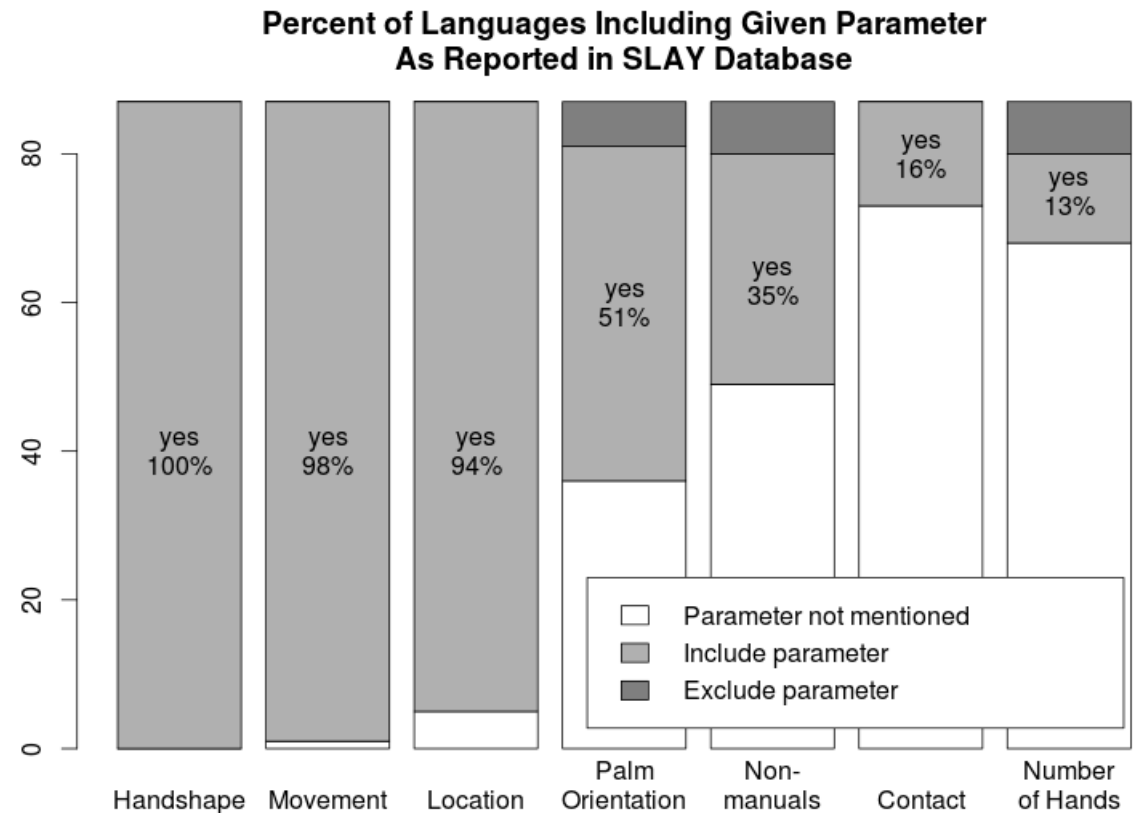
- Research questions:
  - **How are parameters (the sub-lexical units of sign) distributed across the world's signed languages?**
  - **Are any/some/all parameters universal cross-linguistically?**
  - How do parameters pattern together?
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# Findings: Distribution

<b>Parameter</b>	<b>Present</b>	<b>Absent</b>	<b>Not discussed</b>
Handshape	100%	0%	0%
Movement	98.86%	0%	1.14%
Location	94.25%	0%	5.74%
Palm Orientation	51.14%	6.89%	41.37%
Contact	15.91%	0%	84.09%
Non-manuals	35.23%	8.04%	56.32%
Number of Hands	13.64%	8.04%	78.32%

# Findings: Towards Universals

- Almost all languages (94%) included handshape, movement and location and none specifically excluded them
- Other parameters (palm orientation, non-manuals, contact and number of hands) much rarer
  - Except for contact, all were looked for and not found





# Findings: Overview

- Research questions:
  - How are parameters (the sub-lexical units of sign) distributed across the world's signed languages?
  - Are any/some/all parameters universal cross-linguistically?
  - **How do parameters pattern together?**
  - Are any parameters highly marked?
  - What *isn't* used as a parameter?

# Findings: Parameter Patterns

- An implicational hierarchy emerged during analysis of the database
- Some caveats:
  - Explicitly arguing *against* parameters is relatively rare; only around 8% of analyses argue against one or more parameter
  - The database does not yet have 100% coverage, which may change these results
  - Some rankings are supported by only one or two languages
- Reading the chart:
  - (light) Blue = argued for
  - (dark) Red = argued against
  - White = not discussed



# **Finding: Markedness Hierarchy**

Handshape, Movement, Location >  
Palm Orientation, Contact >  
Non-manuals > Number of Hands

# Findings: Overview

- Research questions:
  - How are parameters (the sub-lexical units of sign) distributed across the world's signed languages?
  - Are any/some/all parameters universal cross-linguistically?
  - How do parameters pattern together?
  - **Are any parameters highly marked?**
  - **What *isn't* used as a parameter?**

# Findings: Extremely Marked Parameters

- Two additional parameters occurred very rarely
- Duration:
  - Palestinian sign language has a minimal pair HONEY and CRUSHED-SESAME (Abdel-Fattah 2005)
  - It has been proposed as a parameter for Auslan (Johnston & Schembr 2007), but perhaps only as a minor one
- Which hand is used:
  - Turkish Sign Language has a finger-spelling system that uses only the non-dominant hand, which is arguably not part of the language (Kubuş 2008)

# Findings: Unused Parameters

- Example: Feet
  - Used in homesign (non-linguistic gesture systems used by deaf children with no access to sign) (Hunsicker & Goldin-Meadow 2013)
  - Not used as articulators by any sign language in the database (although occasionally as a location, e.g. in Adamorobe Sign Language (Nyst 2007))
- Gives us bounds on the types of tools used by sign languages

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- 5) **Discussion**
  - Information, not explanation
  - Review of main findings



# Discussion:

## Information, not explanation

- While this study offers information about *what* the distribution of sign language parameters is, we still don't know *why*
- Some possibilities for explaining variation in more-marked parameters:
  - *Age*: As signed languages develop, they may include change the number of parameters they use
  - *Status as a village sign language*: Village sign languages may make different use of parameters
  - *Cultural factors*: Taboos on eye contact may limit used of lexical non-manuals such as eye gaze, etc.
  - *Investigator bias*: Some researchers incorrectly identify or fail to find existent parameters

# Discussion: Main Findings

- Handshape, movement and location may be universal sign language parameters
- Markedness hierarchy:
  - Handshape, Movement, Location > Palm Orientation, Contact > Non-manuals > Number of Hands
- Sign languages make use of a relatively small number of parameters for encoding lexical information

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Thank you!

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# Al Sawayid Bedouin Sign Language?

- Does it have parameters?
  - “ABSL exhibit[s] the most variation in the formation of handshapes, ISL next, and ASL showing the least ... ABSL signers are aiming for a holistic iconic image, and that discrete phonological categories are not yet robust in the language”<sup>1</sup>
- For the purposes of this project, yes
  - Working definition: sub-lexical units used to encode meaning in sign languages
  - ABSL signers *are* using handshape, location and movement to encode meaning, but the grammatical system is still emerging
- Other researchers agree. Al-Fityani (2007) compared signs across Arab sign languages based on handshape, movement, location and orientation<sup>2</sup>.

1 – Israel, A., & Sandler, W. (2011). Phonological category resolution in a new sign language: A comparative study of handshapes. *Formational units in sign languages*, 177-202.

2 – Al-Fityani, K. (2007). Arab sign languages: A lexical comparison. *Center for Research in Language Technical Reports*, 19(1), 3-13.

# Table of Conditional Probabilities

	<i>Handshape</i>	<i>Movement</i>	<i>Location</i>	<i>Palm Orientation</i>	<i>Contact</i>	<i>Non-manuals</i>	<i>Number of Hands</i>	<i>Total prob:</i>
<i>Handshape</i>	X	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	<b>100.00%</b>
<i>Movement</i>	98.86%	X	100.00%	100.00%	100.00%	96.77%	100.00%	<b>98.86%</b>
<i>Location</i>	94.32%	95.40%	X	91.11%	85.71%	93.55%	83.33%	<b>93.18%</b>
<i>Palm Orientation</i>	51.14%	51.72%	52.44%	X	35.71%	*61.29%	*33.33%	<b>51.14%</b>
<i>Contact</i>	18.18%	16.09%	51.22%	11.11%	X	19.35%	33.33%	<b>15.91%</b>
<i>Non-manuals</i>	35.23%	35.63%	35.37%	*6.66%	42.86%	X	*41.66%	<b>35.23%</b>
<i>Number of Hands</i>	13.64%	13.79%	13.41%	*8.89%	28.57%	*16.12%	X	<b>13.64%</b>

Table of the conditional probabilities of certain parameter being included in an analysis. The table may be read as follows: “Given that an analysis says that a language has [column value] there is a [cell value] percent chance that it will also include [row value].” Note that only analyses that claim a language does have a particular parameter were included for the counts, so analyses against and excluding a parameter were included together. Cells marked with an asterisk indicate that those probabilities are significant ( $p < 0.001$ ). Significance tests include all three judgments: “yes”, “no” and “excluded”. Handshape had only one level and was thus excluded from significance testing.

# Implications for Sign Phonology

- If handshape, movement and location are universals, then should that be reflected in phonological models?
- Hand Tier model (Sandler & Lillo-Martin 2006)
  - Includes movement, location and handshape as primitives
- Movement Hold Model (Lidell & Johnson 1989)
  - Could be modified by removing orientation information from the holds, but would leave some languages (e.g. ASL) underspecified
- Prosodic model (Brentari 1998)
  - Uses movement as the nuclear (sonorant) unit in sign language phonology, handshape and location less central

# All Hierarchies

- Markedness Hierarchy:
  - Handshape, Movement, Location > Palm Orientation, Contact > Non-manuals > Number of Hands
- Frequency Ranking:
  - Handshape > Movement > Location > Palm Orientation > Non-manual > Contact, Number of Hands
  - More analyses discuss number of hands, whether for or against, (19 vs. 14) but more explicitly include contact than number of hands (14 vs. 12)
- Combined Ranking (possibly of limited usefulness):
  - Frequency used to resolve free ordering in markedness hierarchy
  - Handshape > Movement > Location > Palm Orientation > Contact > Non-manuals > Number of Hands