

The Phonological Representation of the Non-Dominant Hand: Evidence from Articulatory Compensation in ASL

Jonathan Udoff, Ignatius Nip, Karen Emmorey

TISLR 10

1 October 2010



SAN DIEGO STATE
UNIVERSITY



Handedness in ASL

- Phonological specification of handedness
 - One-handed signs
 - Two-handed place signs (h2-P)
 - Two-handed symmetrical signs (h2-S)



H2-P: DISCUSS



h2-S: SHOES

Two Types of Two-Handed Signs

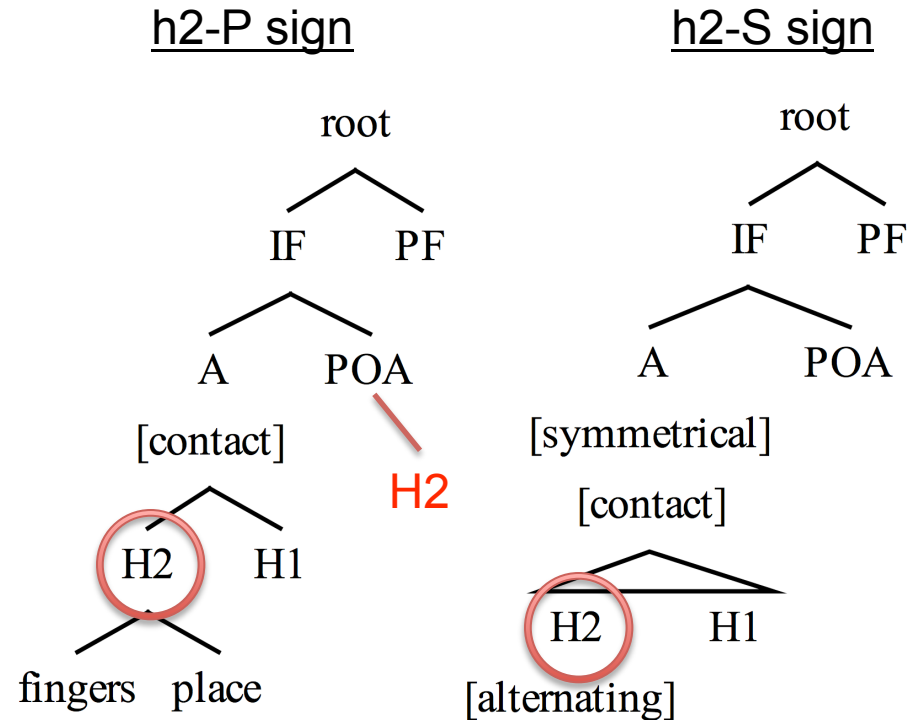
- h2-P (type 3): h1 moves and articulates on h2; h2 is restricted to a closed class of handshapes and cannot move
 - e.g., DISCUSS
- h2-S (type 1): Both hands have the same movement and handshape
 - e.g., SHOES



- Two competing models describe the non-dominant hand's possible roles in ASL phonology

One-Role Models

- h2 is always represented as articulator regardless of phonological category
- Captures phonetic equivalence of the two hands
- Explains some phonological and historical processes
- **BUT, double representation of h2 in h2-P signs**

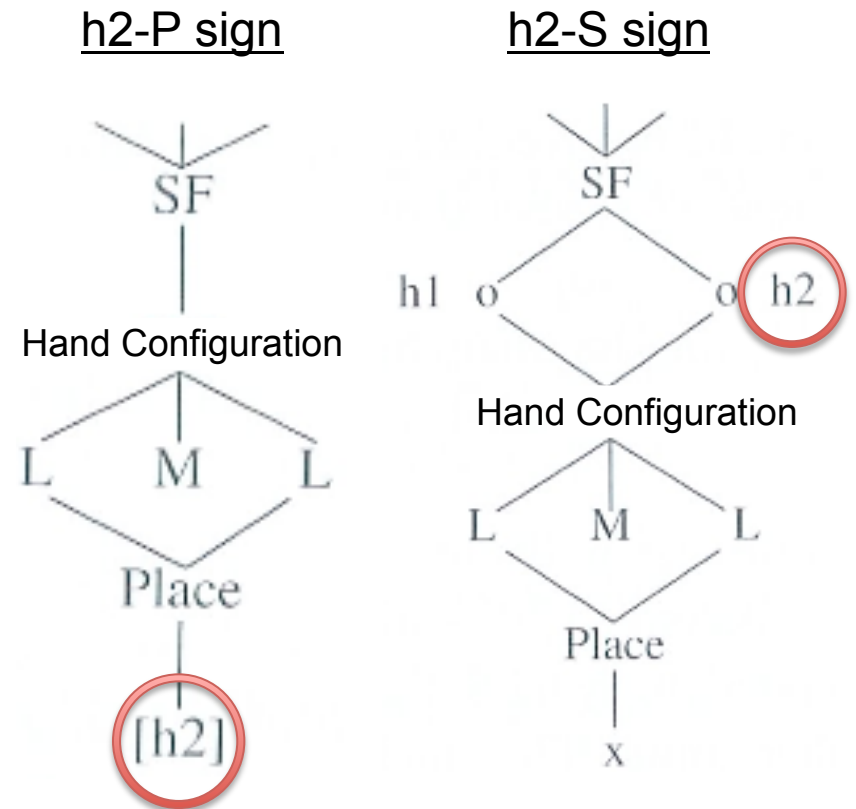


Prosodic Model (Brentari, 1999)

[cf. van der Hulst, 1996]

Two-Role Models

- h2 can be a second articulator (h2-S) or a place of articulation (h2-P)
- Captures many phonological processes
- Mirrors Battison's (1973) Dominance & Symmetry constraints



Hand Tier Model (Sandler, 1993;
Sandler & Lillo-Martin, 2006)
[cf. Stokoe, 1960]

Articulatory Compensation

- Impeding the articulators to see how production is affected
- **Sling** constrains the non-dominant arm to block it from participating in the articulation of h2-S and h2-P signs



Predictions

- The **Two-Role Model** predicts...
 - H2-P signs will be displaced towards the non-dominant side of the body
 - H2-S signs will not be affected
- The **One-Role Model** predicts...
 - Same compensatory behavior for h2-S and h2-P signs
 - Displacement toward non-dominant side of the body

Predictions (cont.)

- Effect of linguistic experience
 - Knowledge of manual phonology may shape articulatory compensation behaviors
 - Hearing non-signers will compensate in different and more varied ways than Deaf participants

Methods

- Participants:
 - Hearing non-signers (n=9)
 - Deaf signers (native or near-native; n=9)
 - Right-handed
- Apparatus: “armblock” sling on non-dominant arm
- Procedure: watched a video of a person signing 24 “MY _____ MY” carrier phrases and repeated it back 4 times
 - With armblock sling
 - Unencumbered
 - Hearing non-signers familiarized with signs beforehand

Stimuli

- Signs were either one-handed, h2-P, or h2-S
- All signs produced in neutral space
 - Place of articulation in front of a signer
(as opposed to body-anchored signs)
 - Phonologically underspecified for place
- All signs disallowed **Weak Drop** (Padden & Perlmutter, 1987)
 - Weak Drop: a phonological rule that allows optional deletion of h2

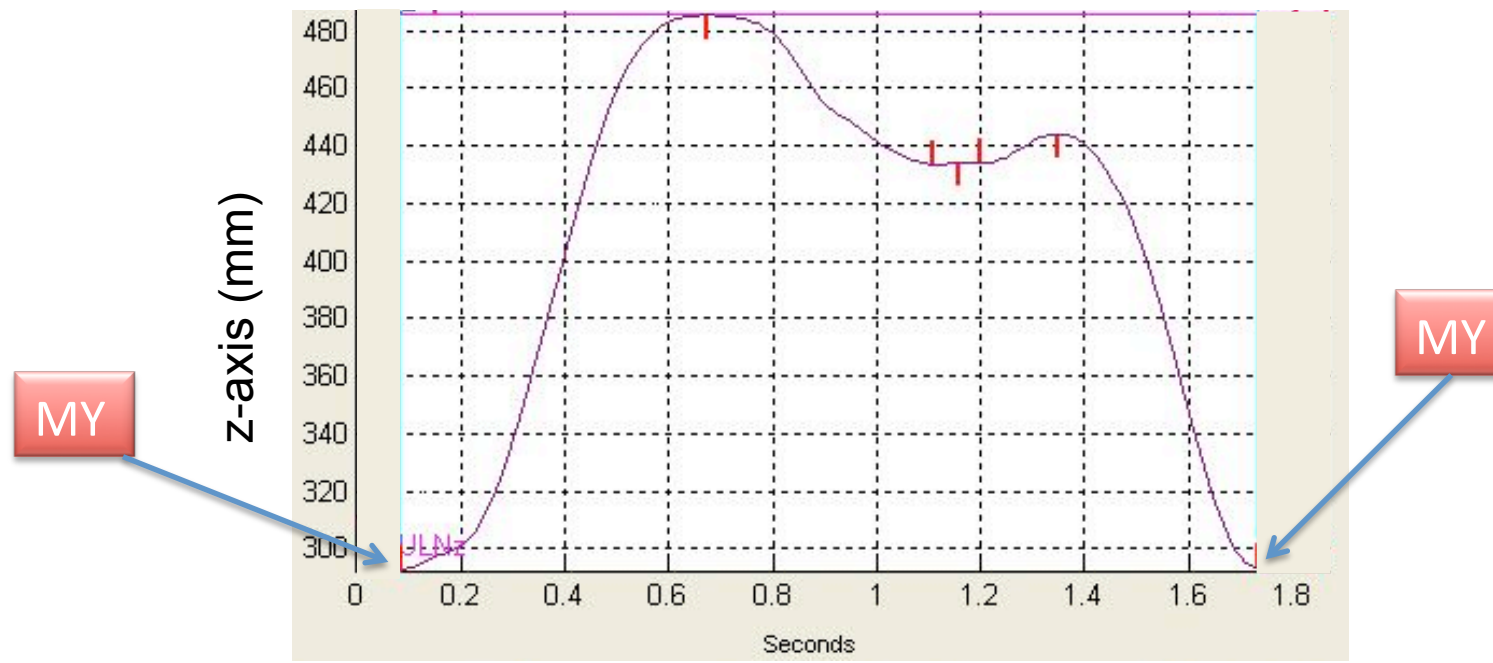
Motion Capture

- Motion Analysis ©
 - Eight camera optical system
 - Passive markers (2 wrist and 5 reference markers)



Data Trimming

- Measured between the two MYs of the carrier phrase
- Used local minima of z-axis (forward-back) to determine when hand hits the chest for the sign MY

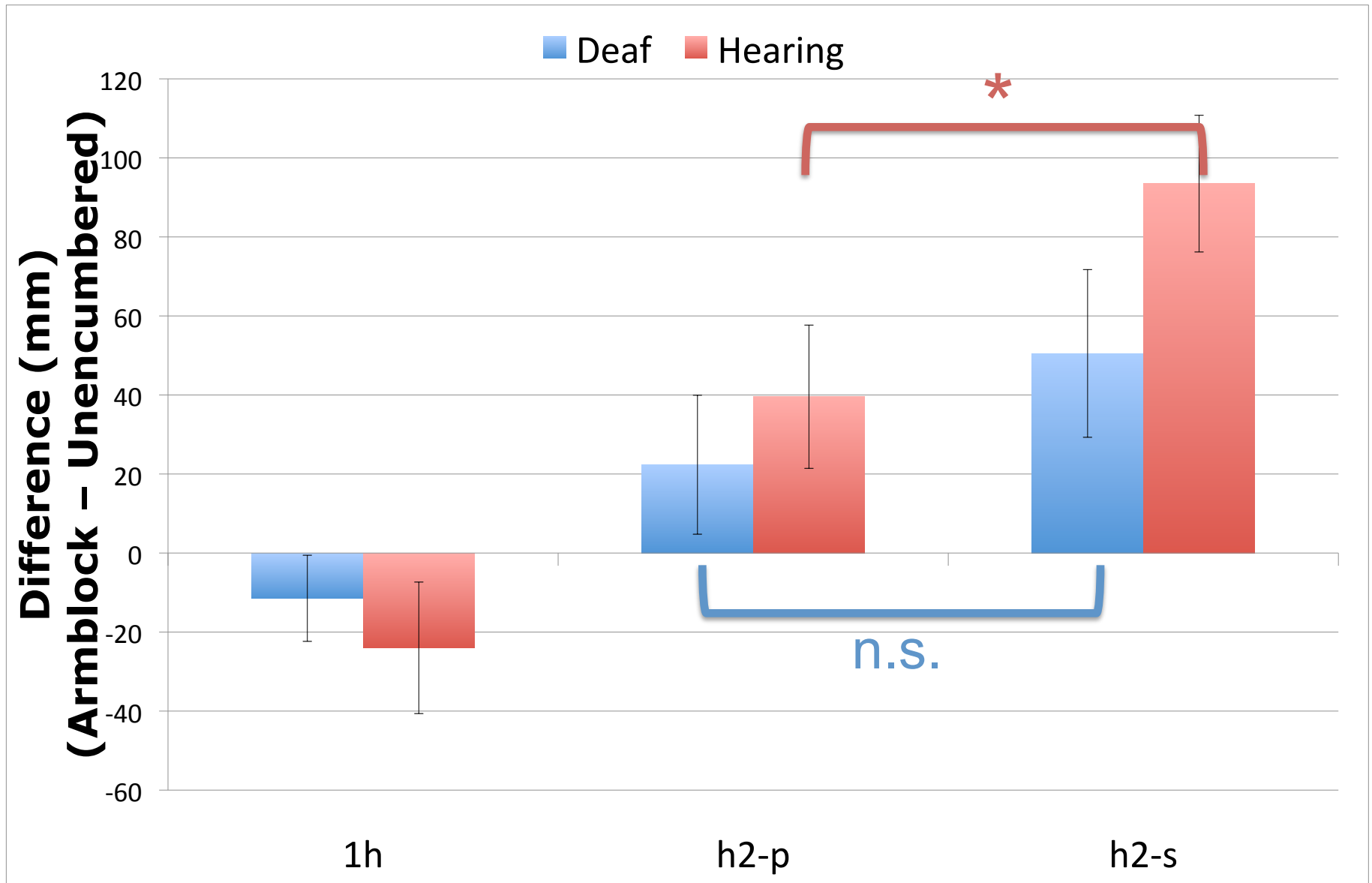


unencumbered "MY SHOES MY"

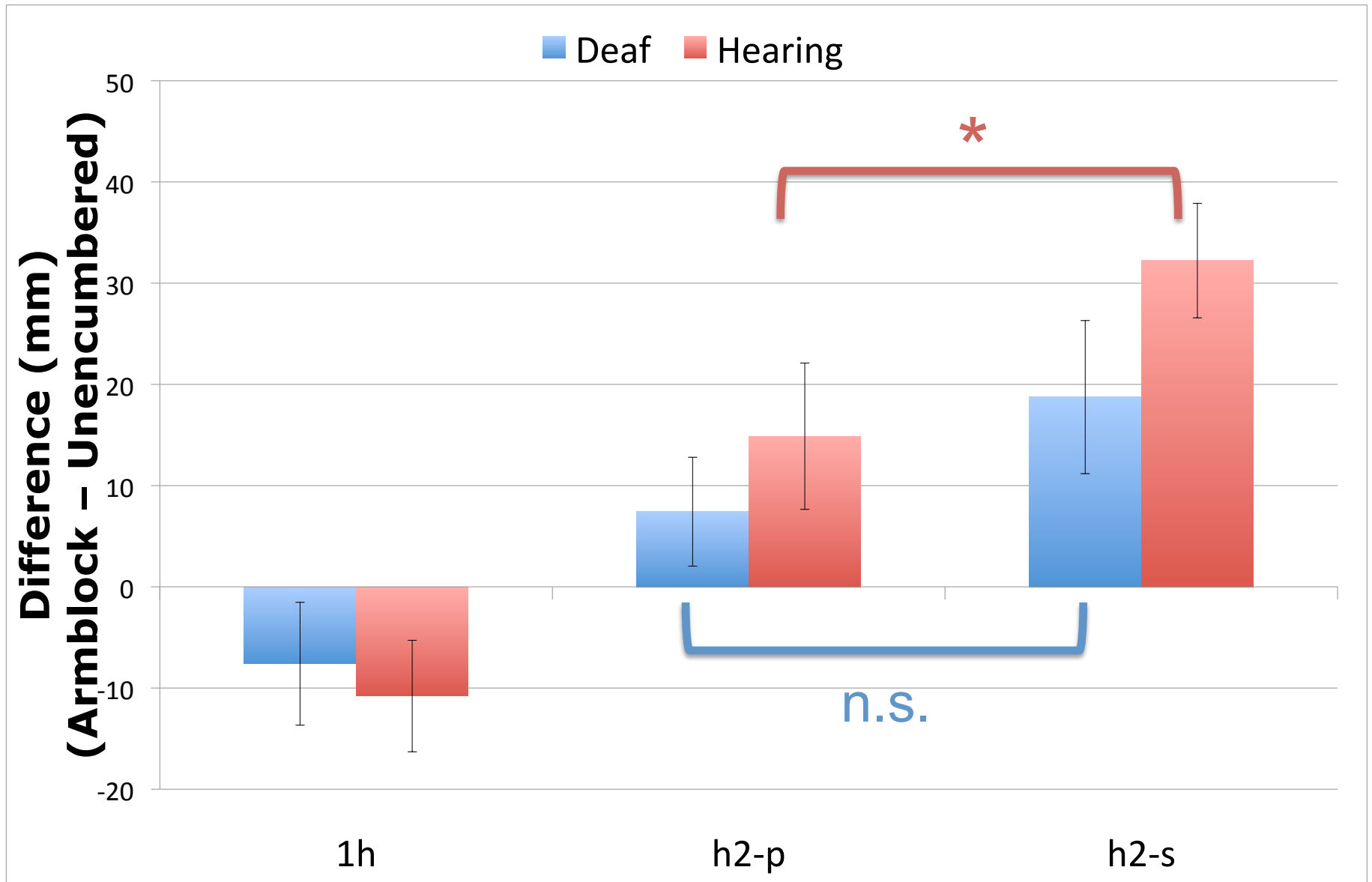
Measurements

- Kinematics of h1 in the x-axis (left-right)
 - Dependent variables: distance, range, mean position
- Difference score = (armblock) – (unencumbered)
 - Each sign served as its own control

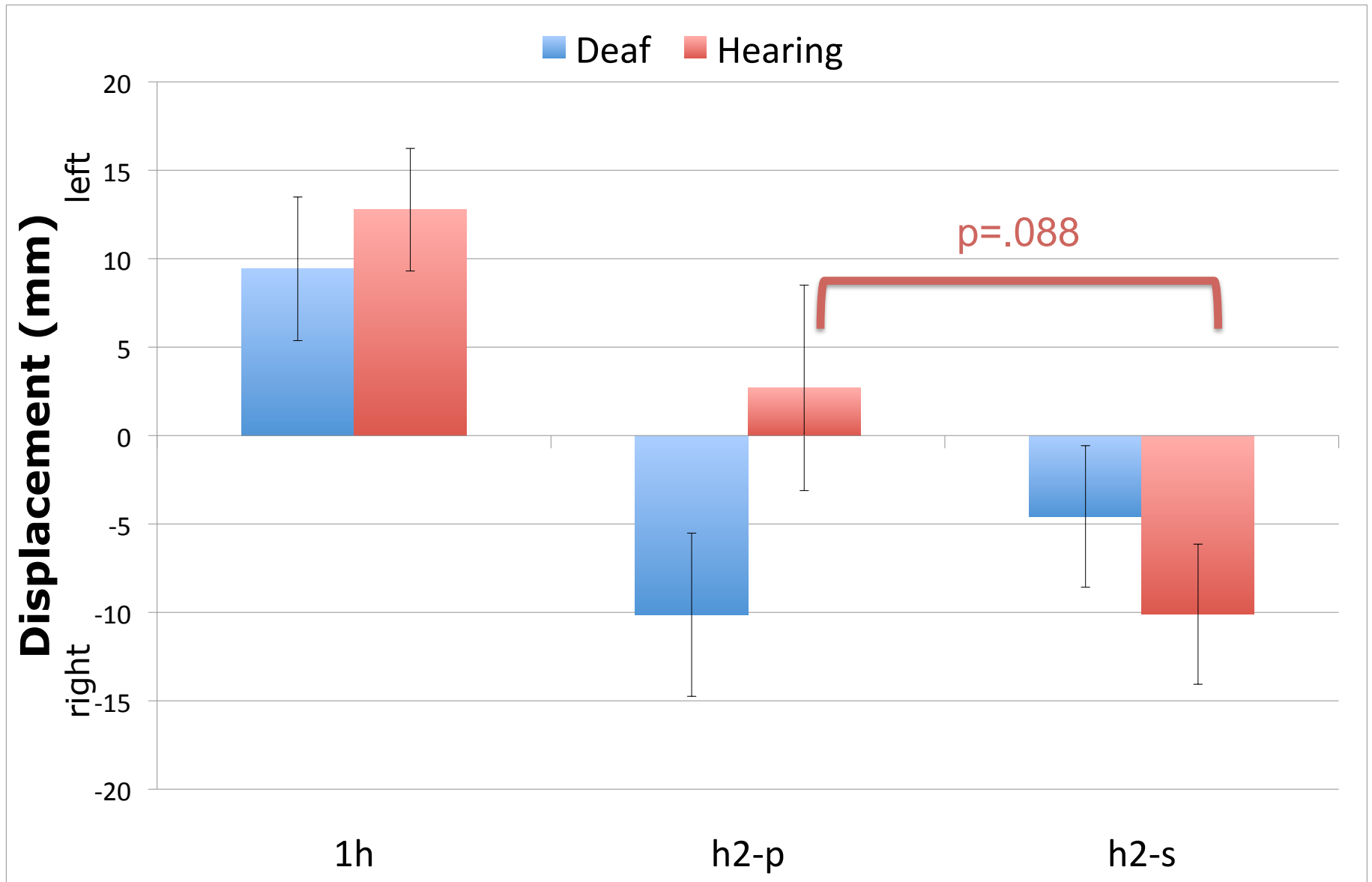
Results: Distance within x-axis



Results: Range of x-axis



Results: Mean position of x-axis



Discussion

- h2-P and h2-S not different for Deaf
 - Supports One-Role Model of non-dominant hand
- One-handed signs differed from two-handed on all measures for both groups
 - Possible general physiological effect of the hands

Discussion (cont.)

- Hearing distinguish between h2-P and h2-S, but Deaf do not
 - Perhaps difference between h2-P and h2-S signs is perceptually salient
 - Suggests that compensatory behavior is dependent on linguistic knowledge of manual phonology

Future Directions

- Sub-types of two-handed signs
 - Subset and intermediary classes of signs
- Other dependent kinematic variables
 - Average velocity, peak velocity, duration
- Perceptual study
 - Can Deaf signers recover a target two-handed sign when articulated with only the dominant hand?

Acknowledgements

- Thanks to
 - the interpreters
 - Lauren Stirling
 - Ashley Engle
 - Brenda Nicodemus
 - Jill Weisberg
 - Melissa and Ethan Herzig
 - everyone at LLCN
- This research is supported by a grant from the National Institute of Deaf and Communicative Disorders to Karen Emmorey and San Diego State University Research Foundation (DC010997).



References

- Brentari, Diane. (1998). *A Prosodic Model of Sign Language Phonology*. Cambridge, MA: MIT Press.
- Padden, Carol and Perlmutter, David. (1987). American Sign Language and the architecture of phonological theory. *Natural Language and Linguistic Theory*, 5, 335–375.
- Sandler, Wendy (1993). Hand in hand: The roles of the nondominant hand in sign language phonology. *The Linguistic Review*, 10, 337–390.
- Sandler, Wendy and Lillo-Martin, Diane. (2006). *Sign Language and Linguistic Universals*. Cambridge, UK: Cambridge University Press.
- Stokoe, William. (1960). *Sign Language Structure*. Silver Spring, MD: Linstok Press.
- van der Hulst, Harry. (1996). On the other hand. *Lingua*, 93, 121–143.