

# Perception of pantomime, American Sign Language verbs, and nonsense signs by deaf signers and hearing non-signers

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## Introduction

Deaf signers have extensive experience with pantomime through ASL story-telling and interacting with hearing non-signers. Pantomime can involve the whole body and is meaningful for both signers and nonsigners, unlike most ASL verbs. Nonsense signs are meaningless for both groups but have linguistic structure for deaf signers.

## Questions

1. Does the perception of pantomimes engage distinct neural systems for deaf signers vs. hearing non-signers?
2. Do the neural systems recruited during the perception of ASL differ from pantomime for deaf signers?
3. Does the perception of meaningless gestures activate perisylvian language regions for signers?

## Participants

14 native Deaf signers (7 males)  
14 hearing non-signers (6 males)

## Stimuli

- Pantomimes
- ASL signs
- Nonsense signs

## Procedure

Passive viewing of 60 clips (1.5 sec each) presented in 45 sec blocks. ISI = 3sec. Baseline was cross fixation.

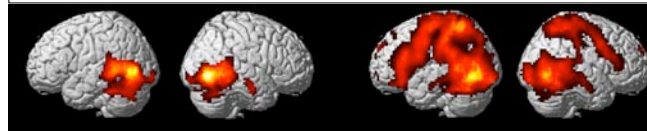


**fMRI parameters:** 3T GE MRI scanner, Real time EPI, TR=2000 ms, TE=30 ms, FA=90, FOV=220\*220, Matrix=64\*64, 24 slices with 5 mm thickness. **Image analysis:** SPM 2; random effects analysis; threshold set at 0.01. **Behavioral assessment:** Gesture/sign recognition task after scanning: Deaf = 74.9% Hearing = 76.6%.

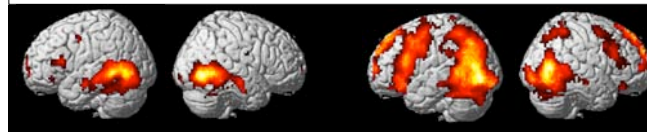
## Deaf

## Hearing

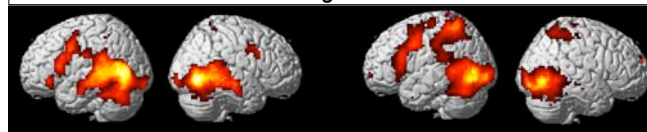
### Pantomimes vs. Fixation



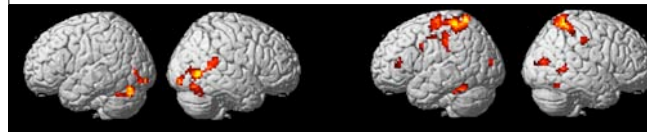
### ASL verbs vs. Fixation



### Nonsense signs vs. Fixation



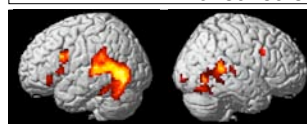
### Pantomimes vs. ASL verbs



### ASL verbs vs. Pantomimes



### Nonsense signs vs. ASL verbs



Hearing: No significant difference ( $p > .01$ )

## Results

1. The mirror neuron system (pre-frontal and parietal cortex) is not engaged when deaf signers passively view pantomimes, in contrast to hearing non-signers.
2. For deaf signers, ASL verbs and nonsense signs engage left inferior frontal and temporal regions, with greater activation for nonsense signs.
3. In contrast to ASL verbs, pantomimes activate inferior temporal cortex for both groups, due to the object-based nature of most pantomimes
4. For hearing non-signers, pantomimes activate superior parietal cortex bilaterally, while (meaningless) ASL verbs activate left inferior parietal cortex.
5. For deaf signers, nonsense signs activate left perisylvian language regions to a greater extent than ASL verbs.

## Conclusions

1. Deaf signers, unlike hearing non-signers, do not automatically engage the mirror neuron system when perceiving pantomimes due to their expertise and experience comprehending human gesture, replicating Corina et al. (in press).
2. Passive viewing of ASL verbs and pantomimes engages very similar neural regions for deaf signers.
3. Nonsense signs activate left hemisphere language regions for deaf signers, but not for hearing non-signers.

## Reference

Corina, D., Chiu, Y-S, Knapp, H., Greenwald, R., San Jose-Robertson, L. & Braun, A. (in press). Neural correlates of human action perception in deaf and hearing subjects. *Brain Research*.

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