**Neural Correlates of Conflict During Interpersonal Communication Observed in Dorsolateral Prefrontal Cortex using NIRS**

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**Introduction**

**Background**

Stroop tasks are designed to elicit conflict between stimulus dimensions and/or response choices.1-3 Delay in reaction time and activity in specialized neural circuits are taken as evidence for biomarkers of conflict.1-3

**QUESTION:** Does conflict between gesture and word engage canonical language systems, such as Wernicke's and Broca's areas, or is it associated with more domain-general systems tied to social function?

**Subjects**

- 34 healthy volunteers: 27 male, 7 female; mean age: 24

**Experimental Design**

**Communication Conflict**

- Task: Identify the gesture as "yes" or "no"

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<th>CONGRUENT</th>
<th>Head</th>
<th>Hand</th>
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<tbody>
<tr>
<td>Spoken Word</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Hand Movement</td>
<td>Forward</td>
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**Figure 1.** Video: head shake, nod, thumbs up, thumbs down. Audio: "yes" and "no." Estures are congruent or incongruent with spoken word.

Subjects use button responses to indicate the meaning of thumb or head movements as "yes" or "no." 6 each of congruent and incongruent-dominant blocks, alternated with 15s rest - 4 trials per block, ISI: 3.75s

**Figure 2.** fNIRS optode layout with emitters (red) and detectors (blue) on left hemisphere

**Figure 3.** Task design: 15s task alternates with 15s rest. 4 trials per block. Fixed ISI of 3.75s.

**fNIRS Acquisition**

- Continuous-wave functional near-infrared spectroscopy (Shimadzu LABNIRS) sampled every 33ms.
- 30 channels registered to standard MNI coordinates using SPM-NIRS (Bioimaging and Signal Processing Lab, KAIST) and a 3D digitizing system (Polhemus Patriot)

**Behavioral Results**

**Within-subjects Analysis**

- The difference in reaction time for congruent and incongruent trials was significant: p < 0.05, df: 30, two-tailed.
  - µ: 21ms±9ms (SEM)

**Group Analysis**

- Congruent reaction time: µ: 741ms±28ms (SEM)
- Incongruent reaction time: µ: 762ms±30ms (SEM)

**Figure 5.** Reaction time differences (ms) for incongruent trials larger than congruent.

**Conclusions**

Neuroimaging results are consistent with the hypothesis that conflict between gesture and word engages both domain-specific language regions and socially-responsive neural circuitry.

**Domain specific (blue boxes):**

- Wernicke's Area: ST / MT
- Receptive language
- Broca's Area: IFG

**Socially-responsive (gray box):**

- Temporal-parietal junction: TPJ
- Social processing

**References**


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