

# Syllabic discrimination in the brain

## An audio-visual fMRI-EEG study

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### Abstract

Several studies report that the observation of a speaker's mouth influences speech perception (McGURK & MCDONALD, 1976 ; BERNSTEIN *et al.* 2002 ; CALVERT & CAMPBELL, 2003 ; MUNHALL *et al.* 2004). This study explores the neural systems underlying the perception of the structure of a phonetic category by investigating the audio-visual perception of features in a syllabic discrimination task (AX with two forced choices AA or AB).

Stimuli consisted of natural syllables [pi bi ti di py by ty dy] associated in thirty-two pairs, of a duration of 1120 ms (each syllable: 360 ms and a interval inter-stimuli of 400ms). The pairs were established in order to present one identical condition and three different contrasts: one vocalic with the [i-y] variation, one related to POA (place of articulation) [ b-d ; p-t] and one related to sonority [ p-b ; t-d].

Videos showing the mouth of a French woman (facial views) were presented to native French subjects with normal hearing and vision (or corrected to normal) and no history of neurological disturbance. This audio-visual condition (AV) was counterbalanced by an audio-only condition (AO) with a stilled face and the sound, in order to study the role and the integration of bimodal stimuli.

A behavioural pre-study was conducted with 56 volunteers in a silent room. Response time and discrimination scores were recorded. The thirty candidates that obtained the best results were selected for the fMRI-EEG phase. Only results of the preliminary study are presented here. Discrimination scores in AO varied from 93.13 to 100%. In AV conditions, scores ranged from 87 to 100 %. Average response times show an advantage of AO with a time of 807 ms significantly lower than that of AV, with 862 ms ( $p < 0.01$ ). However, the silent room in which the preliminary study was carried out showed different results compared with first results obtained in the MRI scan condition, indicating an enhancement in AV condition.

Phonetic contrasts were discriminated without significant differences in response time:

|                   |        |
|-------------------|--------|
| Vocalic contrast  | 812 ms |
| Sonority contrast | 825 ms |
| POA contrast      | 827 ms |

Only identical pairs were discriminated significantly faster, with an average time of 769 ms ( $p < 0.001$ ).

fMRI-EEG data will be presented during the meeting.

## References:

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