Neuromagnetic signatures of segregation in complex acoustic scenes
Cocktail party problem

Stochastic figure-ground stimulus

Psychophysics Temporal coherence modelling fMRI MEG
Stimulus (Basic)

Figure with ‘coherence’ = 4 and ‘duration’ = 7

Teki, Chait et al., 2011. J Neurosci
Stimulus (Noise)

Figure with ‘coherence’ = 4 and ‘duration’ = 6
Psychophysics (Noise)

Coh = 6
Dur = 6
n=10
MEG (Basic)

Figure with ‘coherence’ = 0, 2, 4 or 8.
25 ms chords
Ground/Figure duration = 600 ms
MEG Task

- Subjects naïve (n=20) to the auditory stimuli.
- Instructed to perform an irrelevant visual task:
  -> Respond if image 3 is same as 1 or 2
MEG EVOKE (Basic)

Significant difference from baseline:

- Coh=8, 120 ms (=5 chords)
- Coh=4, 165 ms (=6.2 chords)
- Coh=2, 240 ms (=9.6 chords)

Using DSS
de Cheveigne, 2010
Source analysis (Basic)

I. Sources for EARLY component (600-900ms): Priors in PT (based on fMRI)

*COH8 vs. Ground
*COH4 vs. Ground
*COH2 vs. Ground
Not significant between different COH conditions

II. Sources for EARLY and LATER (900-1200ms) components: Priors in PT

*COH8
*COH4
*COH2
Not significant for Ground

*Significantly different
p<0.05; Hotelling T2 test
Figure with ‘coherence’ = 0, 2, 4 or 8.
25 ms chords
Ground/Figure duration = 1200 ms
MEG EVOKE (Noise)

Significant difference from baseline:

- **LH**
  - Coh=8, 173 ms (=4 chords)

- **RH**
  - Coh=4, 347 ms (=6.9 chords)

**Transition**: 1200 ms

**Late**: 2400 ms
Source analysis (Noise)

I. Sources for EARLY component (1200-1500ms): Priors in PT

*COH8 vs. Ground
*COH4 vs. Ground
*COH2 vs. Ground

Not significant between different COH conditions

*Significantly different
p<0.05; Hotelling T2 test
Summary

• Auditory system can extract salient objects in the acoustic scene in the absence of directed attention
• MEG latencies correspond with behavioural latencies for figure detection
• Sources for coherent signals localized in PT

• Ongoing MEG work:
  further source analysis, time-frequency analysis, beamforming
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http://www.fil.ion.ucl.ac.uk/~steki
http://www.fil.ion.ucl.ac.uk/~tgriff