

Direct electrophysiological recording of human auditory cortex responses to different pitch values

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Introduction

- Present study investigates pitch processing in the human brain with neurosurgical epilepsy patients
- Technique allows us to assess both evoked and induced responses with a high degree of spatial and temporal resolution
- Work is a continuation of previous study looking at 2 subjects
- Find responses to pitch are distributed across Heschl's gyrus and appear on posterior lateral superior temporal gyrus

Experimental Methods

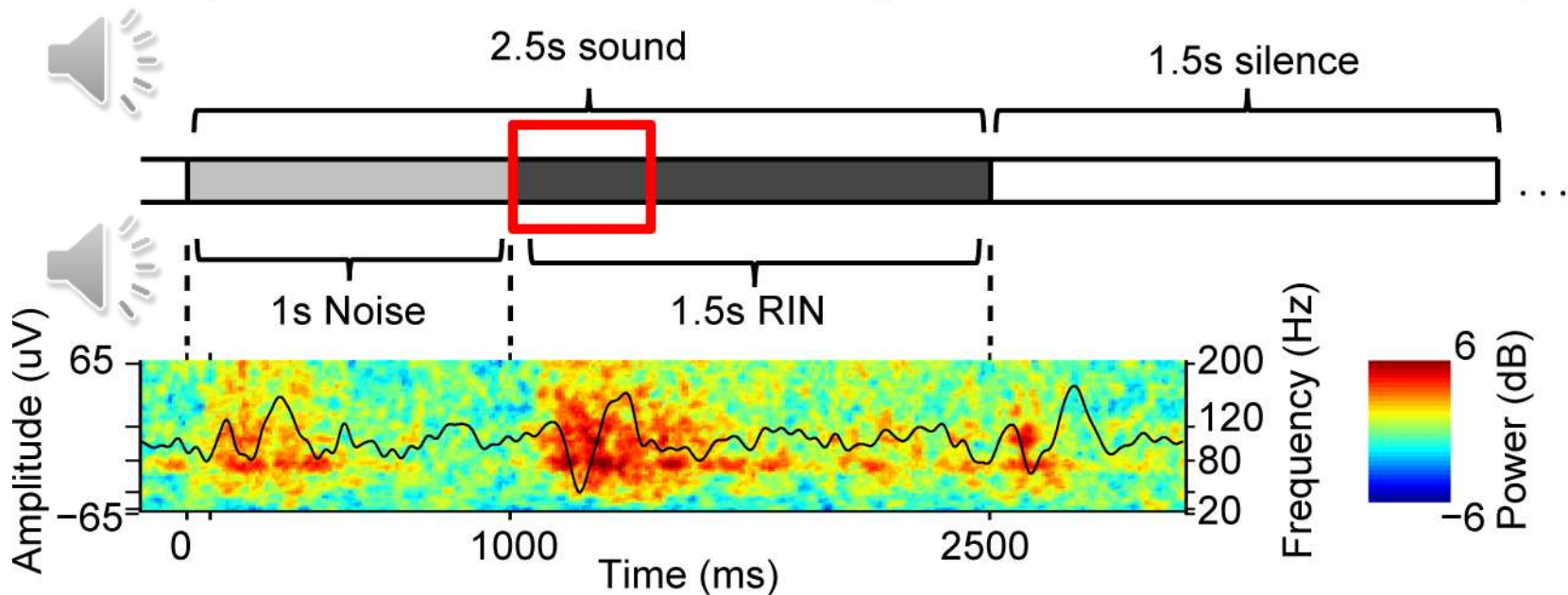
Subjects: 6 neurosurgical epilepsy patients

Stimuli: 1s broadband noise followed by 1.5s regular interval noise (8, 16, 32, 64, 128, 256Hz rates, 16 iterations, highpass 1kHz)

Recordings: Heschl's gyrus (HG) and perisylvian cortex using multicontact depth and subdural grid electrodes

Analysis: induced event-related band power (ERBP), normalized relative to 250-50 ms prior to the RIN transition; evoked responses (ERPs) filtered 1-20 Hz

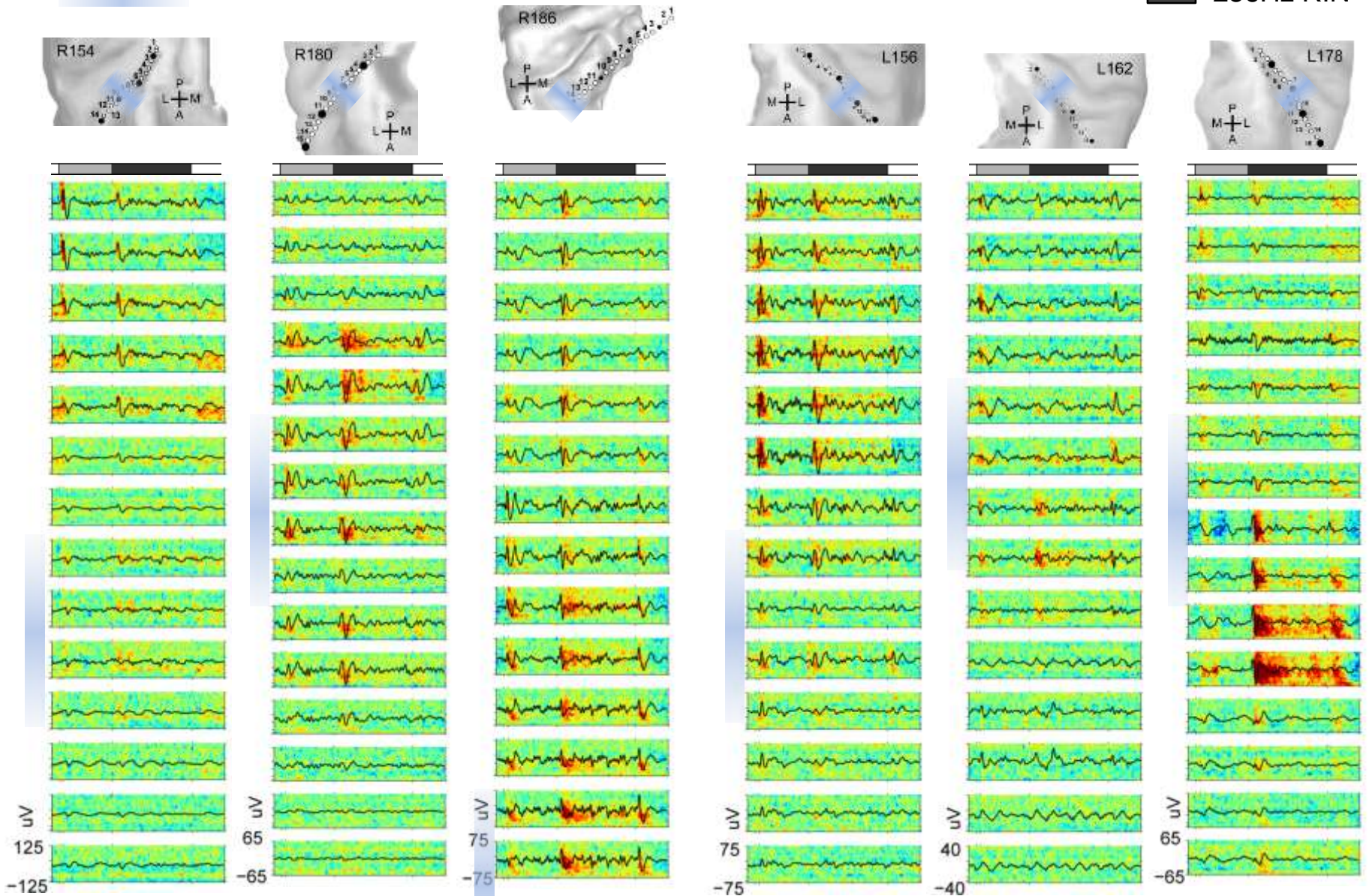
Single trial schematic with example evoked and induced response

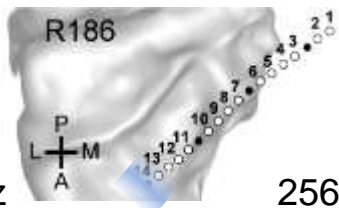


Heschl's Gyrus: Pitch Responses

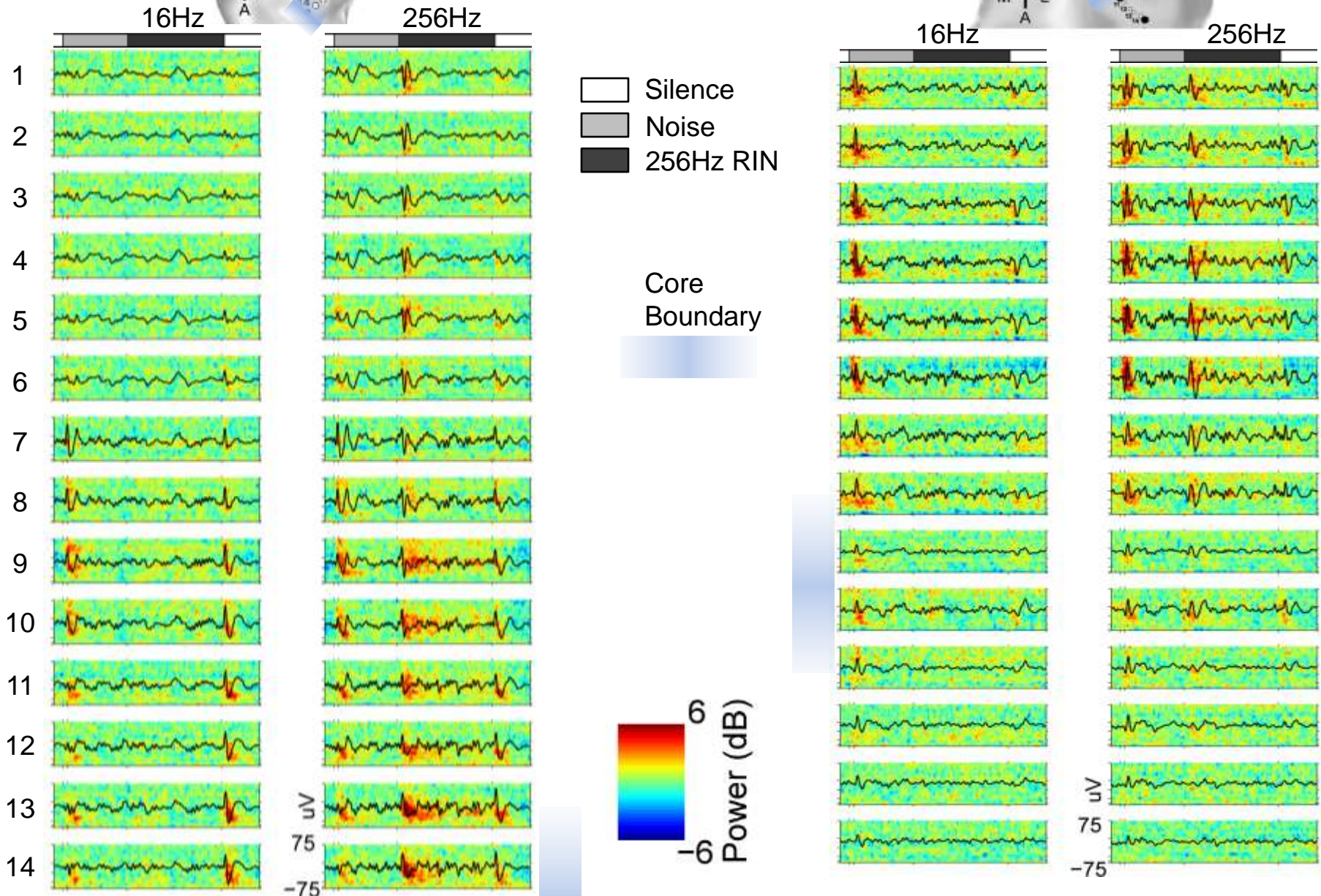
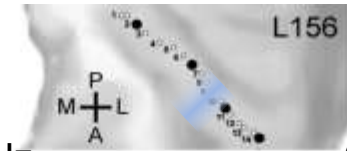
Core
Boundary

- Silence
- Noise
- 256Hz RIN

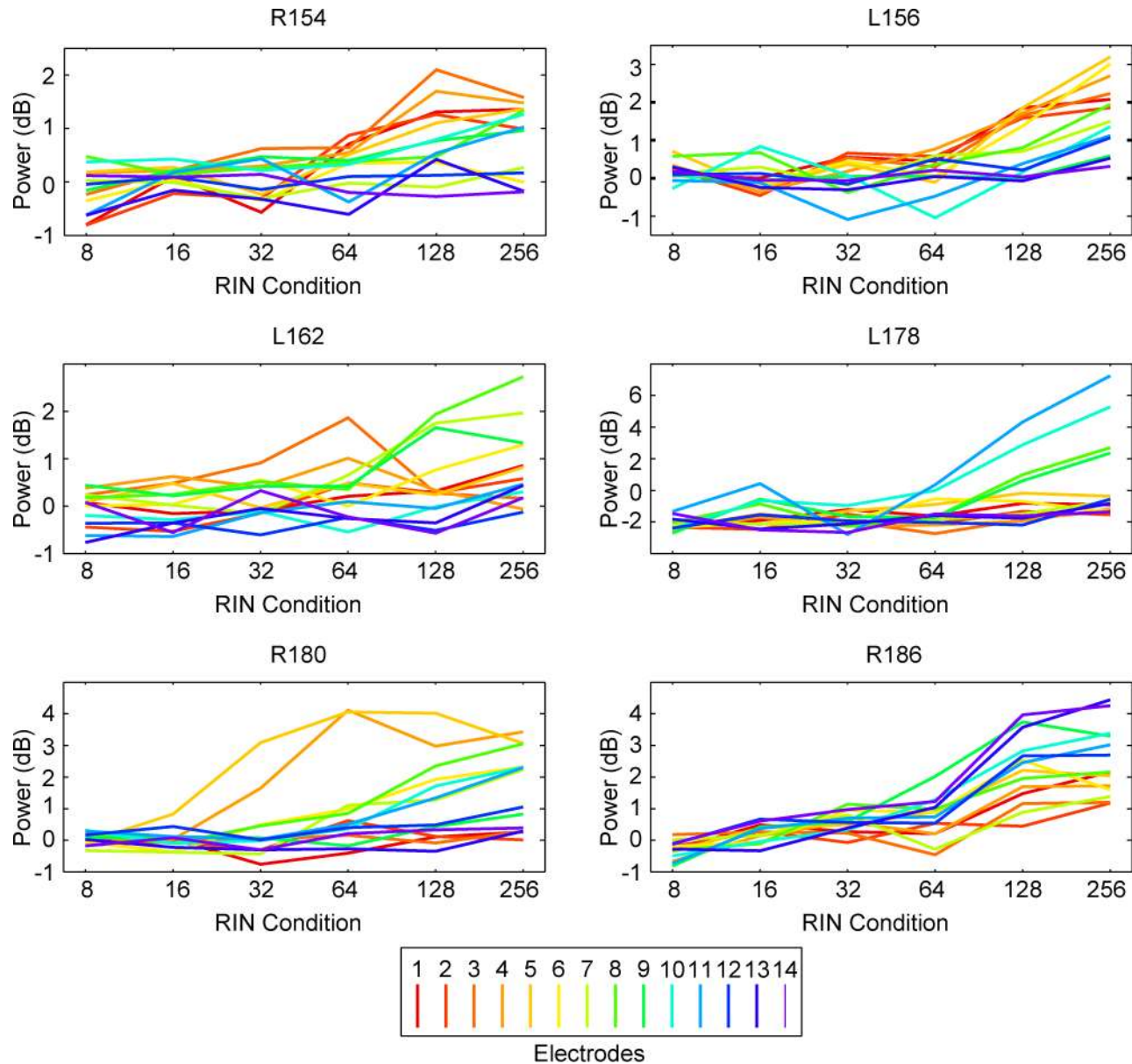




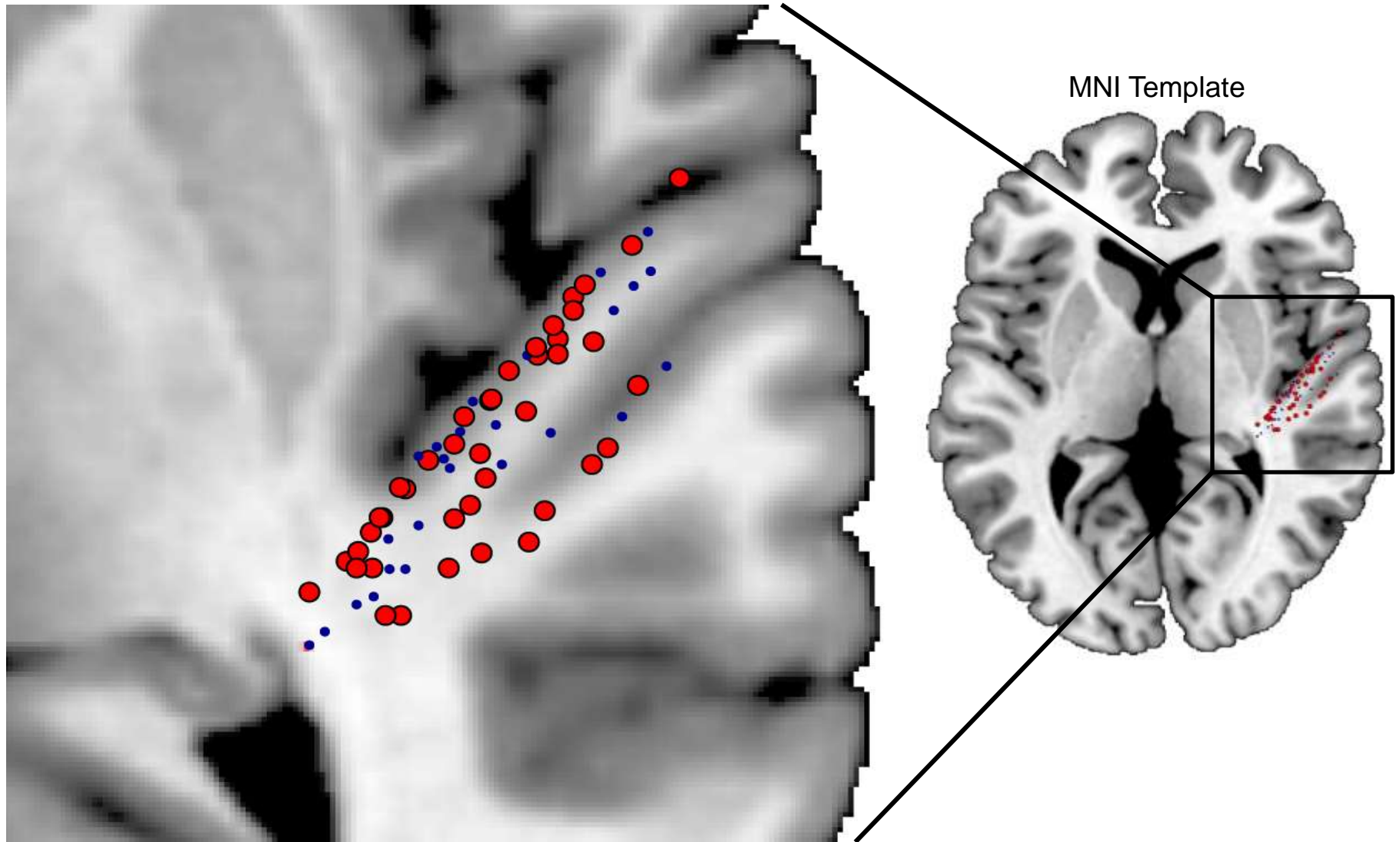
Heschl's Gyrus: Pitch vs No Pitch



Heschl's Gyrus: Pitch response tuning

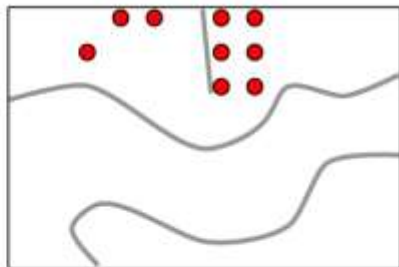
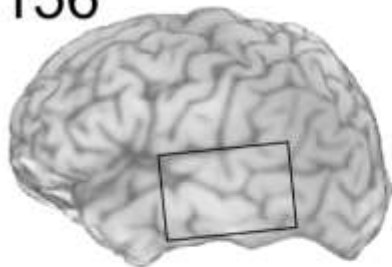


Common mapping on template brain

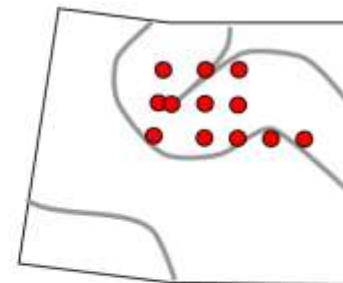
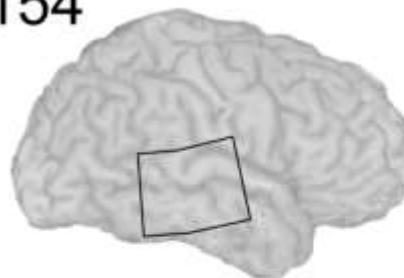


Superior Temporal Gyrus: Pitch Response

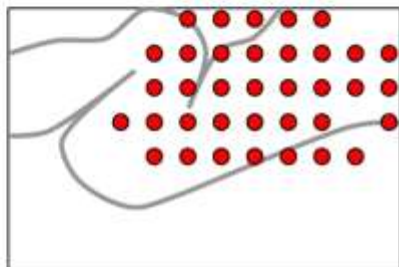
L156



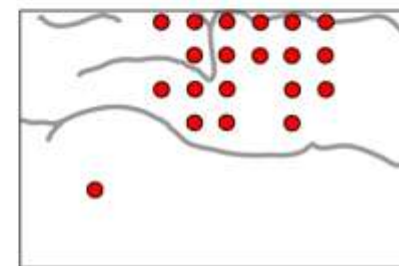
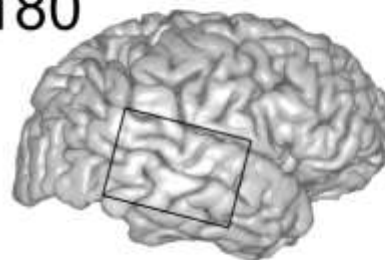
R154



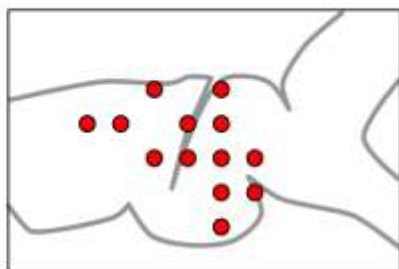
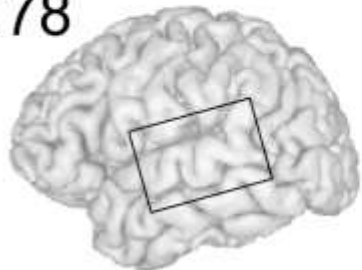
L162



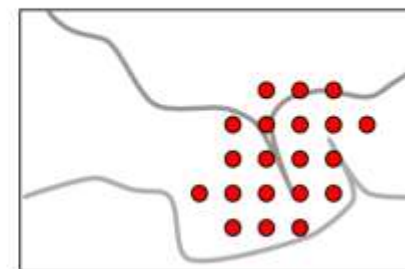
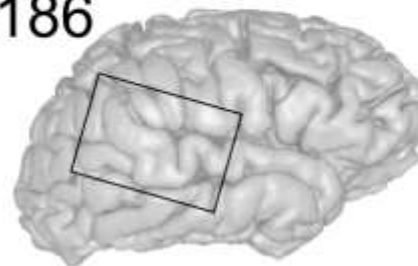
R180



L178



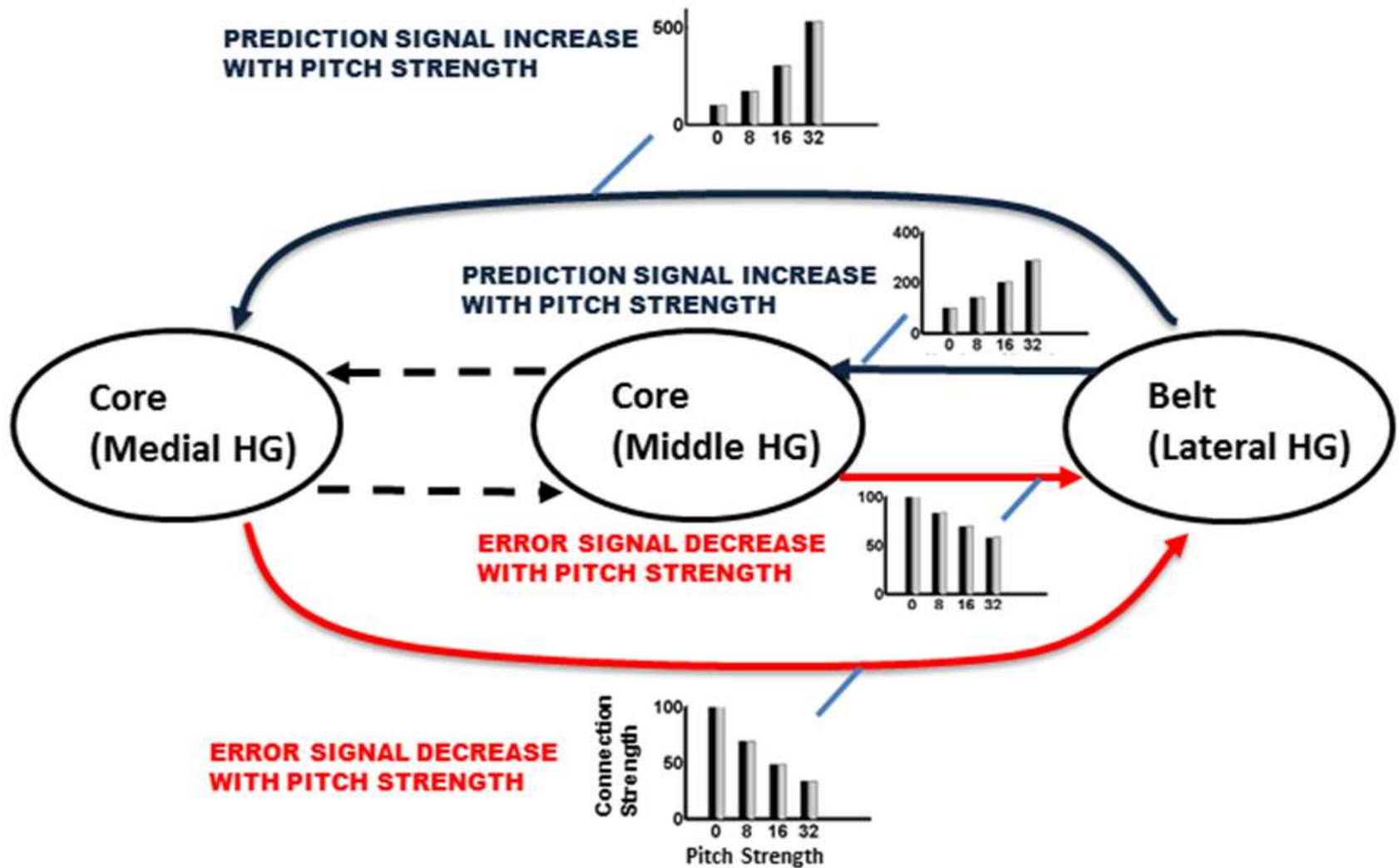
R186



Summary

- Robust responses to pitch are seen for each subject
- Responses to pitch are distributed across HG
- Pitch responses also on region of posterior lateral superior temporal gyrus

How/where is pitch encoded in the brain?



Many thanks to our patients.

Iowa

Matt Howard

Hiroto Kawasaki

Hiroyuki Oya

Kirill Nourski

Haiming Chen

UCL

Tim Griffiths

Sukhbinder Kumar



welcometrust

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