Background

• Speaking-induced suppression (SIS): a suppressed response to speech in auditory cortex during speaking
  – response to concurrent tones not greatly suppressed
  – SIS abolished when auditory feedback was altered by gated noise
  – Motor-induced suppression (MIS): a suppression of auditory feedback of any motor act?
  – Suppression of response to a tone triggered by button press?

MIS for tone triggered by button press

• What are its characteristics?
  – Is it a learned process?
  – How does it generalize?
  – What about the time window between motor act and auditory feedback?
  – Can different delay times be learned?

General Experimental Methods

Magnetocardiographic recordings (band-pass filtered from 0 to 200 Hz, sampling rate 1000 Hz) were obtained from the whole head using a 275 channel biomagnetometer (VSM MedTech Inc., Port Coquitlam, Canada).

Experiments generally consisted of 3 block types:

- Tone Alone (TA)
  - Subjects passively listened to a simple tone
- Button+Tone (B+T0)
  - Subjects pressed a button (right thumb) and heard the simple tone without delay
- Button+Tone+Delay (B+TDelay)
  - Subjects pressed a button (right thumb) and heard the simple tone after some Delay

Results

% MIS across subjects

• MIS in training block not significant
  - MIS is learned
  - MIS only occurs contralateral to the motor effector
  - MIS does not generalize to other tone delays

Experiment 1: Is MIS learned and does it generalize to other time delays?

• The experiment consisted of 6 blocks (100 trials each):
  - A short break of 2-3 minutes was provided between blocks.
  - Subjects: 13 healthy right-handed subjects
  - aged 20-40 years

Experiment 2: Will MIS develop for a delayed tone?

• The experiment consisted of 6 blocks (100 trials each):
  - A short break of 1-2 minutes was provided between blocks.
  - Subjects: 7 healthy right-handed subjects
  - aged 20-40

Experiment 3: How does MIS learned for 100ms-delayed tone generalize?

• The experiment consisted of 9 blocks (100 trials each, except control block)
  - A short break of 1-2 minutes was provided between blocks.
  - Subjects: 13 healthy right-handed subjects
  - aged 20-40

Results

% MIS

- Tone Alone (TA) –
- Button+Tone (B+T0) –
- Button+Tone+Delay (B+TDelay) –

Discussion

• How do we explain the difference in generalization pattern between zero and non-zero delays?
  1) MIS for non-zero delays is a generalized sensory expectation effect due to a mismatch between the expected and actual sensory feedback.
  2) The sensory timing model is separately learned from the sensory/spatiality model, and maybe the timing model takes longer to learn.

• MIS developed for 100ms-delayed tone generalized to:
  - different tone delays (5ms and 200ms)
  - different tone frequencies (500Hz)
  - different motor effector (left thumb)