

HST-583

Lab II Outline

Biophysical basis of fMRI signals

Part I: Acquisition

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October 3, 2001

Lab II goals

The goals of this lab include:

1. Demonstrate that modest shifts in global physiological parameters (e.g. respiration rate) can result in BOLD signal changes comparable in magnitude to those produced by activation of neural tissues.
2. Investigate amplitude of BOLD response to a specific global physiological change (accelerated breathing) in different brain tissue types (grey matter, white matter, blood vessels).
3. Investigate examples of fMRI signal changes produced by regionally specific increases in neural activity in response to different sensory inputs (visual and motor).
4. Familiarize students with methods and analysis of human physiological recordings during functional MRI.

Human Images (3 Tesla, head coil)

- Scout
- 3D Sagittal
- **Hyperventilation only**
EPI medium resolution, $4 \times 4 \times 4 \text{ mm}^3$, TR=3000 ms, $\alpha=90^\circ$, 20 slices, 140 images per slice (7 min).
Paradigm: Baseline (1min) - Hyperventilate (4min) - Baseline (2min)
- **fMRI: Visual and Motor only**
EPI medium resolution, $4 \times 4 \times 4 \text{ mm}^3$, TR=3000 ms, $\alpha=90^\circ$, 20 slices, 140 images per slice (7 min).
Paradigm: Baseline (2min) - Visual + Motor task (2min) - Baseline (3min)
- **fMRI: Visual, Motor and Hyperventilation**
EPI medium resolution, $4 \times 4 \times 4 \text{ mm}^3$, TR=3000 ms, $\alpha=90^\circ$, 20 slices, 140 images per slice (7 min).
Paradigm: sum of the two previous paradigms.
- **fMRI: Retinotopic Mapping**
EPI medium resolution, $4 \times 4 \times 4 \text{ mm}^3$, TR=3000 ms, $\alpha=90^\circ$, 20 slices, 128 images per slice (6:24 min).
Paradigm: flashing checkerboard.
- **fMRI: Motor Cortex Mapping**
EPI medium resolution, $4 \times 4 \times 4 \text{ mm}^3$, TR=3000 ms, $\alpha=90^\circ$, 20 slices, 128 images per slice (6:24 min).
Paradigm: finger tapping.