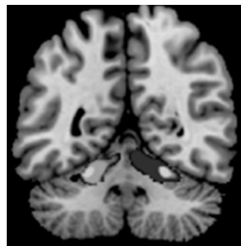


Functional MRI Data Acquisition: Temporal

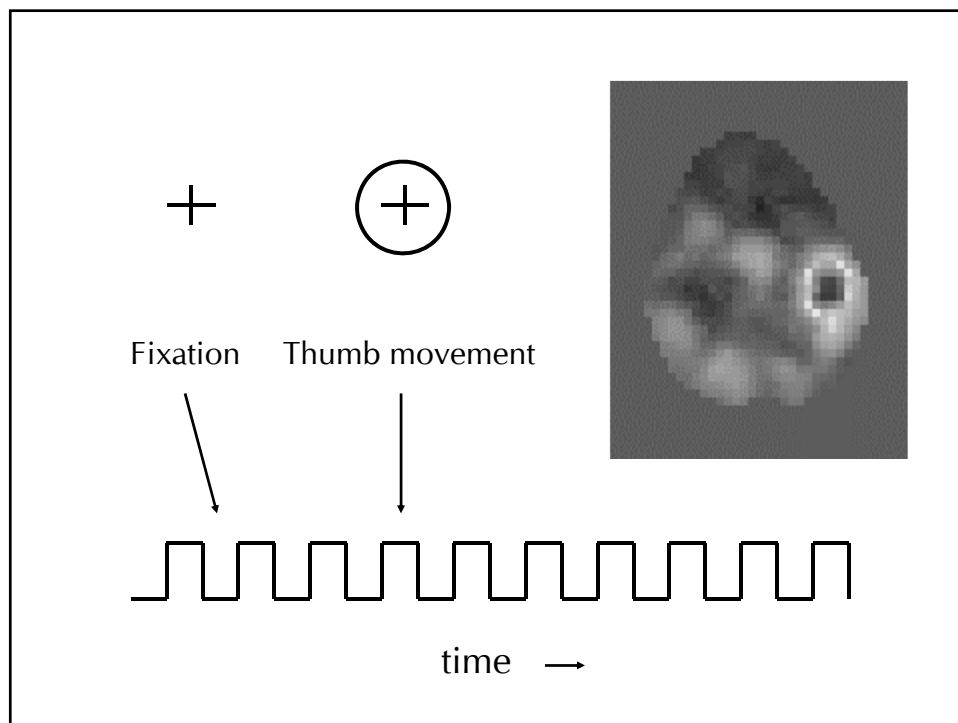


fMRI Acquisition: Temporal Effects

- Session length
- Repetition time
- Fixed vs. distributed temporal sampling
- Sparse temporal sampling
- Noise source recording
- Prospective motion correction

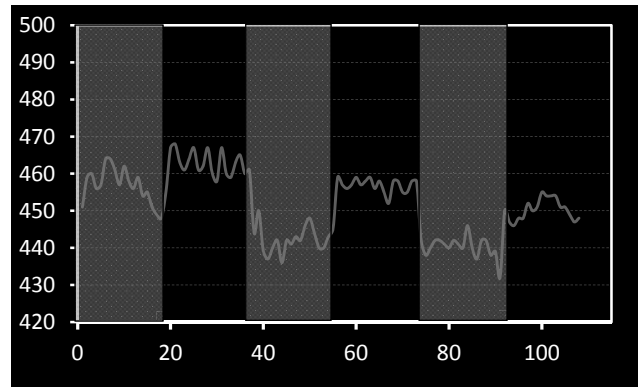
fMRI Acquisition: Temporal Effects

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Effect Size

mean (Move) - mean (Rest) / std dev (Rest/Move)



Rest Move Rest Move Rest Move

Methods of Calculating the Standardized Mean Difference (Effect Size)

Direction Calculation Method

$$ES = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2(n_1 - 1) + s_2^2(n_2 - 1)}{n_1 + n_2 - 2}}} = \frac{\bar{X}_1 - \bar{X}_2}{s_{pooled}}$$

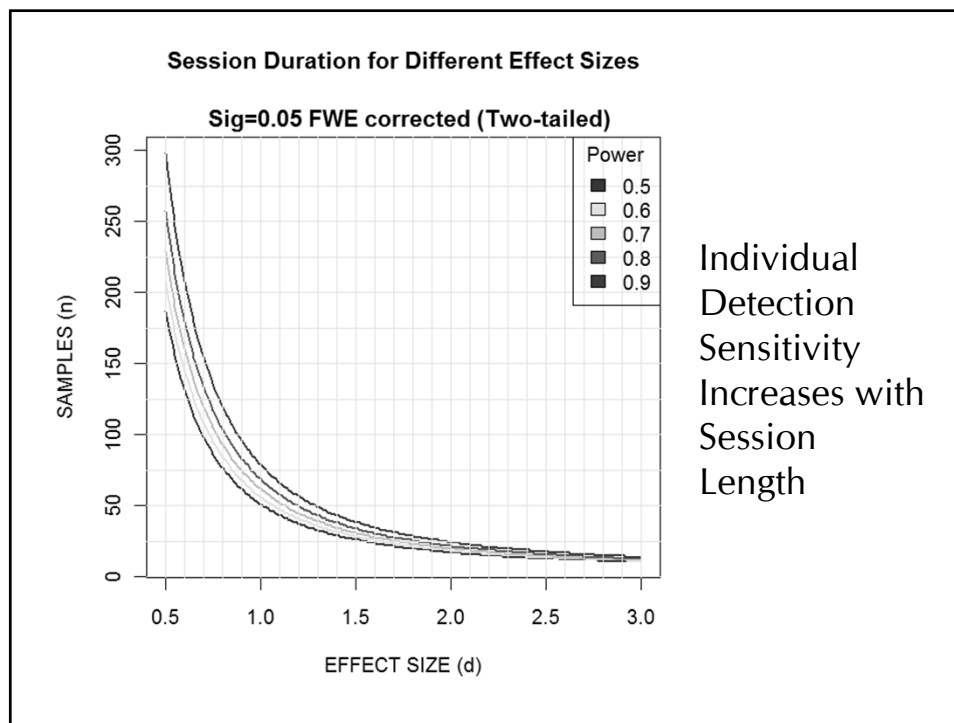
Methods of Calculating the Standardized Mean Difference (Effect Size)

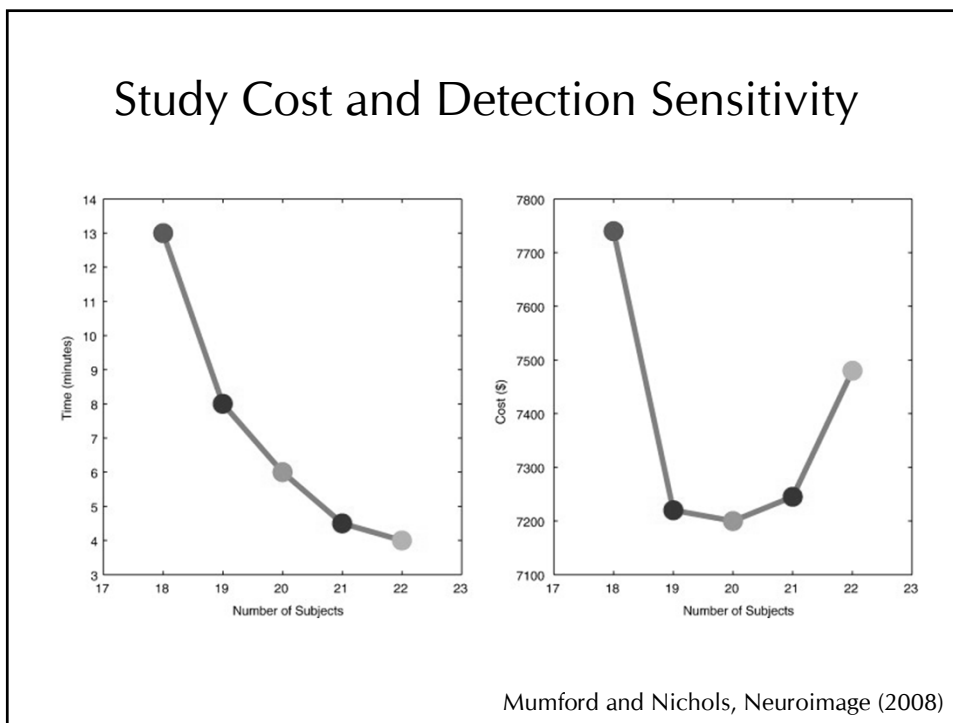
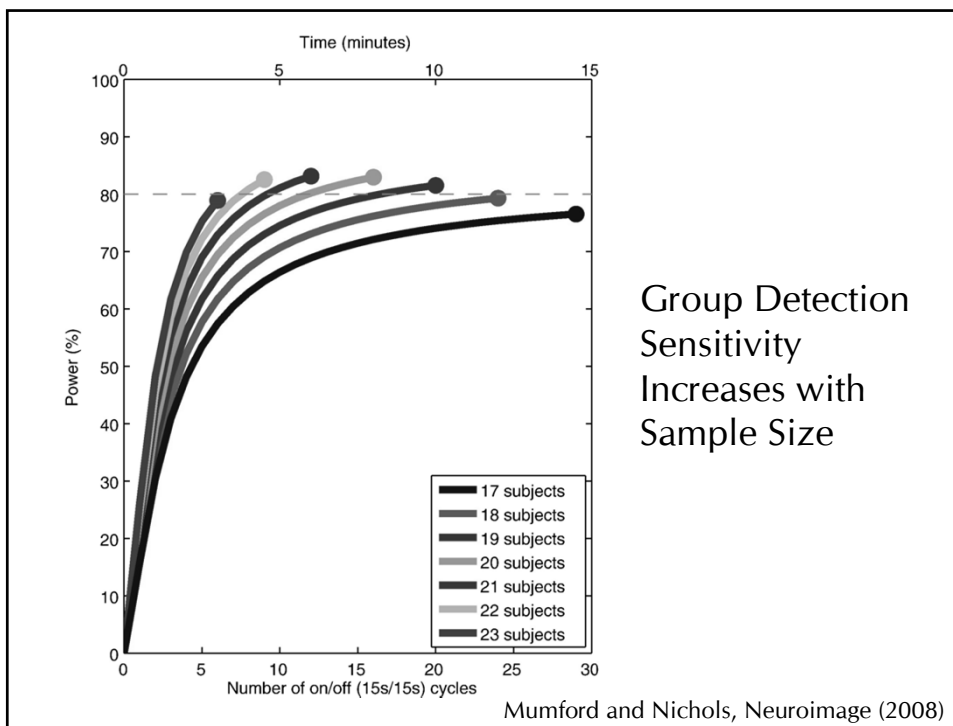
Algebraically Equivalent Formulas:

$$ES = t \sqrt{\frac{n_1 + n_2}{n_1 n_2}} \quad \text{independent t-test}$$

$$ES = \sqrt{\frac{F(n_1 + n_2)}{n_1 n_2}} \quad \text{two-group one-way ANOVA}$$

DB Wilson

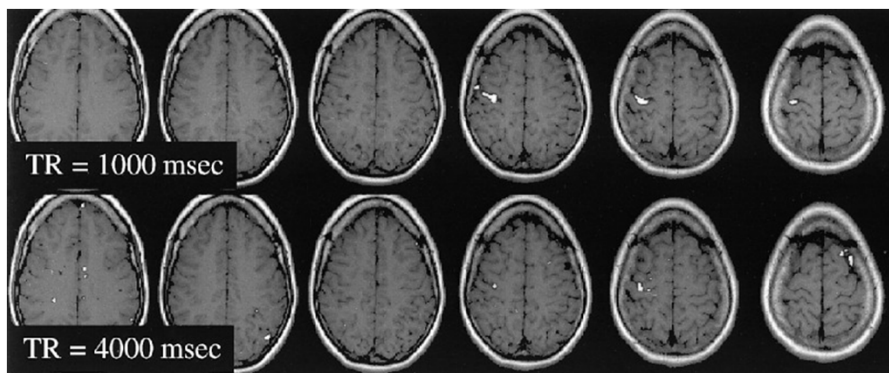




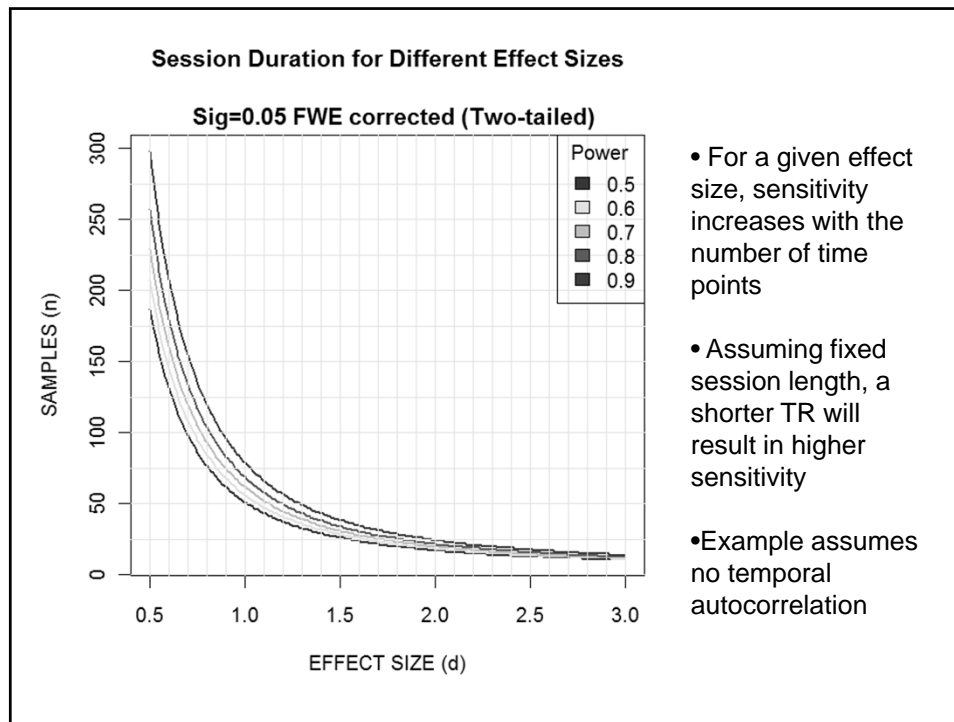
fMRI Acquisition: Temporal Effects

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A Short Repetition Time Increases Sensitivity

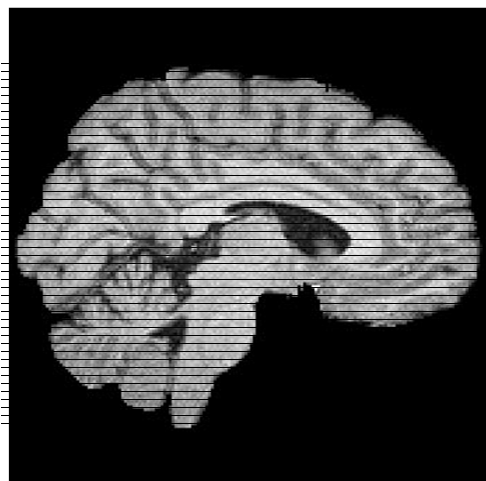


Fera et al., MRM (2003)



Optimal Repetition Time Selection

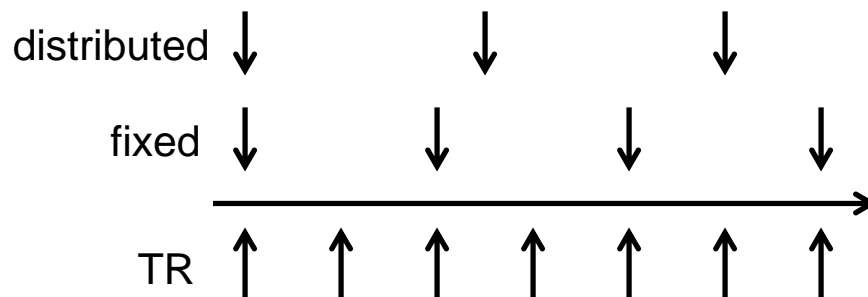
- Make the TR as short as possible given the constraints of voxel size and overall spatial coverage
- Make certain that the TR is NOT an even multiple of the task timing!



fMRI Acquisition: Temporal Effects

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Distributed Temporal Sampling

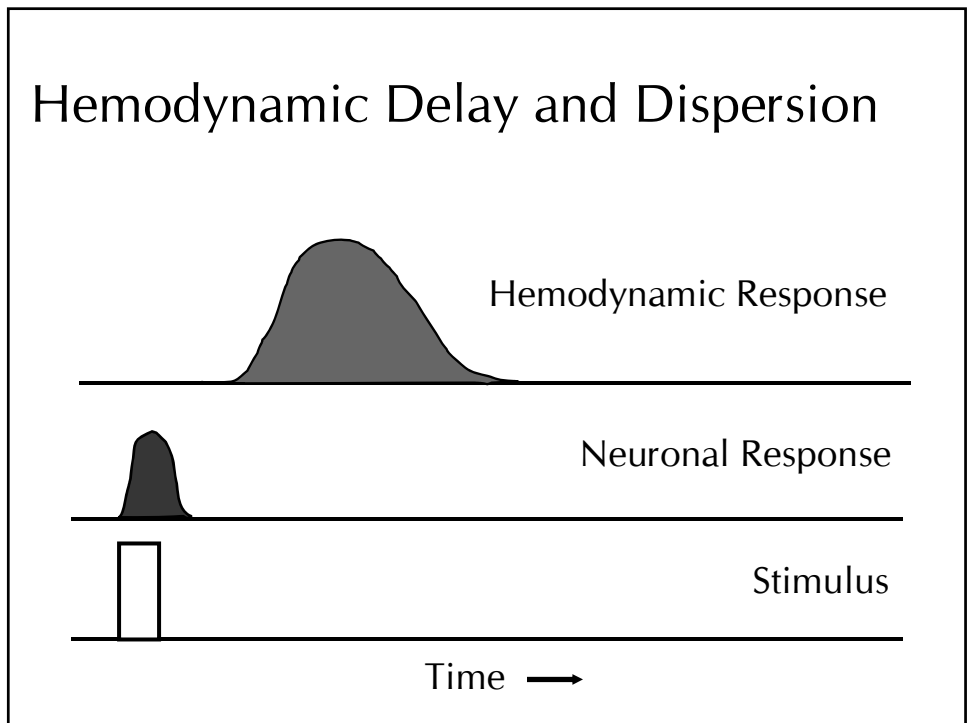
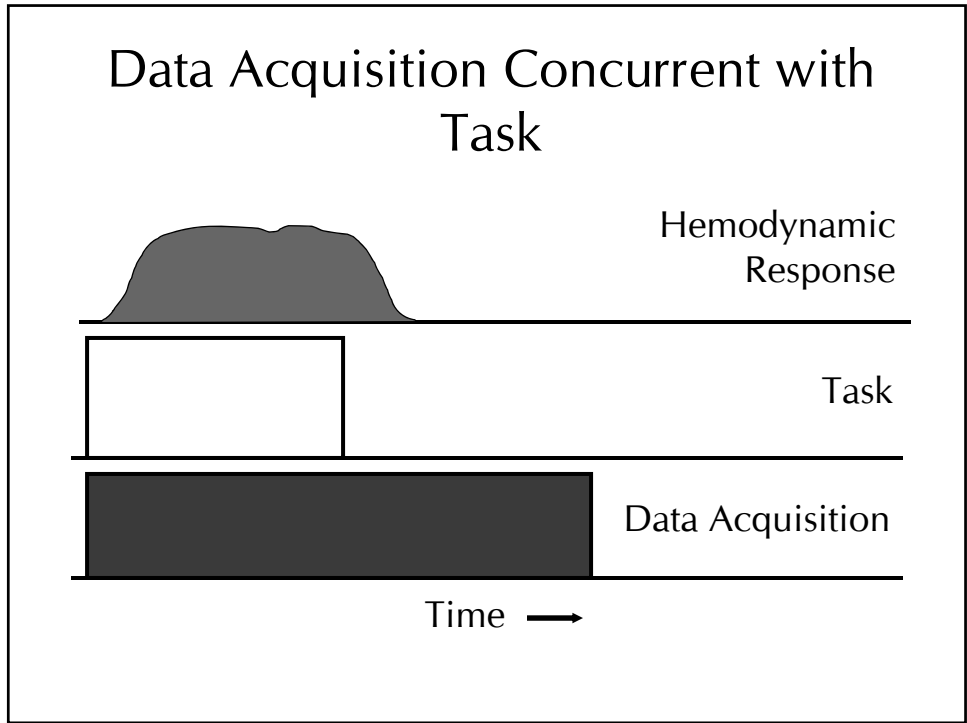


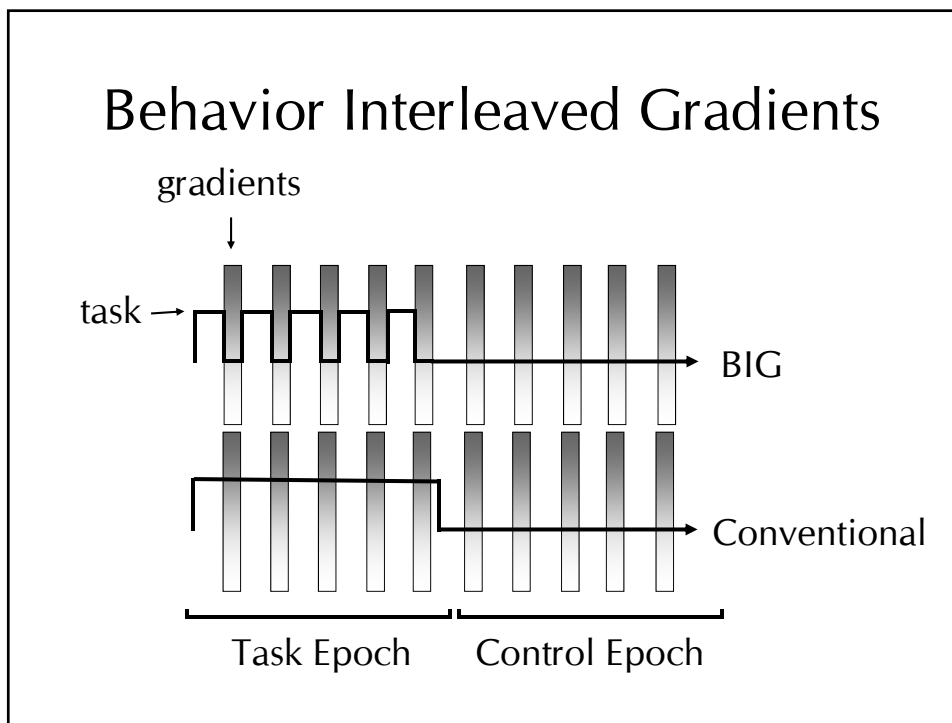
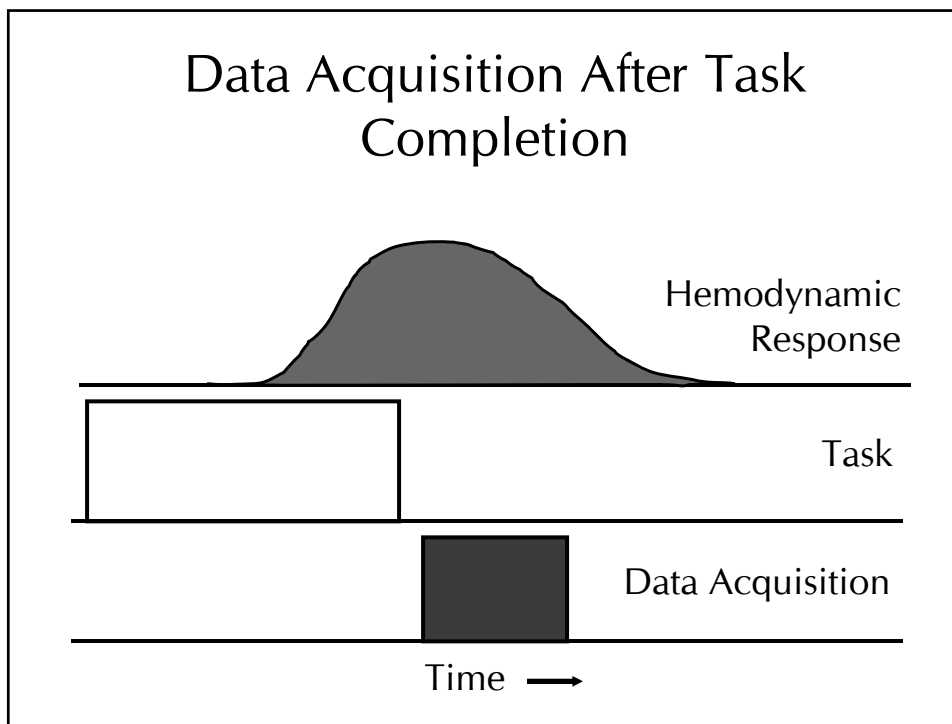
fMRI Acquisition: Temporal Effects

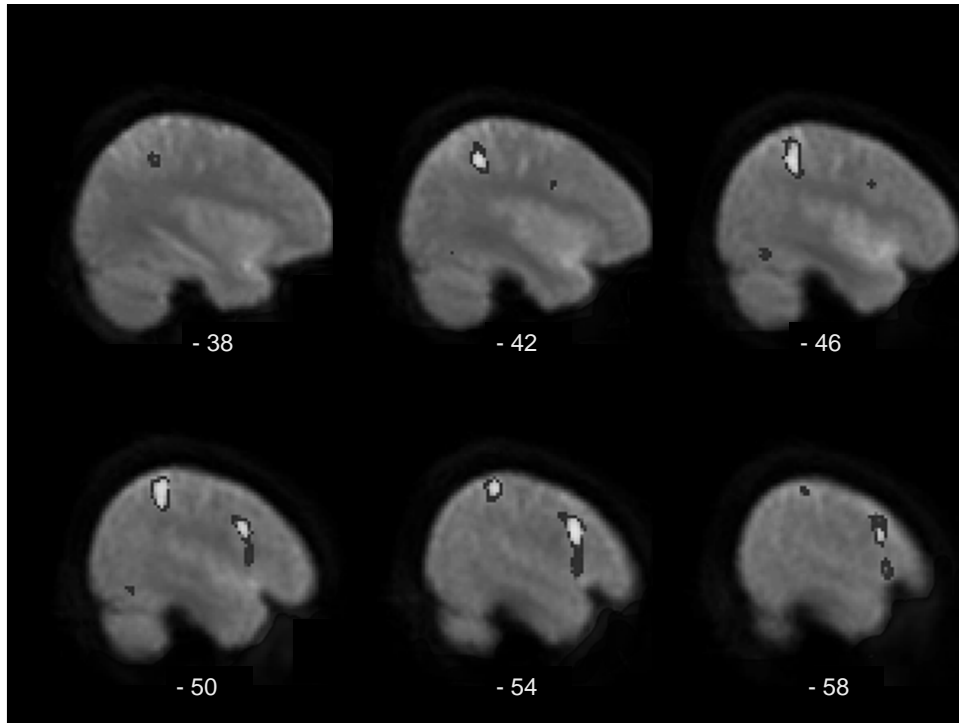
- Session length
- Repetition time
- Fixed vs. distributed temporal sampling
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Sparse Temporal Sampling Reduces:

- Unintended auditory system stimulation
- Auditory stimulus masking
- Task interference
- Susceptibility artifacts from jaw movement



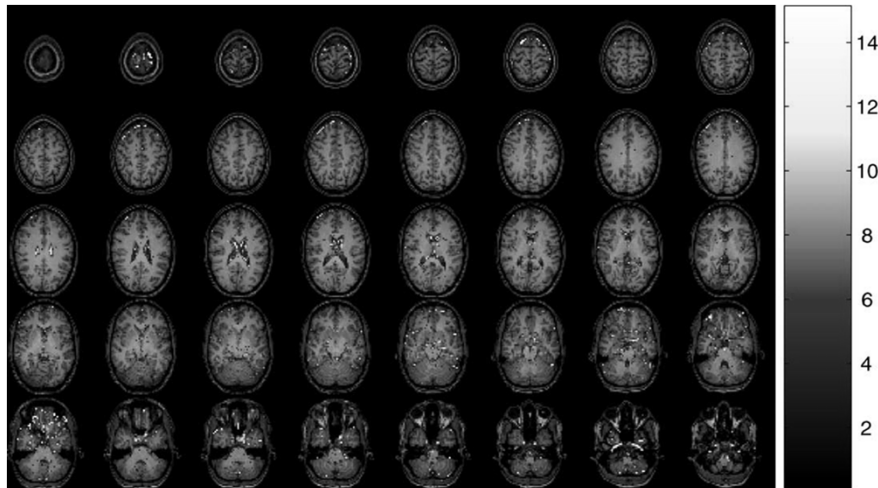




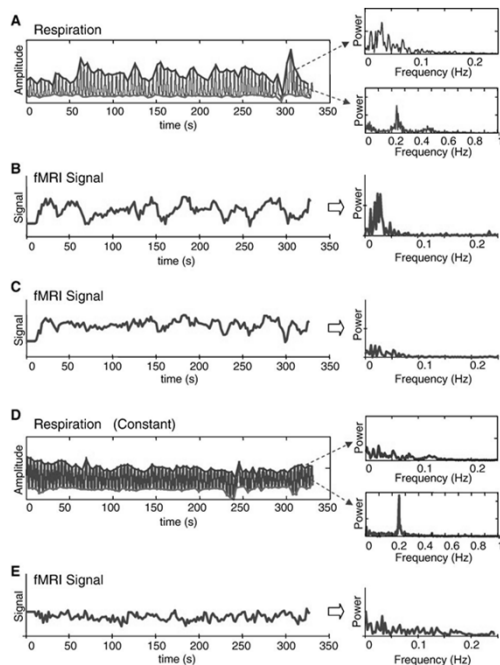
fMRI Acquisition: Temporal Effects

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Respiration Modulates BOLD Contrast



Lund et al., Neuroimage (2006)



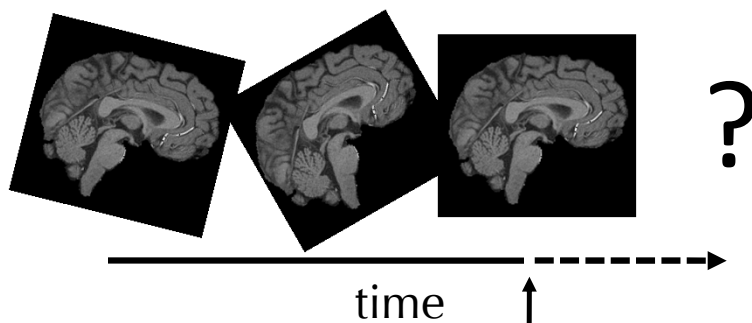
Respiration Modulates BOLD Contrast Time Series

Birn et al., Neuroimage (2006)

fMRI Acquisition: Temporal Effects

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Prospective Motion Correction



Prospective motion correction makes predictions that may be dependent on outdated information.



fMRI Acquisition: Temporal Effects

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