

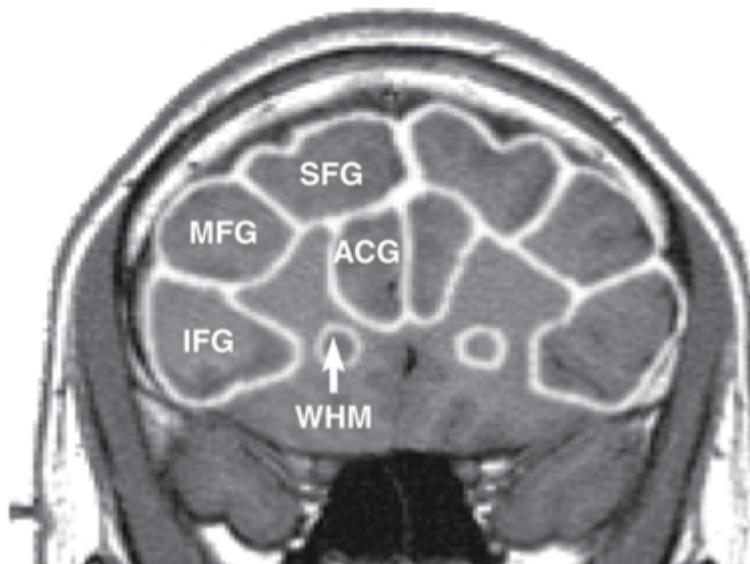
# Functional Neuroimaging: Visualizing the Working Brain

## Statistical analysis

- Basic statistical tests
- Regression analysis
- Multiple comparisons corrections
- Group analysis

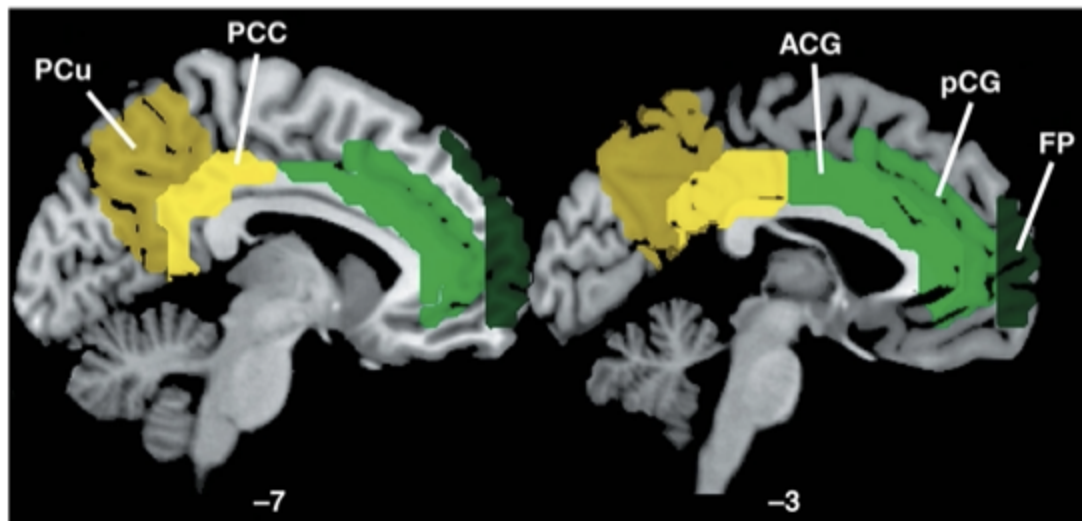
## Region-of-interest approach

(A) Anatomically derived



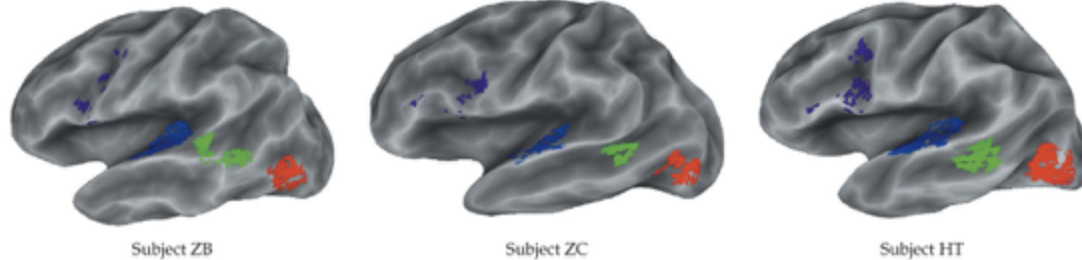
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(B) Atlas-derived



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(C) Functionally defined



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## T-test

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$$t = \frac{\bar{x} - \bar{y}}{\delta_{xy}} = \frac{\bar{x} - \bar{y}}{\sqrt{\delta_x^2 + \delta_y^2}}$$

x is the time while y is BOLD signal

## Correlation analysis

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$$r = \frac{1}{n-1} * \frac{\Sigma(x - \bar{x})(y - \bar{y})}{\delta_x \delta_y}$$

## General linear model (GLM)

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$$y = G * \beta + \gamma$$

y is the data matrix, G is Design matrix,  $\beta$  is Parameter matrix,  $\gamma$  is the Error matrix

## Experimental contrasts

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Contrast: A statistical comparison of the activation evoked by two (or more) experimental conditions, in order to test a research hypothesis.

		Hypothesis truth	
		$H_1$ (active) true	$H_0$ (inactive) true
Output of statistical test	Reject $H_0$ (active)	Hit	Type I error
	Accept $H_0$ (inactive)	Type II error	Correct rejection

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## Multiple comparison problem

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## Family wise error rate (FWER) method

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## False discovery rate (FDR)

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## Random field theory (RFT)

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## Group analysis of fMRI data

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