Data presentation of
fMRI and DTI test

Presented by *WJ Kuo*

Subject preparation

TMBIC fMRI workshop_2014_01_20-21

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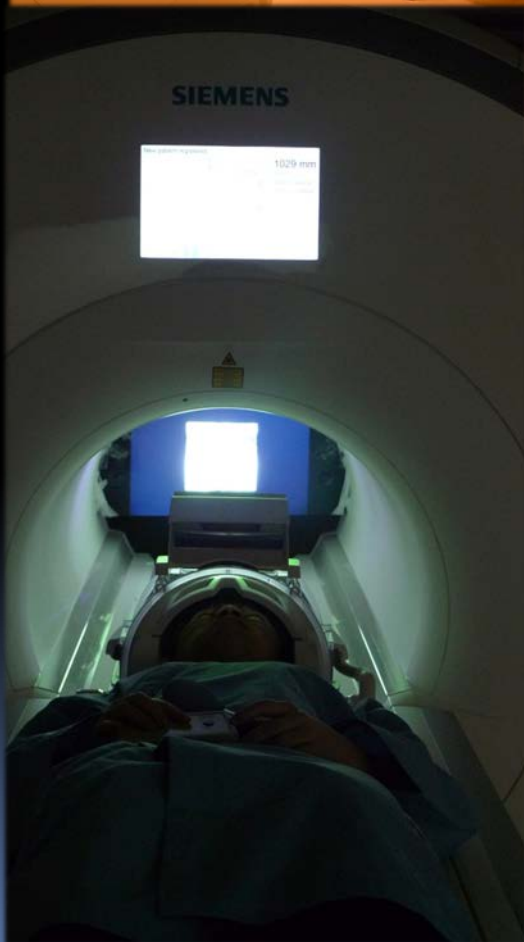
Conceptual & Methodological Aspects of Experimental Designs

- ***Conceptual design***
  - How to design proper tasks to measure the mental process of interest?

- ***Methodological design***
  - How to construct task paradigms to optimize the efficiency and power to measure the effects of interest, given multiple constraints in fMRI environment?

Functional MRI

- **Experiment Parameters**
  - TE/TR: 30/2000 ms, FA: 90 $^\circ$
  - 35 slices to cover 222 x 222 x 105 mm^3 brain volume, spatial resolution: 3x3x3 mm^3
  - Total Acquisition time: 9 minutes
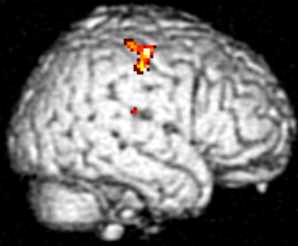- **Analysis**
  - *SPM8, GLM*

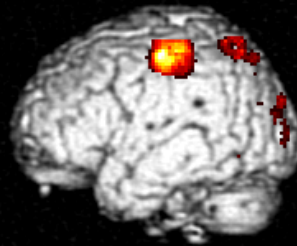# Paradigm I: visual (motor) detection

S1   S2   S3   S3   S2   S3   S1   S1   S2 …
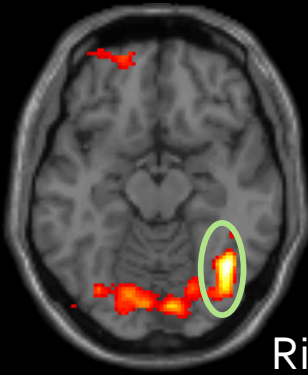
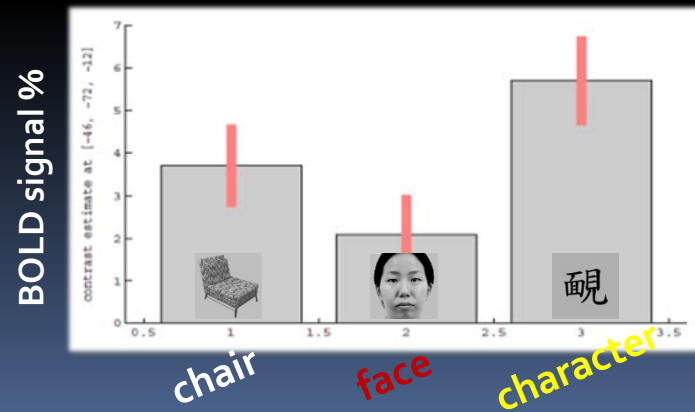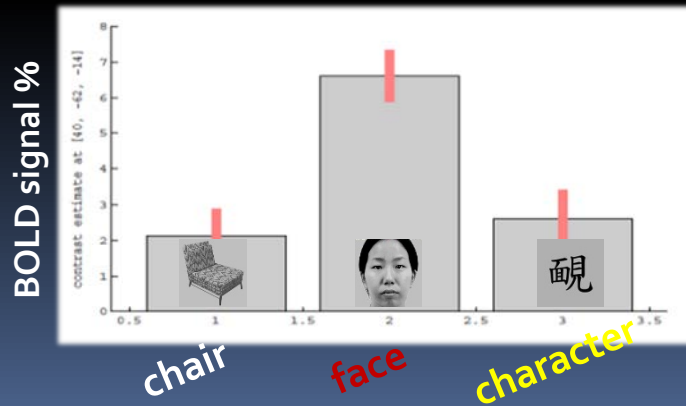s1: chair   s2: face   s3: word (character)

Left-hand response   Right-hand response

Right-*FG/ FFA*

Left-*FG/ VWFA*

chair   face   character

chair   face   character

BOLD signal %

BOLD signal %

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Paradigm II: Attentional oddball paradigm
*(*auditory presentation*)*

S1   S2   S1   S1   S2 S1   S1   S1 S1 …

S1: standard *(75%)*
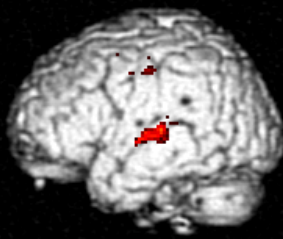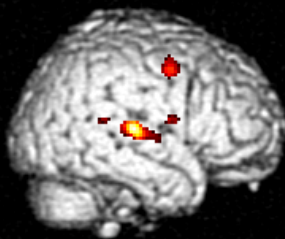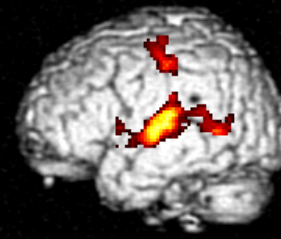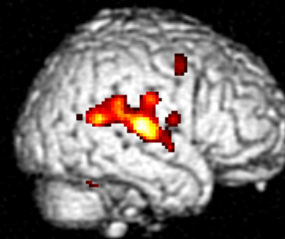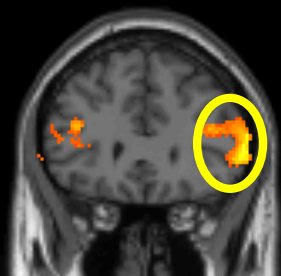*S2: deviant*   *(25%)*

S1

S2

standard stimulus (75%)　　　　deviant stimulus (25%)
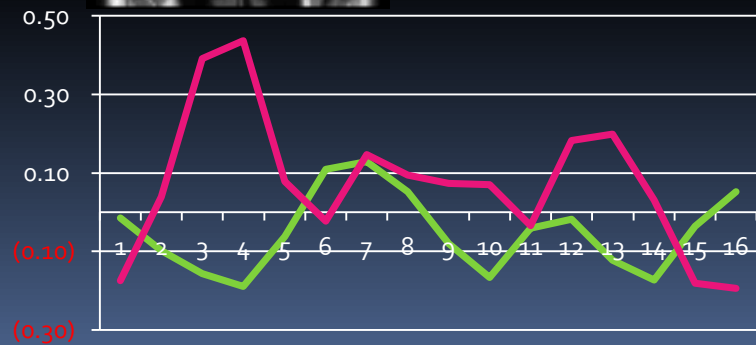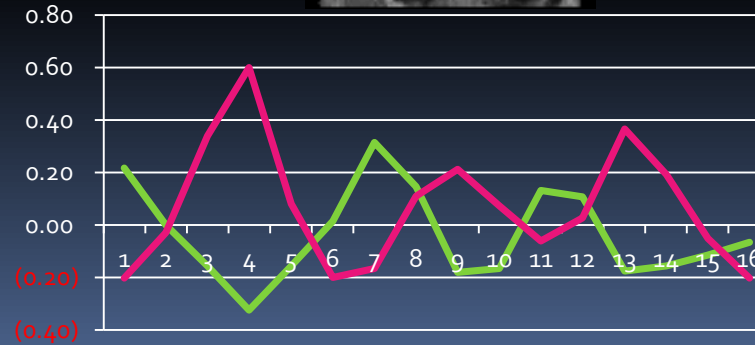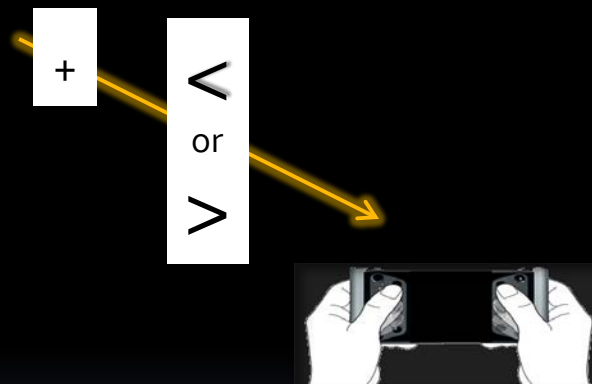
—Standard (75%)
— Deviant (25%)

RPFC

LIPL

Paradigm III: Mental chronometry

- ✓ *Neural effects related to simple RT variations …*
- ✓ *At behavioral level, we recorded reaction time for post hoc separation of the trials. For each trial, it begins with …..*
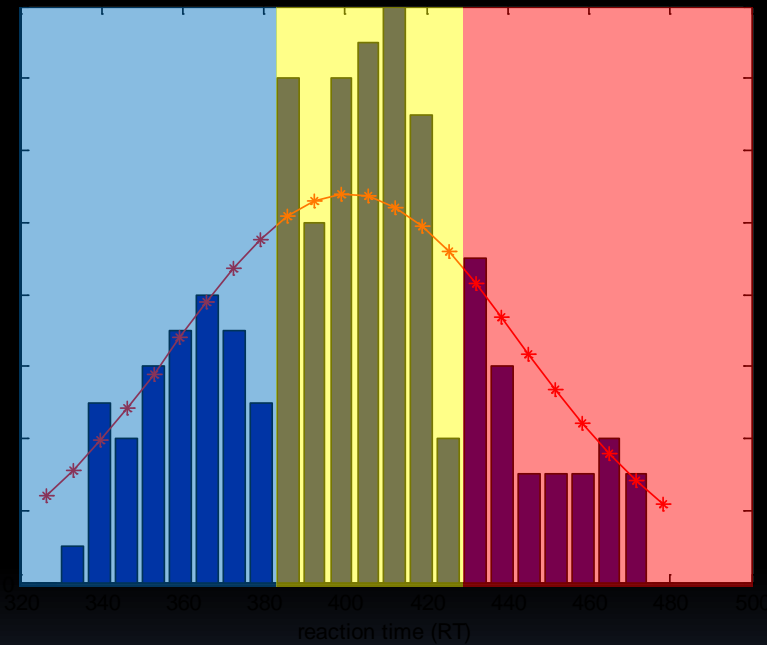

- • *Event-related fMRI design*
- • *There are 180 x 2 trials for response.*
- • *RT and accuracy were recorded.*

1 TR   1 TR   1 TR   1 TR   ......   MRI scanning
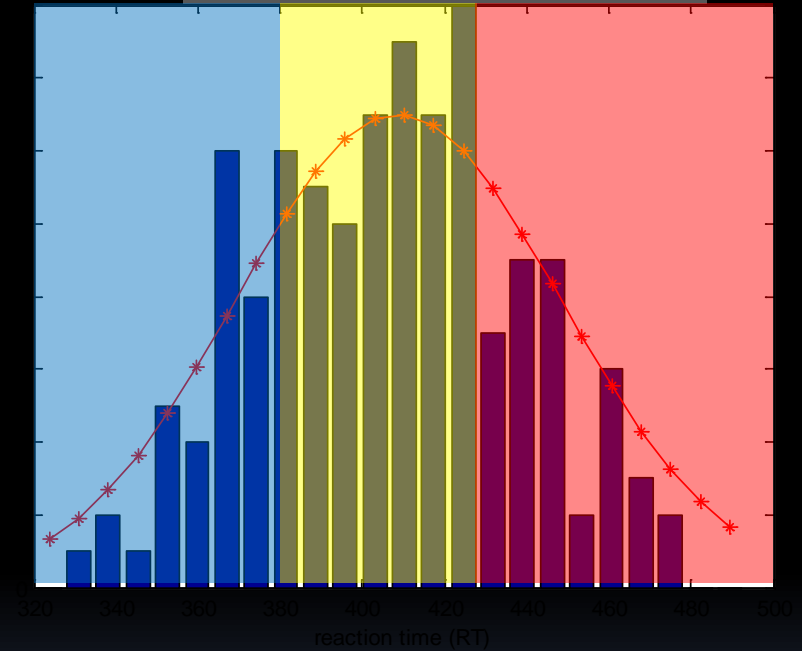
Tr A   Tr B   ......   exp trials
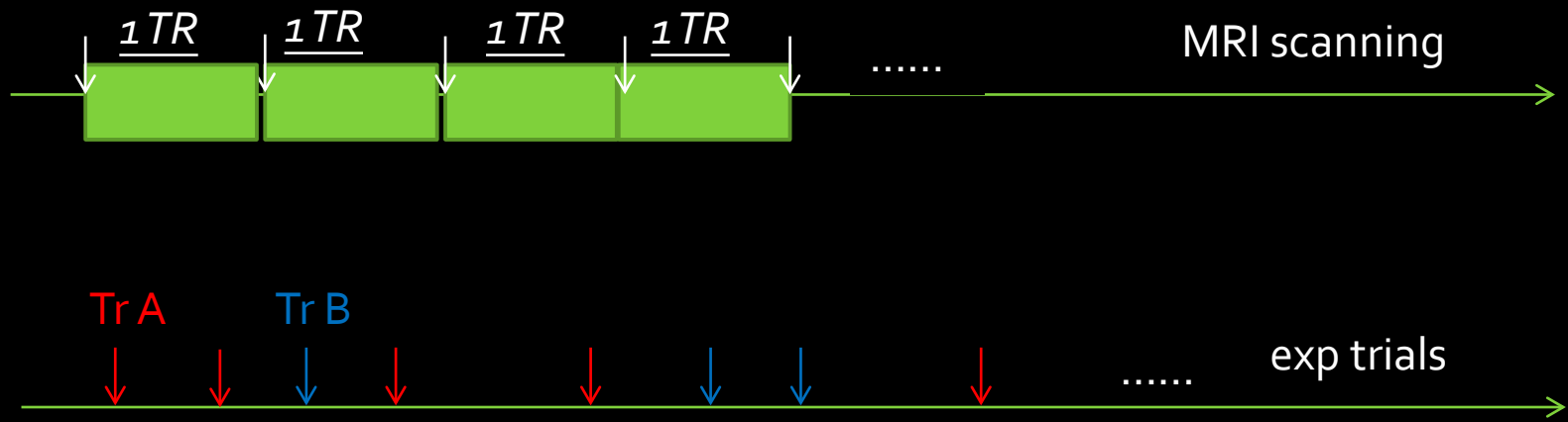
Response categorization (subject 116)

Left-hand response

Right-hand response

Response levels separated by mean RT ➜

L-fast, *L-medium*, *L-slow*
R-fast , *R-medium*, *R-slow*

fMRI preprocessing and modeling

- slice timing, realignment, coregister, normalize, smooth
- Specify 1st level GLM model
  - Unit of design = scans(488 scans), time interval = 2s
  - Basis function : hrf
  - Regressor : head motion
  - Condition : L-fast, L-slow, R-fast, R-slow, Error
- Specify 2nd level GLM model
  - Design : full factorial design (2*2)
  - Factors : hand (left, right), RT (fast, slow)
  - Threshold : p = .01