STUDY design and plotting overview

STEP 1
Build a STUDY

STEP 2
Build design(s)

STEP 3
Precompute the data

STEP 4
Plot the data

Exercise...
Formalizing experimental protocols

25 questions

M R P F R M F P R P F M

60 s

0.5 + 1s

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect

Correct / incorrect
Memory options

Memory options should change when using STUDY vs single dataset.
Create simple ERP STUDY

This interface creates a simple STUDY and computes its condition grand average ERPs. For each subject, trials for each condition must first be stored in a separate dataset. Create other STUDY using the standard editor.

Number of conditions: 2
Number of subjects: 15
Create simple ERP STUDY

<table>
<thead>
<tr>
<th>STUDY set name:</th>
<th>Letter memorization task</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Condition 1 name</th>
<th>Condition 2 name</th>
</tr>
</thead>
<tbody>
<tr>
<td>letter-ignore</td>
<td>letter-memorize</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition 1 datasets</th>
<th>Condition 2 datasets</th>
</tr>
</thead>
<tbody>
<tr>
<td>/data/STUDY/S01/Ignore.set</td>
<td>/data/STUDY/S01/Memorize.set</td>
</tr>
<tr>
<td>/data/STUDY/S02/Ignore.set</td>
<td>/data/STUDY/S02/Memorize.set</td>
</tr>
<tr>
<td>/data/STUDY/S03/Ignore.set</td>
<td>/data/STUDY/S03/Memorize.set</td>
</tr>
</tbody>
</table>

When using more than 1 condition, datasets on each line must correspond to the same subject.
Create simple ERP STUDY
Build a STUDY
Build a STUDY, cont'd
Edit dataset info

[Image of a software interface for editing dataset information]

Important note: Removed datasets will not be saved before being deleted from EEGLAB memory.

Dataset info (condition, group, ...) differs from study info. [set] = Overwrite dataset info.

Select by r.v.

Help
Cancel
Ok
Experimental design

1x2 unpaired

Patients  Controls

Group A  Group B

1x2 paired

Stim A  Stim B

2x2 unpaired

Patients  Controls

Old

Group A  Group B

Young

Group C  Group D

2x2 paired

Stim A  Stim B

Drug A

Drug B

2x2 paired & unpaired

Patients  Controls

Drug A

Drug B
Create design

1x3 design

Select STUDY design
STUDY.design 1

Subjects
Independent variable 1
Independent variable 2

Ind. var. 1 values
ignore
memorize
probe

Ind. var. 2 values

Combine selected values

Use only specific datasets/trials

Delete all datafiles associated with this STUDY design

Save the STUDY

Add design
Rename design
Delete design

Select all subjects
Paired statistics
Combine selected values

ERP - Cz, ignore
ERP - Cz, memorize
ERP - Cz, probe

Time (ms)
-1000 0 1000
Potential (uV)
-2 0 2

Figure 3: Channel ERP
Number of event fields is unlimited.

Create a new STUDY set:

- STUDY set information: Remember to save changes
  - STUDY set name: Sternberg
  - STUDY set task name: Sternberg
  - STUDY set notes: 

<table>
<thead>
<tr>
<th>dataset_name (browse)</th>
<th>subject</th>
<th>session</th>
<th>condition</th>
<th>group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S01</td>
<td></td>
<td>memorize</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S02</td>
<td></td>
<td>probe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S03</td>
<td></td>
<td>memorize</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S04</td>
<td></td>
<td>memorize</td>
<td></td>
</tr>
</tbody>
</table>

Important note: Removed datasets will not be saved before being deleted from EEGLAB memory.

- Dataset into (condition, group): S01 differs from study into [set] = Overwrite dataset into.
- Delete cluster information (to allow loading new datasets, set new components for clustering, etc.)

Select STUDY design:

- Independent variable 1:
  - condition: load
  - duration: 0
  - init_index: 0
  - init_time: 0
  - load: 1
- Independent variable 2:
  - ignore: memorize
  - probe: probe

Combine selected values:

- Use only specific datasets/trials
- Delete all datafiles associated with this STUDY design

Save the STUDY:
**Build a STUDY, alternative method**

![Image of a study building interface](image.png)

<table>
<thead>
<tr>
<th>Dataset Filename</th>
<th>Browse</th>
<th>Subject</th>
<th>Session</th>
<th>Condition</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>2</td>
<td>...</td>
<td>...</td>
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<td>...</td>
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<td>3</td>
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<tr>
<td>9</td>
<td>...</td>
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<td>...</td>
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<td>...</td>
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<tr>
<td>10</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

**Important note:** Removed datasets will not be saved before being deleted from EEGLAB memory.

- Update dataset info - datasets stored on disk will be overwritten (unset = Keep study info separate).
- Delete cluster information (to allow loading new datasets, set new components for clustering, etc.)
Edit dataset info

Create a new STUDY set -- pop_study()

Edit STUDY set information - remember to save changes

| STUDY set name: | Sternberg |
| STUDY set task name: | Sternberg |
| STUDY set notes: |

<table>
<thead>
<tr>
<th>dataset filename</th>
<th>browse</th>
<th>subject</th>
<th>session</th>
<th>condition</th>
<th>group</th>
</tr>
</thead>
<tbody>
<tr>
<td>/Volumes/donnees/data/STUI</td>
<td>...</td>
<td>S01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/Volumes/donnees/data/STUI</td>
<td>...</td>
<td>S02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/Volumes/donnees/data/STUI</td>
<td>...</td>
<td>S03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/Volumes/donnees/data/STUI</td>
<td>...</td>
<td>S04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/Volumes/donnees/data/STUI</td>
<td>...</td>
<td>S05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/Volumes/donnees/data/STUI</td>
<td>...</td>
<td>S06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/Volumes/donnees/data/STUI</td>
<td>...</td>
<td>S07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/Volumes/donnees/data/STUI</td>
<td>...</td>
<td>S08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/Volumes/donnees/data/STUI</td>
<td>...</td>
<td>S09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/Volumes/donnees/data/STUI</td>
<td>...</td>
<td>S10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Update dataset info - datasets stored on disk will be overwritten (unset = Keep study info separate).

Delete cluster information (to allow loading new datasets, set new components for clustering, etc.)

Help  Cancel  Ok
Create design

1x3 design

Select STUDY design
- Ignore vs. Memorize vs. Probe

Subjects
- S01
- S02
- ... S13

Independent variable 1
- slimtype
- stimulus
- time
- type
- uncertainty1
- uncertainty2

Independent variable 2
- None
- duration
- init_index
- init_time
- insert
- load

Ind. var. 1 values
- Ignore
- Memorize
- Probe

Ind. var. 2 values
- None

Combine selected values
- Paired statistics

Use only specific datasets/trials

Delete all datafiles associated with this STUDY design

Save the STUDY

Cancel   Ok
### Select STUDY design

- Audio versus light all subjects
- All stimulus type - non dual subjects only
- Blank versus other stimulus type - non dual subjects only
- Audio preceeded by different stimulus types
- Audio versus light across sessions - non dual subjects only
- Audio versus light across presentation - non dual subjects only

### Subjects

<table>
<thead>
<tr>
<th>c1</th>
<th>c2</th>
<th>c3</th>
<th>c4</th>
<th>c5</th>
<th>c6</th>
<th>c7</th>
<th>c8</th>
<th>nd1</th>
<th>nd2</th>
<th>nd3</th>
<th>nd4</th>
<th>nd5</th>
<th>nd6</th>
<th>nd7</th>
<th>nd8</th>
</tr>
</thead>
</table>

### Independent variable 1

- None
- group
- stimulusType
- presentation
- session
- preevent

### Ind. var. 1 values

- audio
- blank
- both
- light
- audio - light

### Combine selected values

### Unpaired statistics

### Independent variable 2

- None
- group
- stimulusType
- presentation
- session
- preevent

### Ind. var. 2 values

| 1 | 2 |

### Combine selected values

### Use only specific datasets/trials

### Delete all datafiles associated with this STUDY design

- [ ]

### Save the STUDY

- [ ]

### Cancel  Ok
Exercises

Suggestion for exercise

1. From the GUI, select “File > Create STUDY > Simple ERP STUDY”

2. Enter 2 conditions “letter-ignore” and “letter-memorize”

3. In the column for “letter-ignore” select datasets “ignore.set” for 3 subjects S01, S02, S03 (in the STUDY folder)

4. In the column for “letter-memorize” select datasets “probe.set” for 3 subjects S01, S02, S03 (in the STUDY folder)

5. Press OK.
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Exercise...
Precompute data measures
Choose which channel

Choose which subject
Computing Spectrum

[Image of a software interface for computing channel measures for a study.]
Choose which channel

Choose which subject
'cycles', [3 0.8], 'nfreqs', 50, 'ntimesout', 100
Pre-compute measures
View and edit clusters

**STUDY set: Abdominal muscles**

- Study filename: [File Name]
- Study task name: [Task Name]
- Nb of subjects: [Number]
- Nb of conditions: [Number]
- Nb of sessions: [Number]
- Nb of groups: [Number]
- Epoch consistency: yes
- Channels per frame: 31
- Channel locations: yes
- Clusters: 26
- Status: Pre-clustered
- Total size (Mb): 39.1
Plot cluster data

Choose which cluster

Plot mean scalp maps for easy reference

Study 'Attention': 181 of 181 components clustered

Select cluster to plot
- All cluster centroids
- ParentCluster 1 (181 ICs)
- outlier 2 (1 ICs)
- Cls 3 (5 ICs)

Select component(s) to plot
- outlier 2' comp. 1 (S12 IC12)
- Cls 3' comp. 1 (S05 IC11)
- Cls 3' comp. 3 (S06 IC15)

Plot scalp maps
- Plot dipoles
- Plot ERP's
- Plot spectra
- Plot ERSPs
- Plot ITCs

Create new cluster
- Rename selected cluster
- Merge clusters

Save STUDY set to disk
/home/julie/

Cancel Help
Plot cluster data

Choose which cluster

Choose which components
Plot cluster data

Study 'Attention': 181 of 181 components clustered

Select cluster to plot
- Cis 5 (3 ICs)
- Cis 7 (10 ICs)
- Cis 8 (5 ICs)
- Cis 9 (12 ICs)

Select component(s) to plot
- All components
  - S01 IC6
  - S05 IC9
  - S06 IC12

- Plot scalp map(s)
- Plot dipole(s)
- Plot ERPs
- Plot spectra
- Plot ERSPs
- Plot ITCs
- Plot cluster properties

- Create new cluster
- Rename selected cluster
- Merge clusters

Save STUDY set to disk: /home/julie/WorkshopSD2007/STUDY

Reassign selected component(s)
Remove selected outlier comps.
Auto-reject outlier components

Cancel   Help   Ok
Exercises

1. Load stern.study in STUDY folder

2. Create a new STUDY design to compare two types of conditions
   – Ignore letter grouped with Memorize letter
   – Probe letters

3. Recompute spectrum and plot spectrum for electrode Fz

4. Plot scalp topography at 10 Hz for both conditions
std_stat() function in EEGLAB
Use single trials
Exercices

Experiment with STUDY statistics

- Load the Stern STUDY
- Look at significant difference in the first default design in channel Fz (time-frequency plot, ERSP) using the cluster method (Fieldtrip – statistics)
- Look at the same difference a component cluster of your choice.