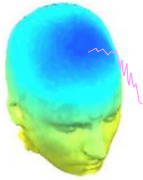
STUDY design and plotting overview



STEP 1

Build a STUDY

STEP 2

Build design(s)

STEP 3

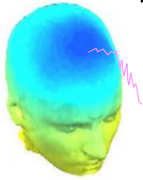
Precompute the data

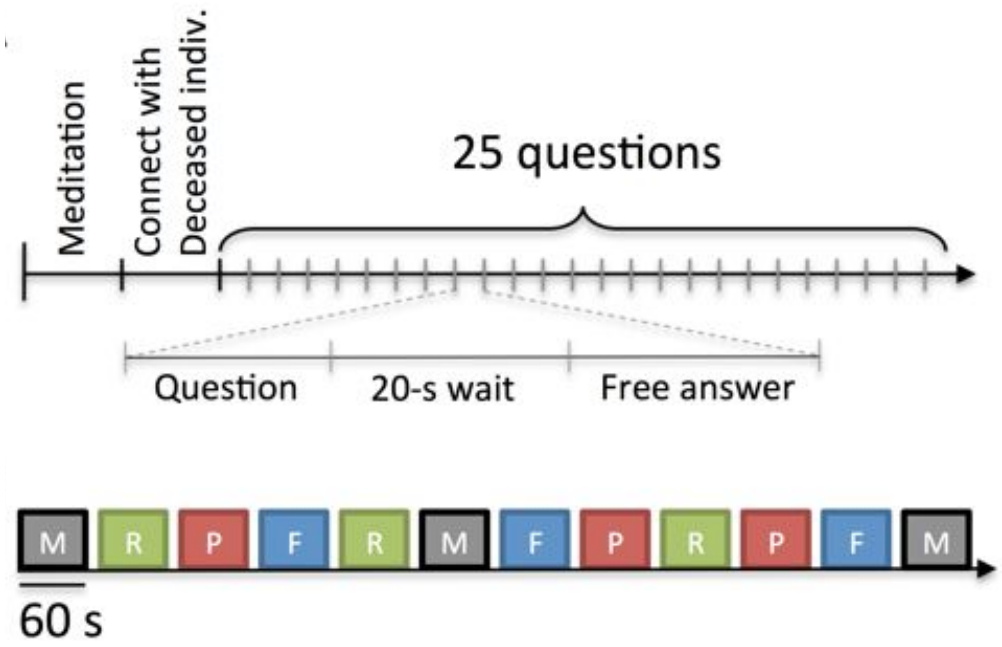
STEP 4

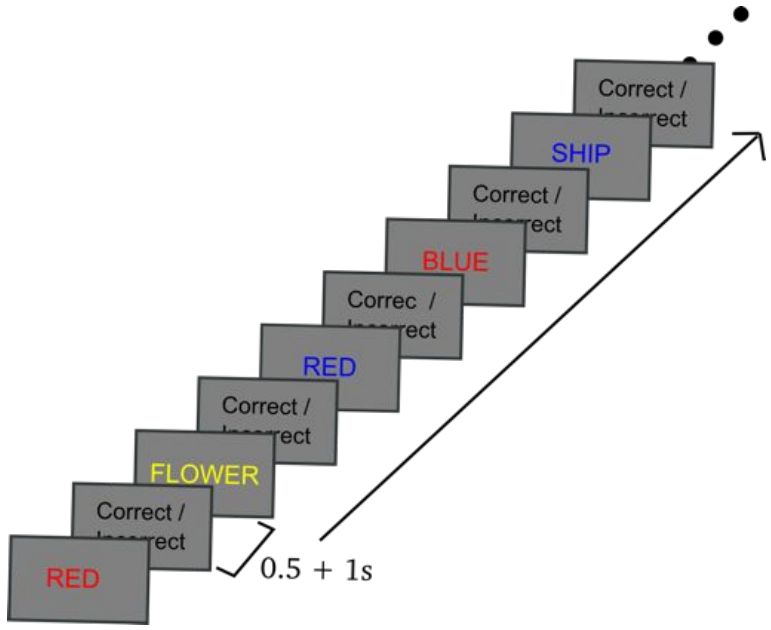
Plot the data

Exercise...

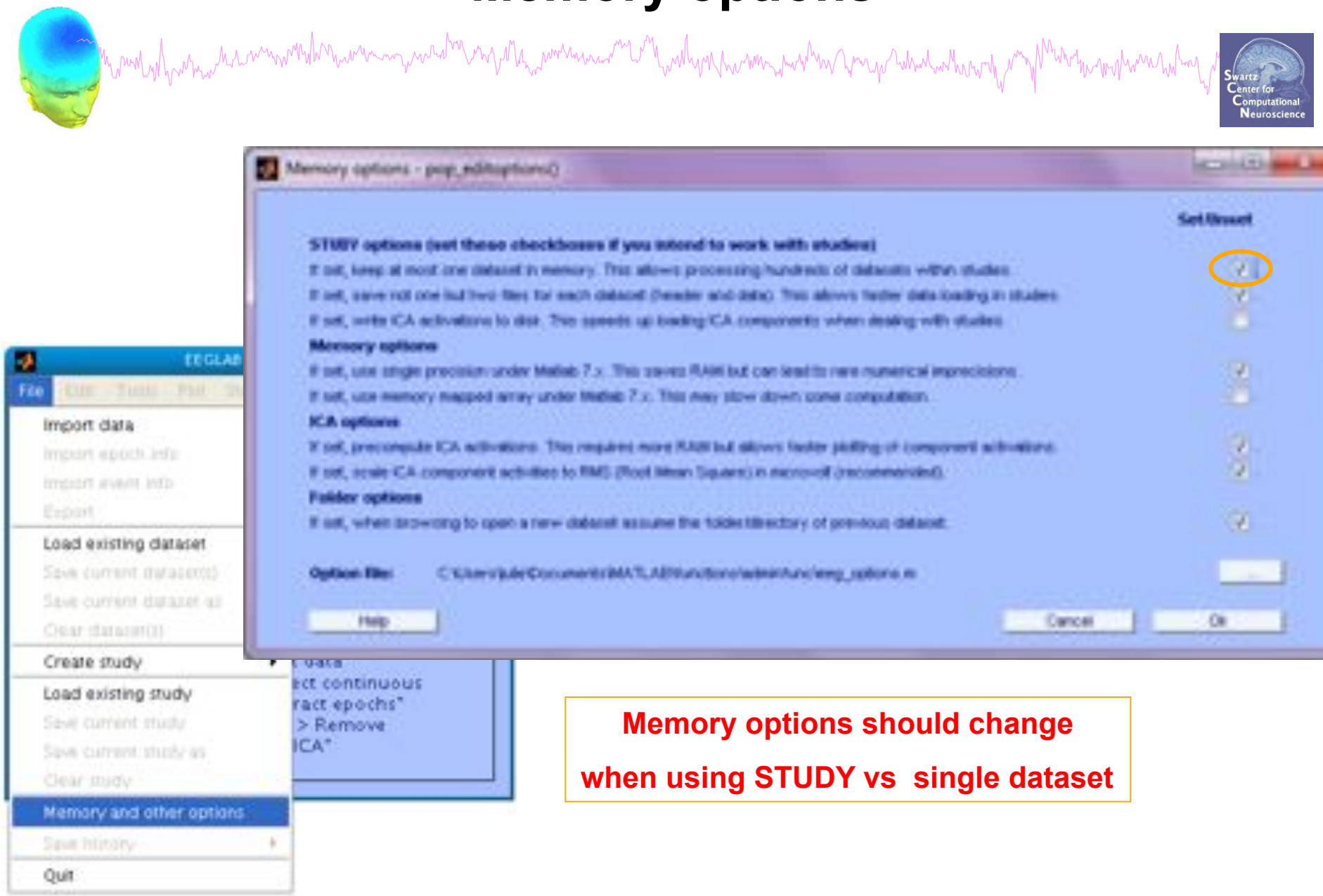
Formalizing experimental protocols





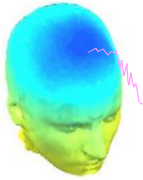


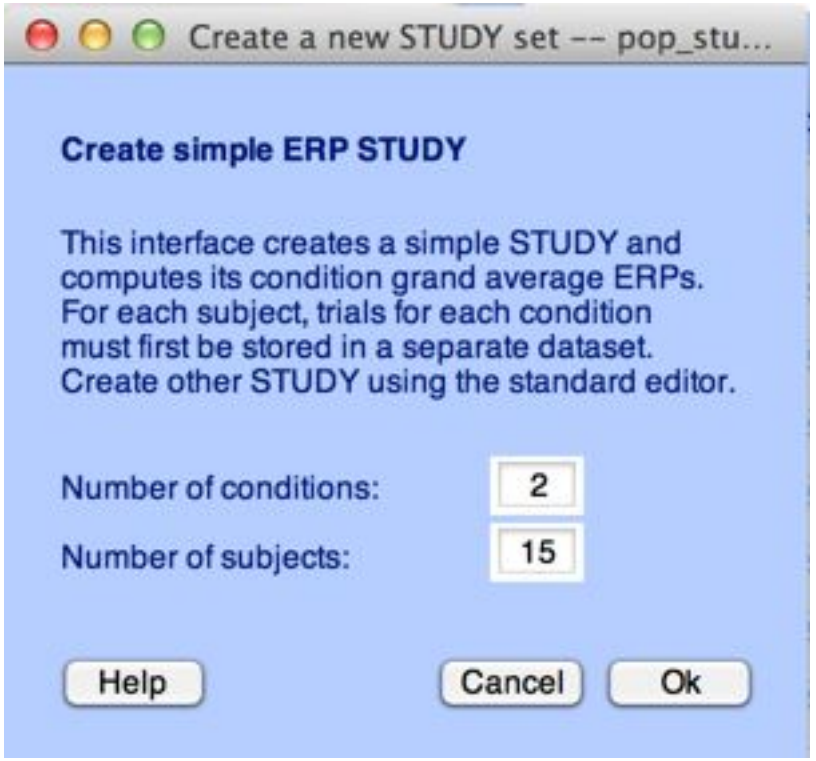
Memory options



Memory options should change when using STUDY vs single dataset

Create simple ERP STUDY





Create a new STUDY set -- pop_studyerp()

Create simple ERP STUDY

STUDY set name: Letter memorization task

Condition 1 name	Condition 2 name
letter-ignore	letter-memorize

Condition 1 datasets	Condition 2 datasets
/data/STUDY/S01/Ignore.set	/data/STUDY/S01/Memorize.set
/data/STUDY/S02/Ignore.set	/data/STUDY/S02/Memorize.set
/data/STUDY/S03/Ignore.set	/data/STUDY/S03/Memorize.set

When using more than 1 condition, datasets on each line must correspond to the same subject.

Help Cancel Ok

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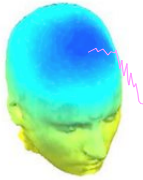
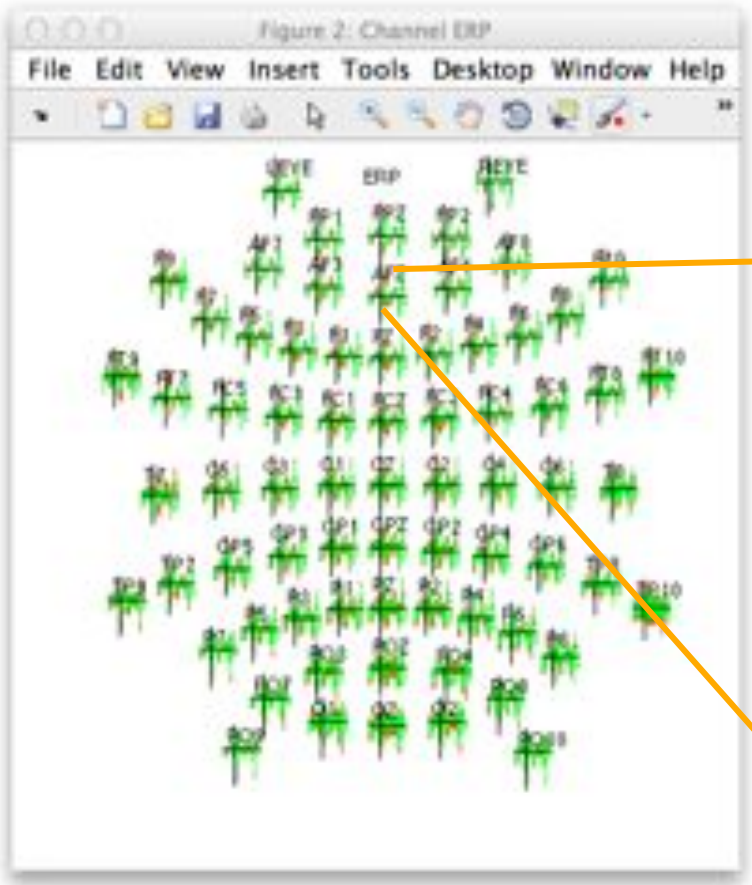
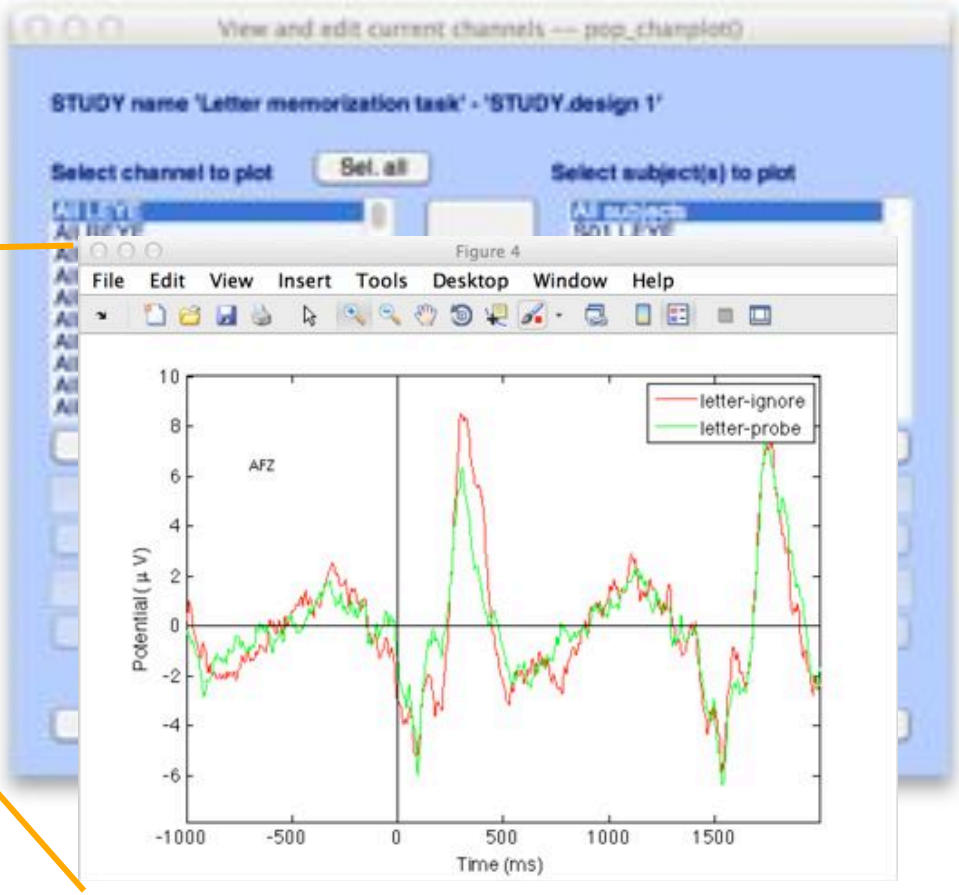
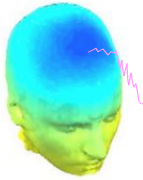
Create simple ERP STUDY

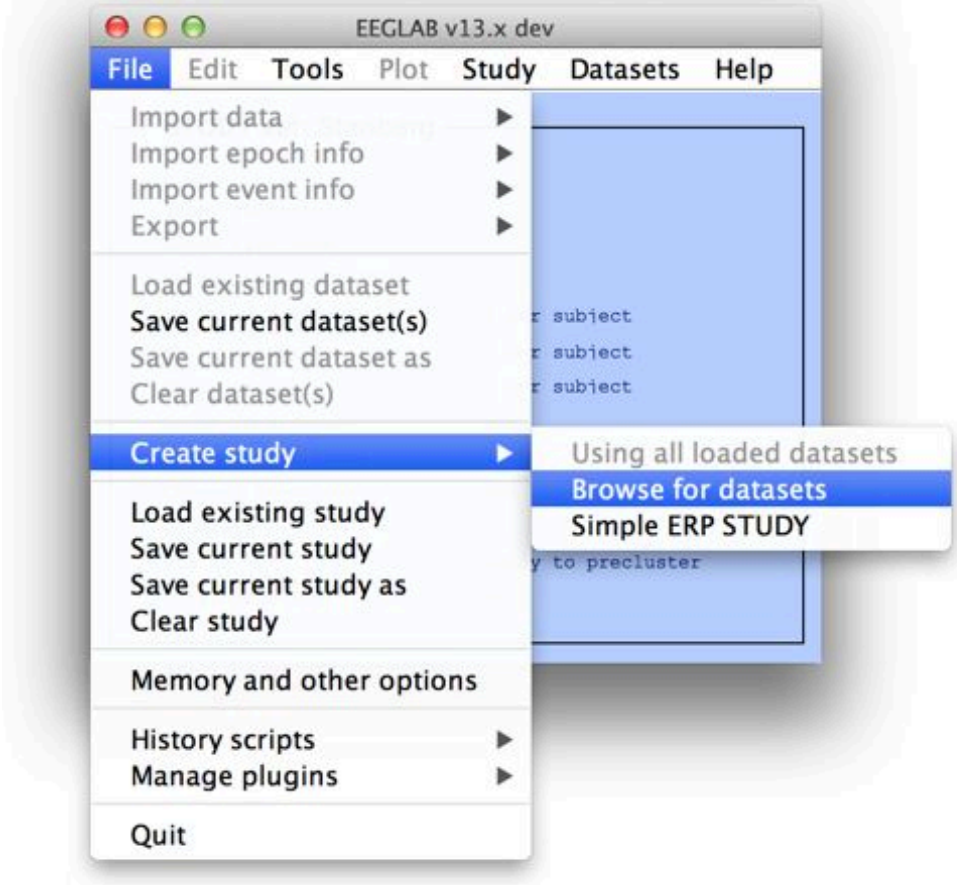




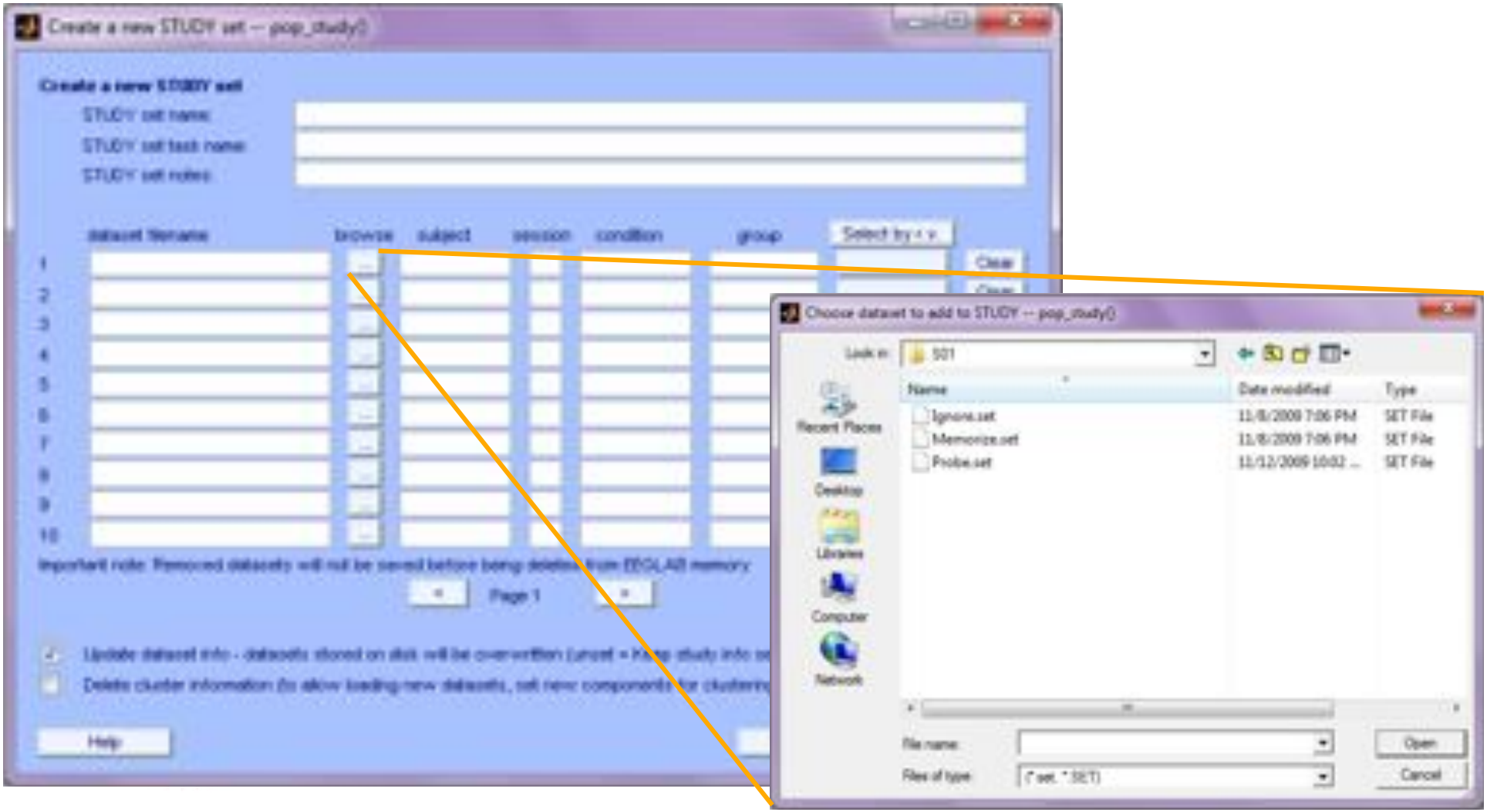


Build a STUDY



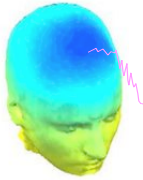


Build a STUDY, cont'd



Edit dataset info

Experimental design



1x2 unpaired

Patients	Controls
Group A	Group B

2x2 unpaired

	Patients	Controls
Old	Group A	Group B
Young	Group C	Group D

1x2 paired

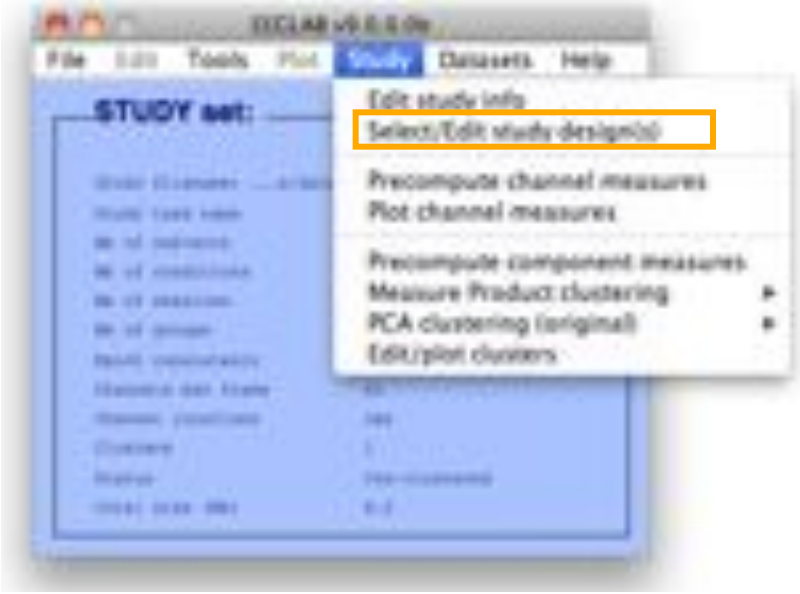
Stim A	Stim B

2x2 paired

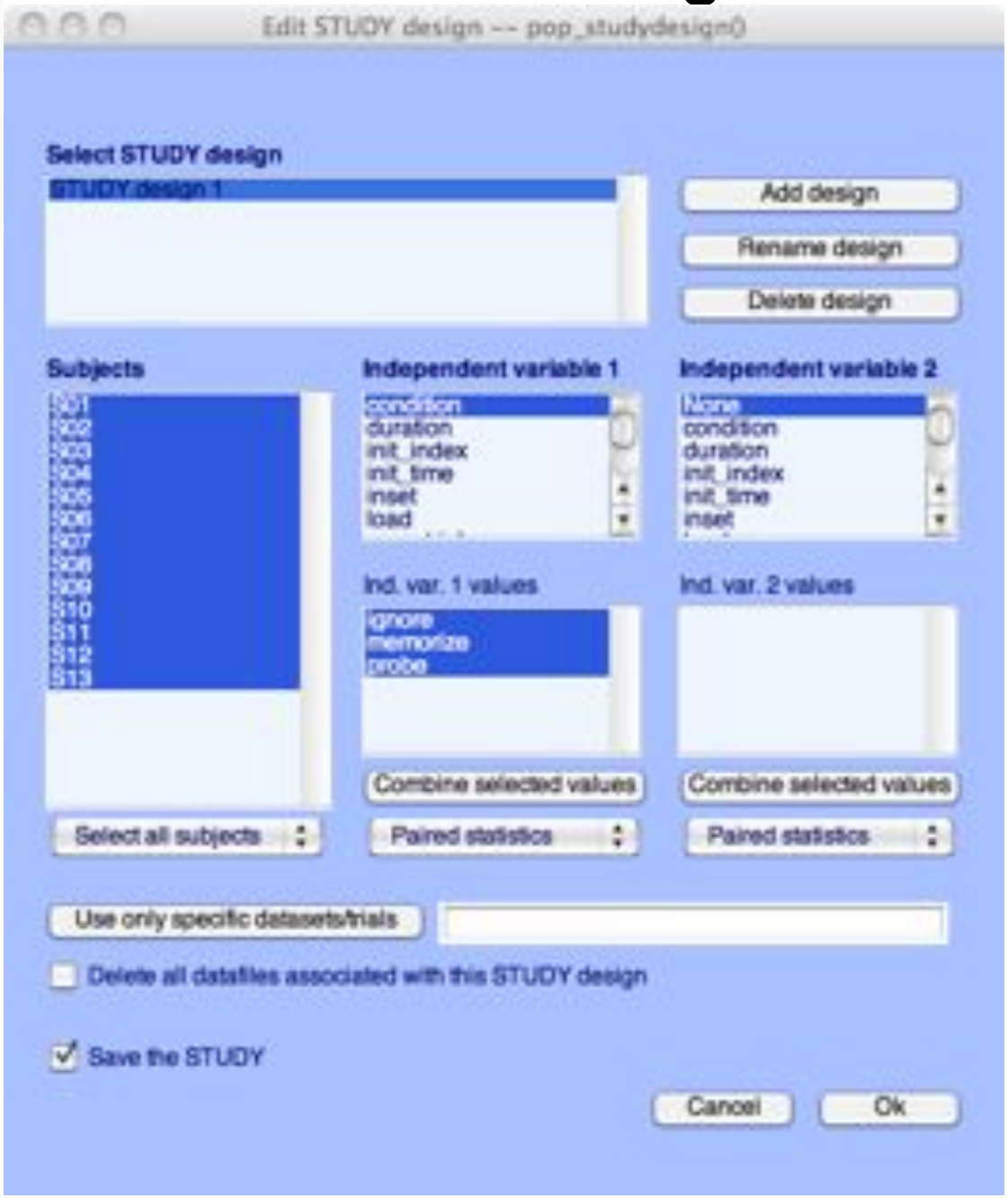
	Stim A	Stim B
Drug A		
Drug B		

2x2 paired & unpaired

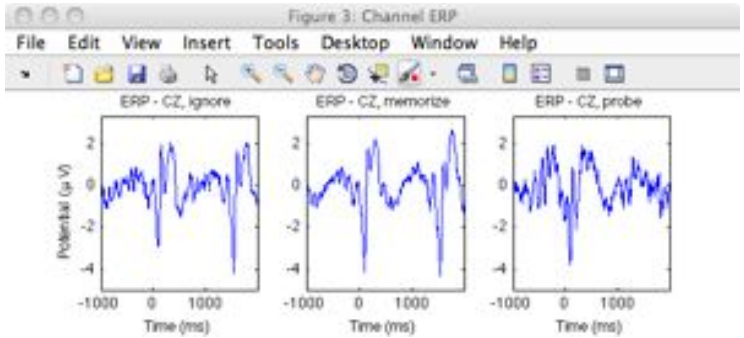
	Patients	Controls
Drug A		
Drug B		

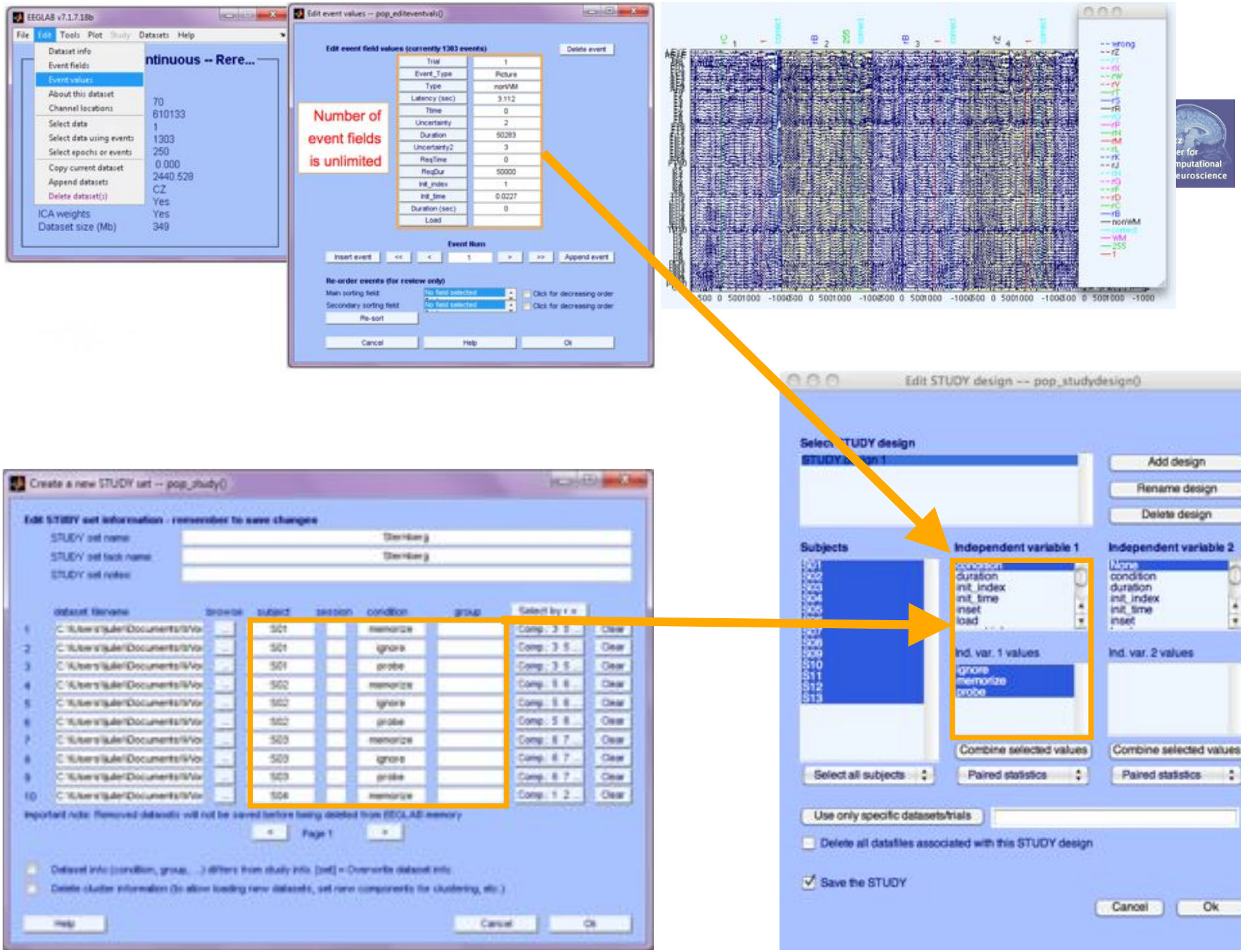


Create design

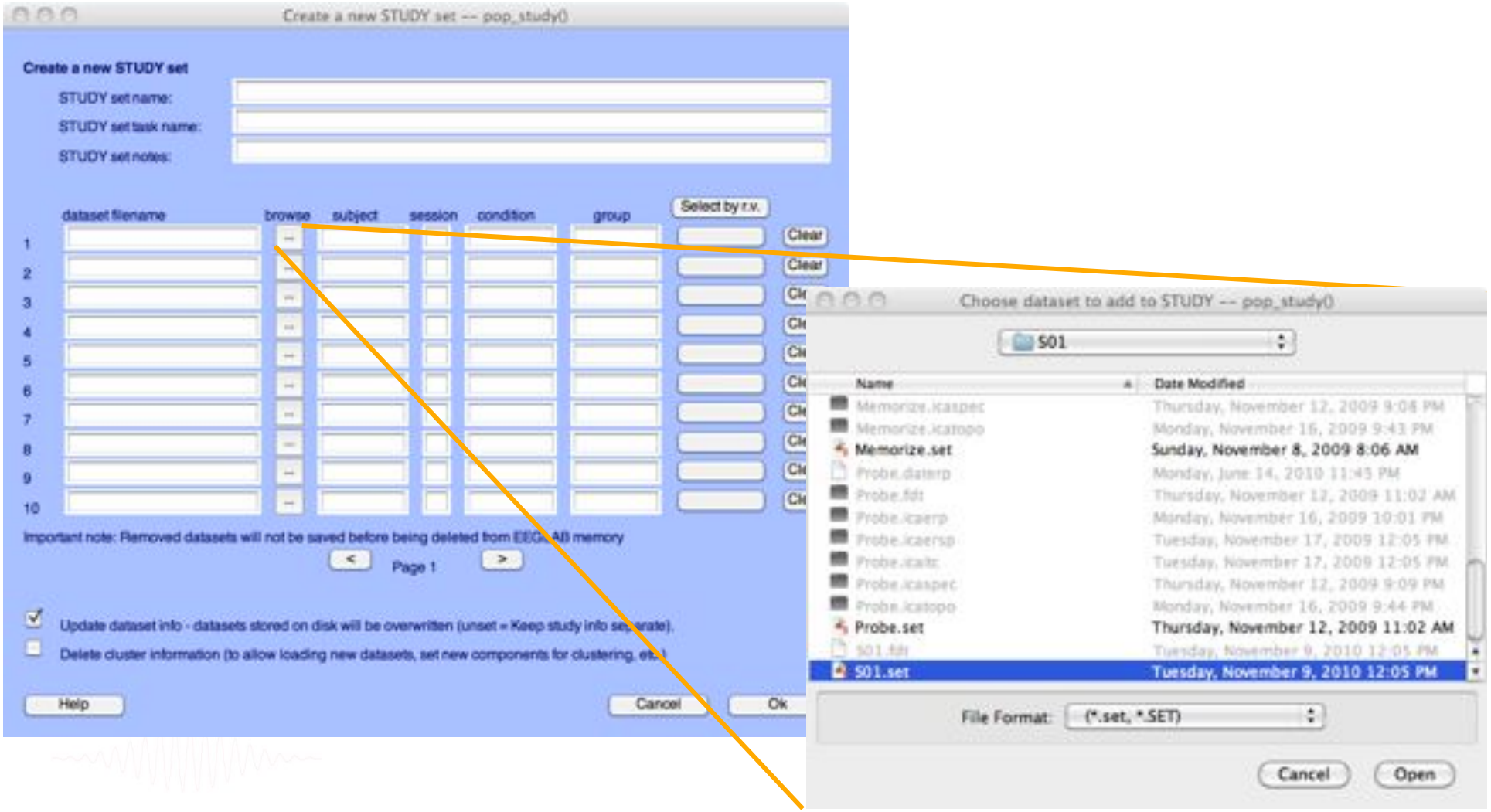


1x3 design

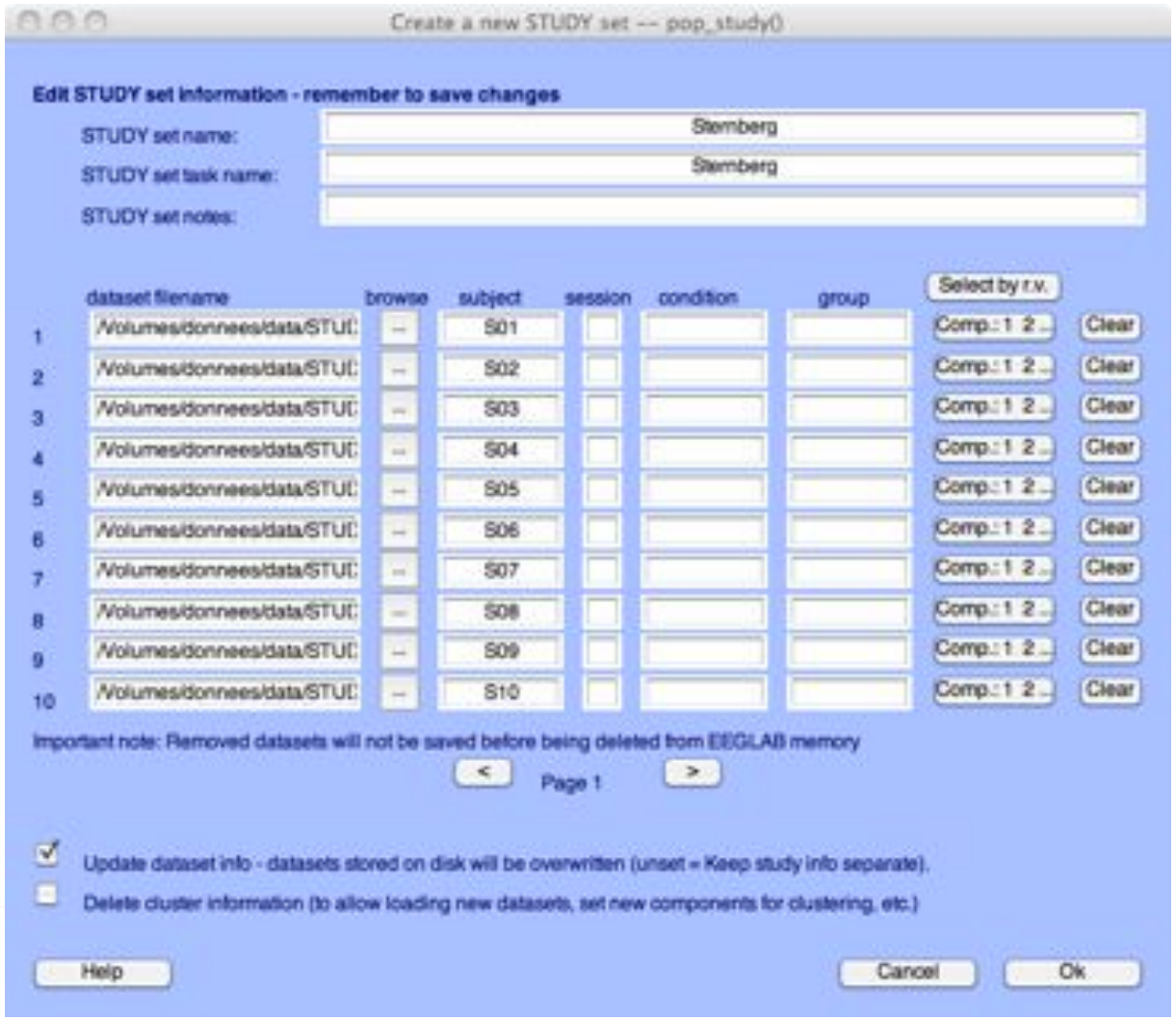


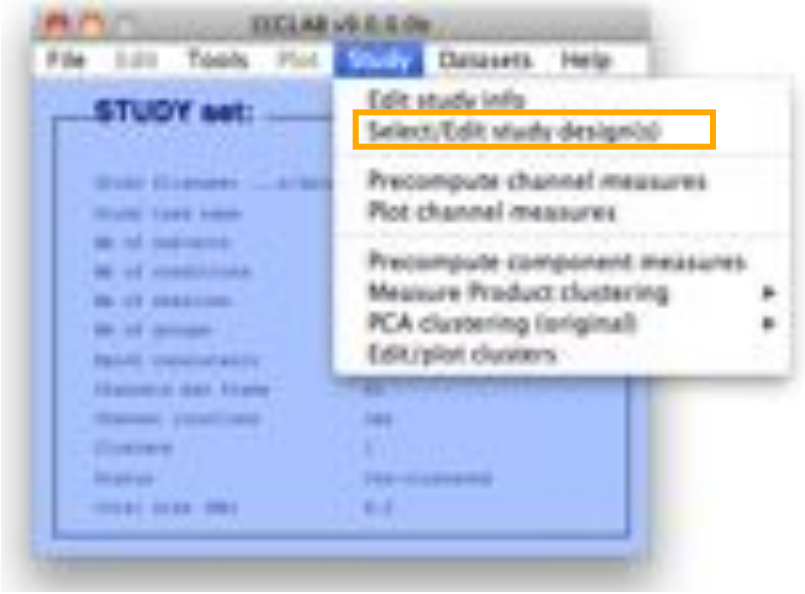

EEGLAB v7.1.7.18b
File Edit Tools Plot Study Datasets Help
Dataset info
Event fields
Event values
About this dataset
Channel locations
Select data
Select data using events
Select epochs or events
Copy current dataset
Append datasets
Delete dataset(s)
ntinuous -- Rere...
70
610133
1
1303
250
0.000
2440.528
CZ
Yes
ICA weights
Yes
Dataset size (Mb)
349
Edit event values -- pop_editeventvals()
Edit event field values (currently 1303 events)
Delete event
Trial
Event_Type
Type
Latency (sec)
Time
Uncertainty
Duration
Uncertainty2
ReqTime
ReqDur
Init_index
Init_time
Duration (sec)
Load
Picture
norWM
3.112
50283
50000
0.0227
Number of event fields is unlimited
Event Num
Insert event
Append event
Re-order events (for review only)
Main sorting field
Secondary sorting field
Re-sort
Click for decreasing order
Cancel
Help
Ok
Create a new STUDY set -- pop_study()
Edit STUDY set information - remember to save changes
STUDY set name
STUDY set task name
STUDY set notes
dataset filename
browse
subject
session
condition
group
Select by r x
Page 1
Cancel
Ok
Edit STUDY design -- pop_studydesign()
Select STUDY design
Add design
Rename design
Delete design
Subjects
Independent variable 1
Independent variable 2
duration
init_index
init_time
inset
load
None
condition
Ind. var. 1 values
ignore
memorize
probe
Ind. var. 2 values
Combine selected values
Select all subjects
Paired statistics
Use only specific datasets/trials
Delete all datafiles associated with this STUDY design
Save the STUDY
Cancel
Ok

Build a STUDY, alternative method

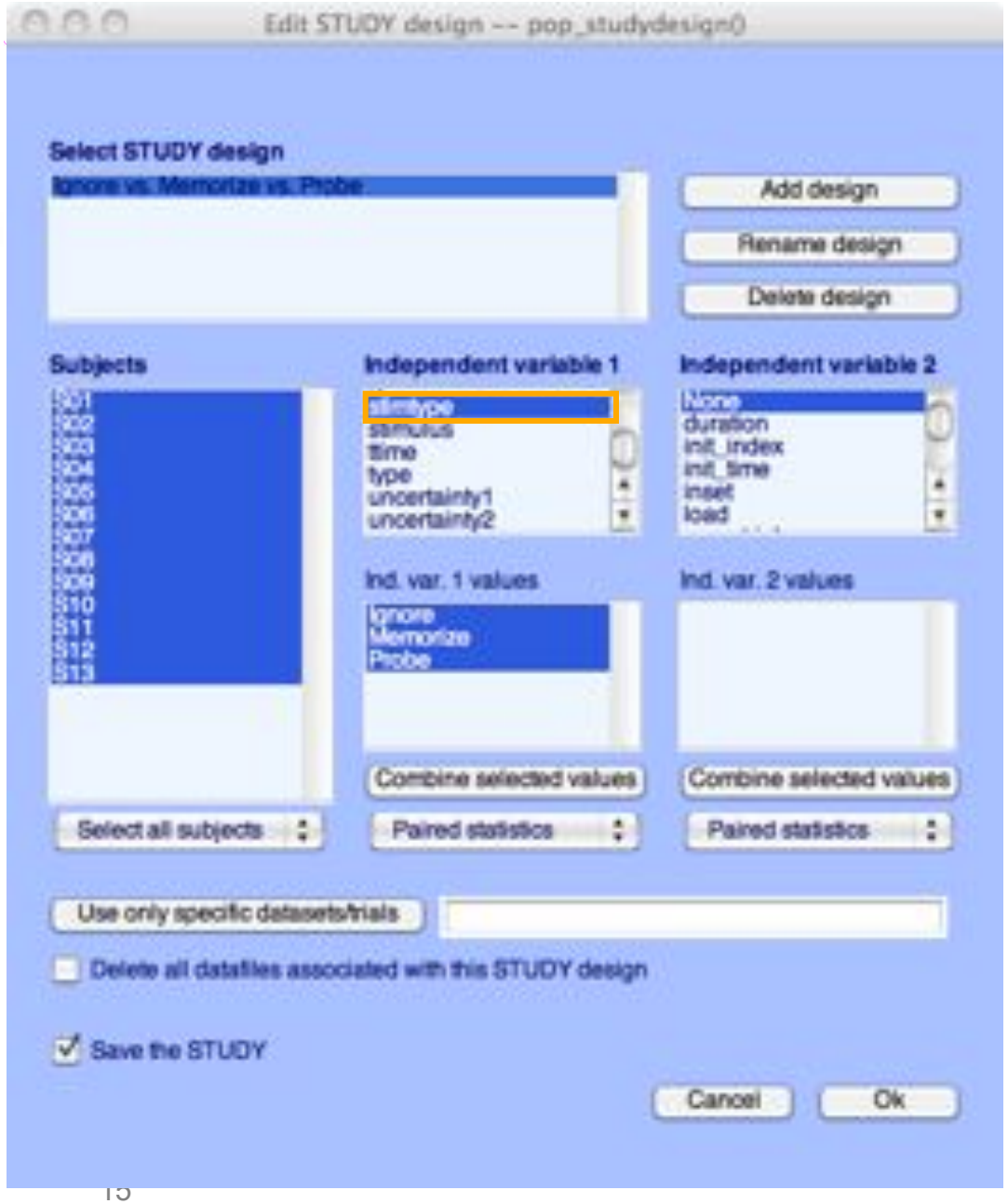


Edit dataset info

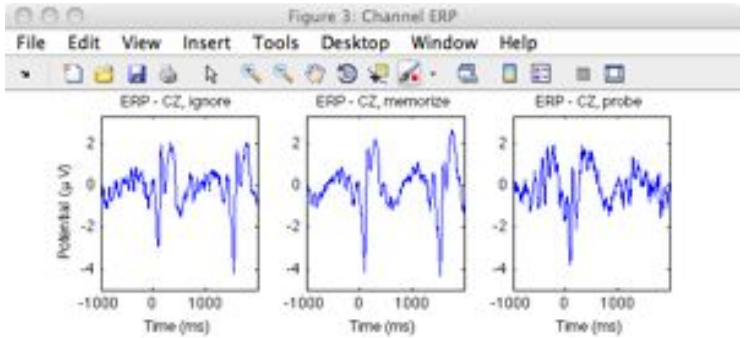


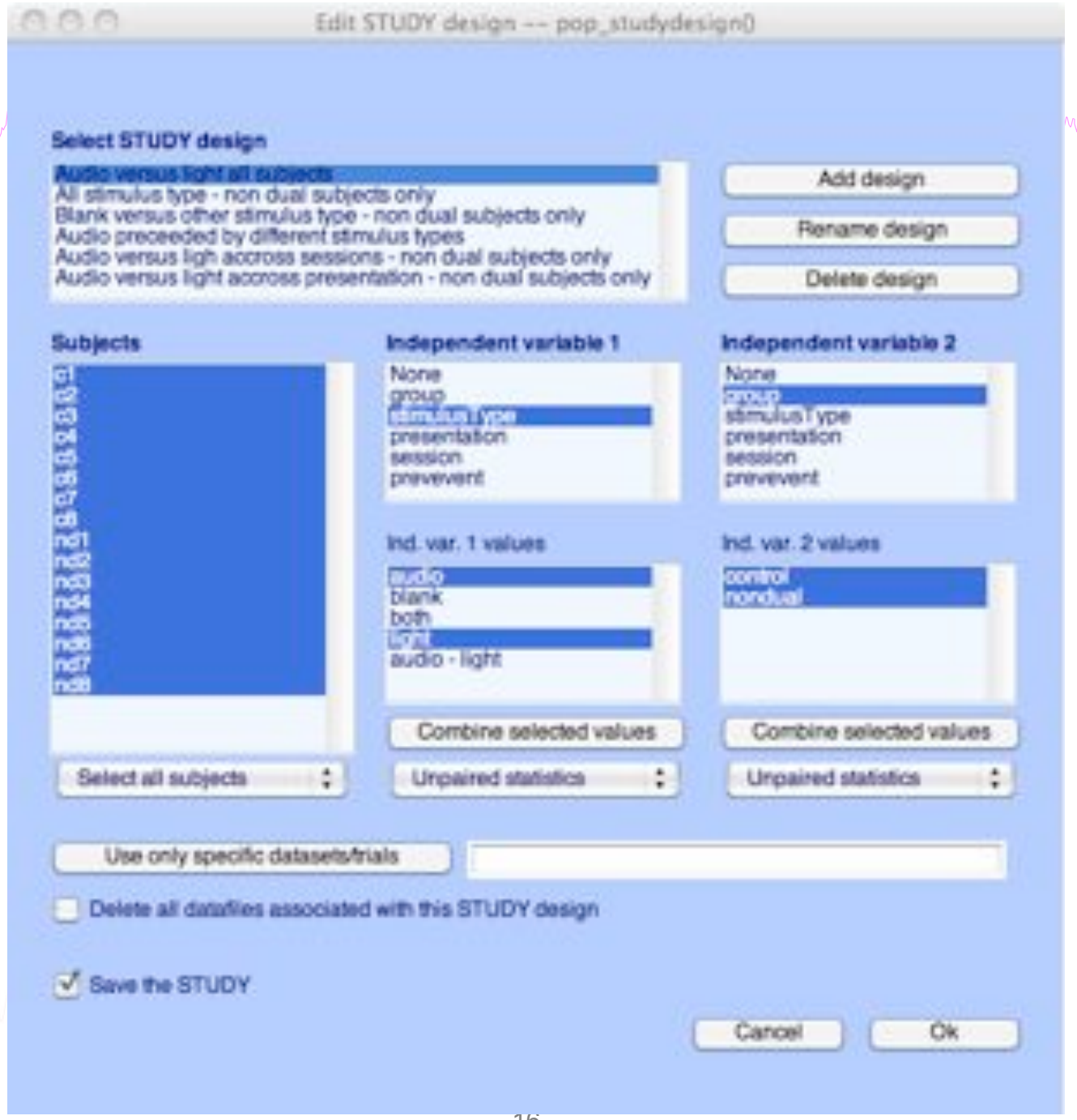


Create design



1x3 design




Edit STUDY design -- pop_studydesign()
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 ligh accross sessions - non dual subjects only
Audio versus light accross presentation - non dual subjects only
Add design
Rename design
Delete design
Subjects
Independent variable 1
None
group
stimulus type
presentation
session
prevevent
Independent variable 2
None
group
stimulusType
presentation
session
prevevent
Ind. var. 1 values
audio
blank
both
light
audio - light
Ind. var. 2 values
control
nondual
Combine selected values
Combine selected values
Select all subjects
Unpaired statistics
Unpaired statistics
Use only specific datasets/trials
Delete all datafiles associated with this STUDY design
Save the STUDY
Cancel
Ok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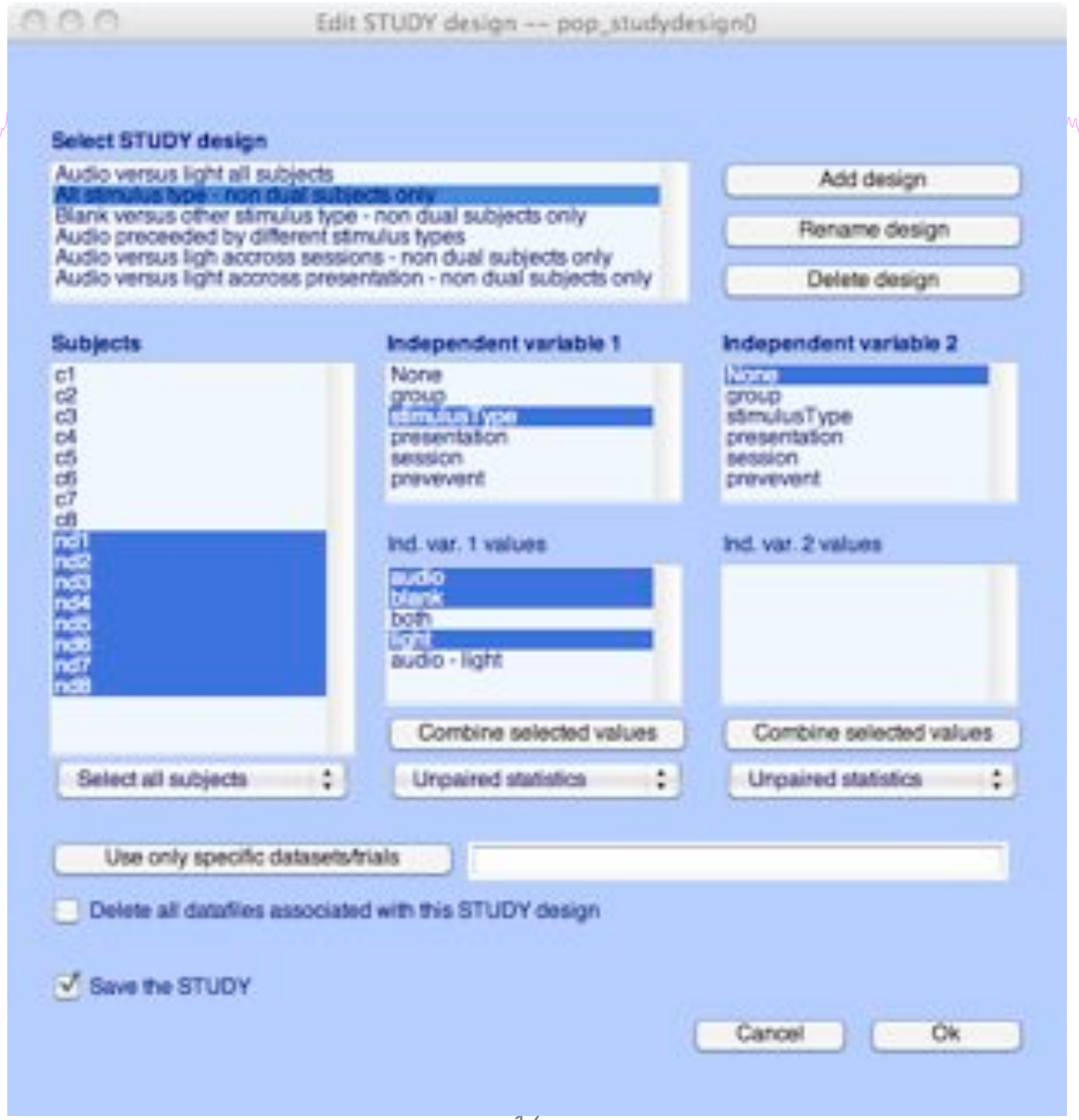
Edit STUDY design -- pop_studydesign()
Select STUDY design
Audio versus light all subjects
Alt stimulus type - non dual subjects only
Blank versus other stimulus type - non dual subjects only
Audio preceeded by different stimulus types
Audio versus ligh accross sessions - non dual subjects only
Audio versus light accross presentation - non dual subjects only
Add design
Rename design
Delete design
Subjects
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nd8
Independent variable 1
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group
stimulusType
presentation
session
prevevent
Independent variable 2
None
group
stimulusType
presentation
session
prevevent
Ind. var. 1 values
audio
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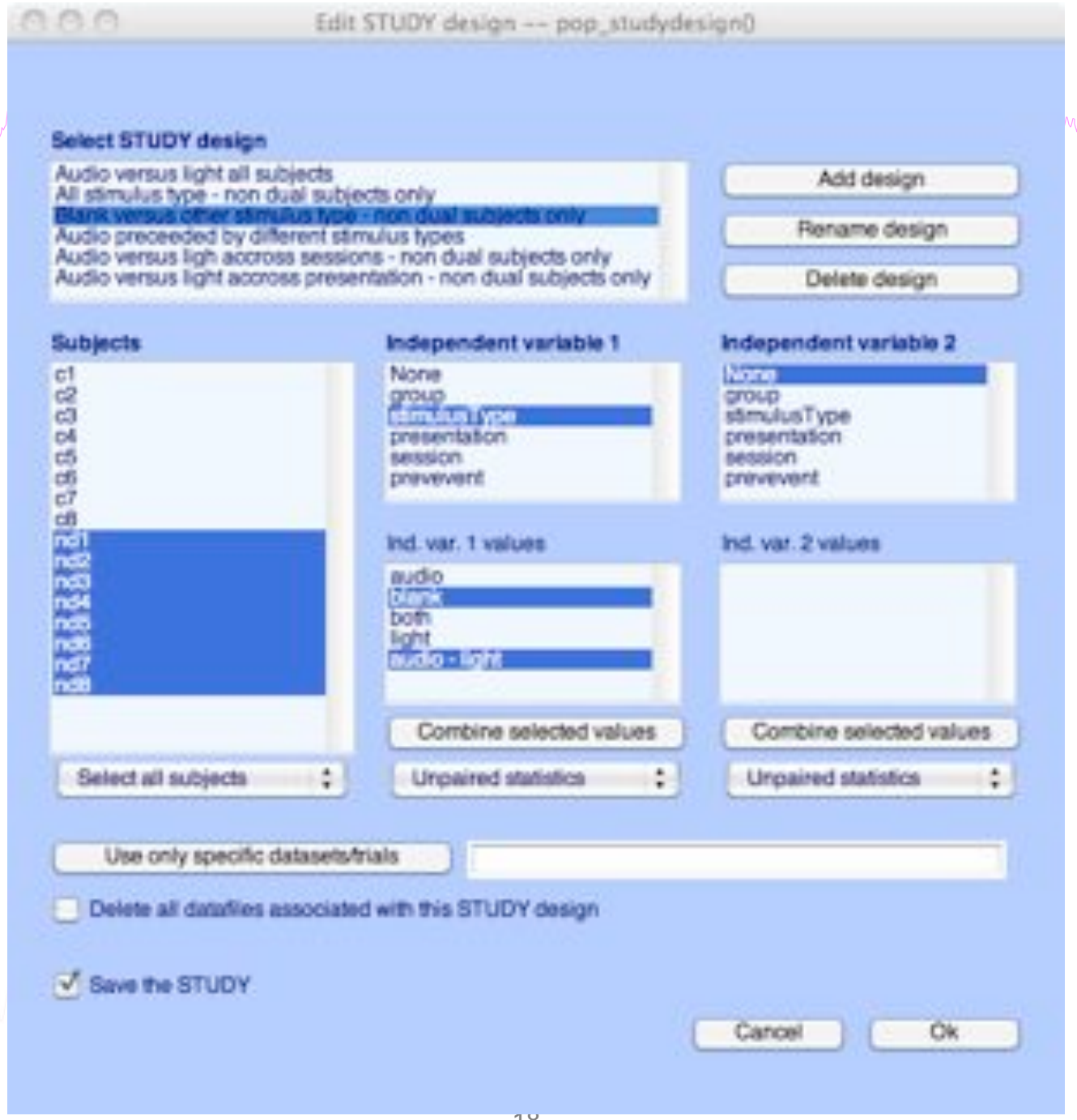
audio - light
Ind. var. 2 values
Combine selected values
Combine selected values
Select all subjects
Unpaired statistics
Unpaired statistics
Use only specific datasets/trials
Delete all datafiles associated with this STUDY design
Save the STUDY
Cancel
Ok


Edit STUDY design -- pop_studydesign()
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 ligh accross sessions - non dual subjects only
Audio versus light accross presentation - non dual subjects only
Add design
Rename design
Delete design
Subjects
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Independent variable 2
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presentation
session
prevevent
Ind. var. 1 values
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light
Combine selected values
Combine selected values
Select all subjects
Unpaired statistics
Unpaired statistics
Use only specific datasets/trials
Delete all datafiles associated with this STUDY design
Save the STUDY
Cancel
Ok


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Edit STUDY design -- pop_studydesign()
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 ligh accross sessions - non dual subjects only
Audio versus light accross presentation - non dual subjects only
Add design
Rename design
Delete design
Subjects
Independent variable 1
Independent variable 2
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stimulusType
presentation
session
prevevent
Ind. var. 1 values
Ind. var. 2 values
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blank
both
Combine selected values
Combine selected values
Select all subjects
Unpaired statistics
Unpaired statistics
Use only specific datasets/trials
'stimulusType','audio')
Delete all datafiles associated with this STUDY design
Save the STUDY
Cancel
Ok


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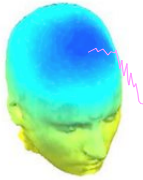
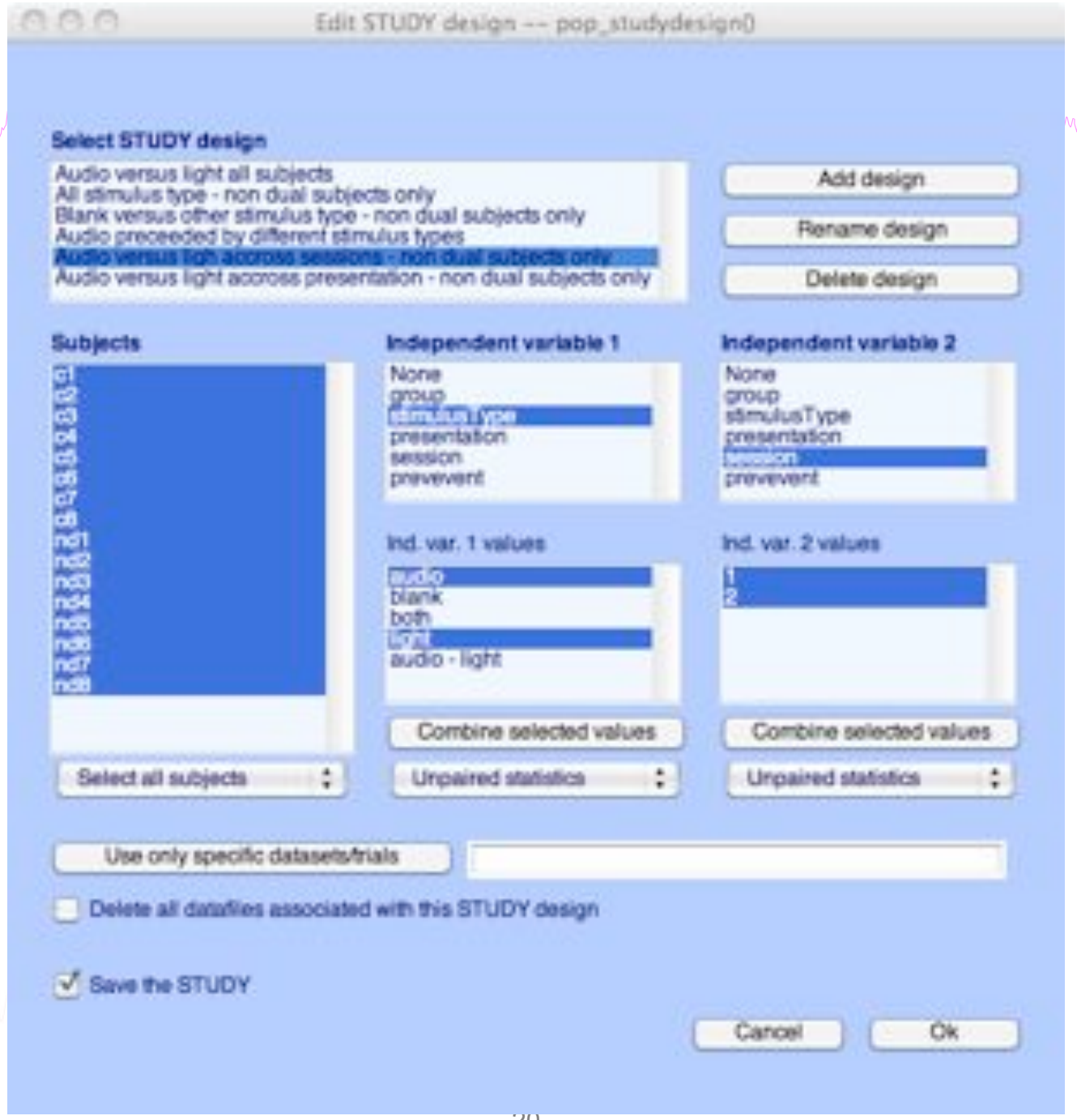
Neuroscience




Edit STUDY design -- pop_studydesign()
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 accross sessions - non dual subjects only
Audio versus light accross presentation - non dual subjects only
Add design
Rename design
Delete design
Subjects
Independent variable 1
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Independent variable 2
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Ind. var. 1 values
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light
audio - light
Ind. var. 2 values
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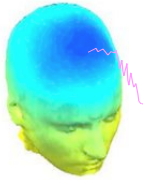
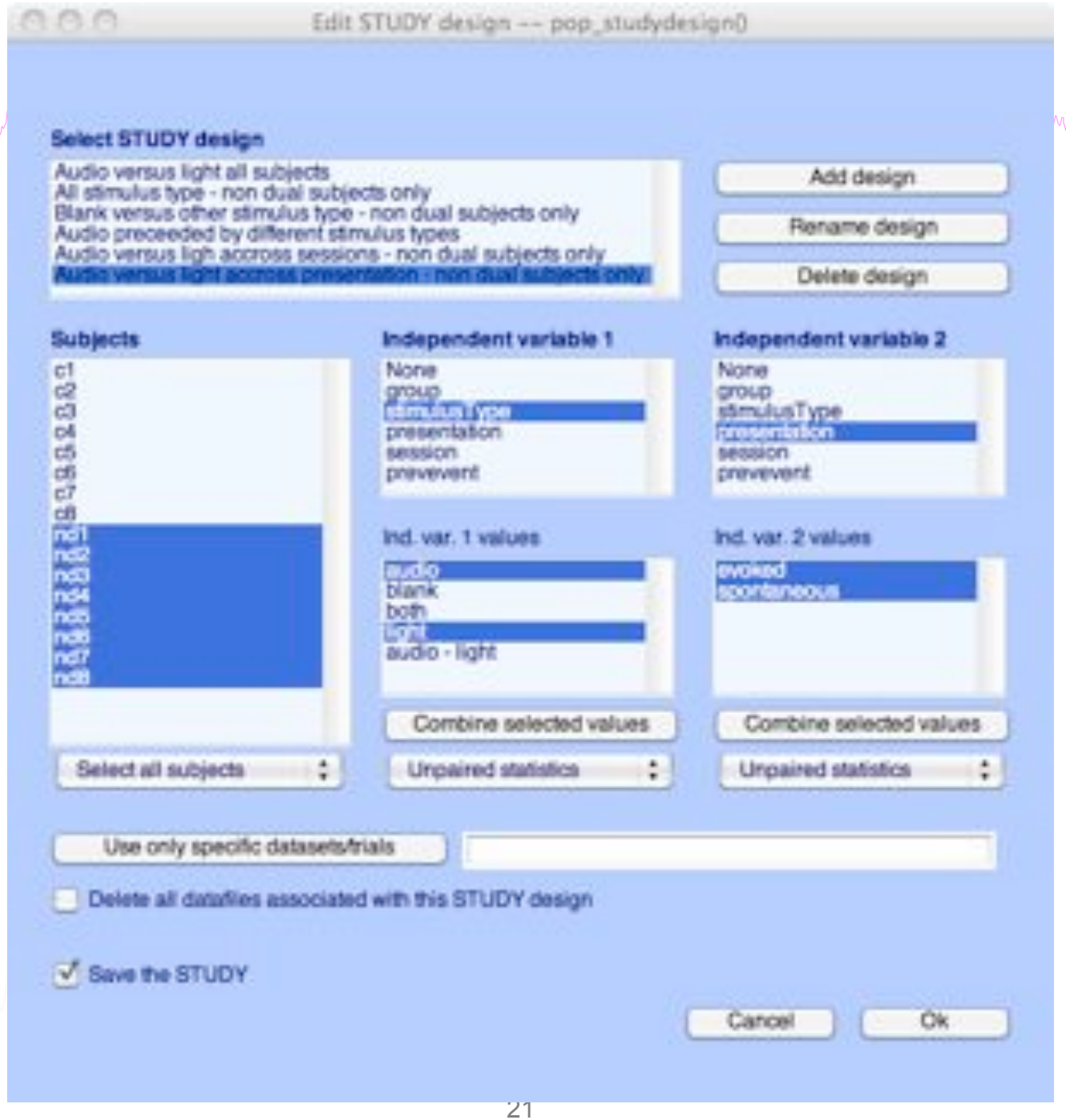
Combine selected values
Combine selected values
Select all subjects
Unpaired statistics
Unpaired statistics
Use only specific datasets/trials
Delete all datafiles associated with this STUDY design
Save the STUDY
Cancel
Ok




Edit STUDY design -- pop_studydesign()
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 ligh accross sessions - non dual subjects only
Audio versus light accross presentation - non dual subjects only
Add design
Rename design
Delete design
Subjects
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Independent variable 1
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Independent variable 2
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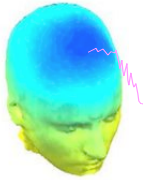
Combine selected values
Combine selected values
Select all subjects
Unpaired statistics
Unpaired statistics
Use only specific datasets/trials
Delete all datafiles associated with this STUDY design
Save the STUDY
Cancel
Ok

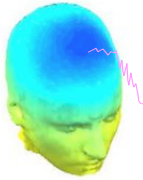
Exercises



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.

STUDY design and plotting overview



STEP 1

Build a STUDY

STEP 2

Build design(s)

STEP 3

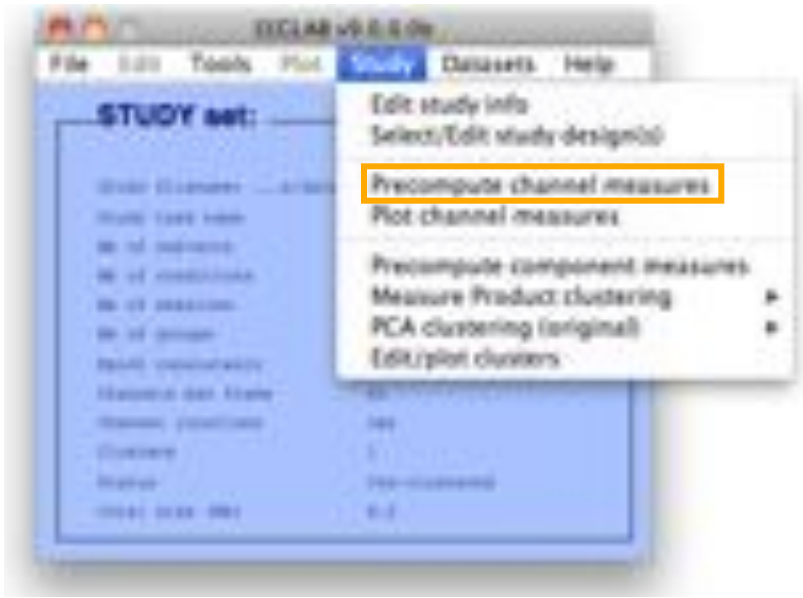
Precompute the data

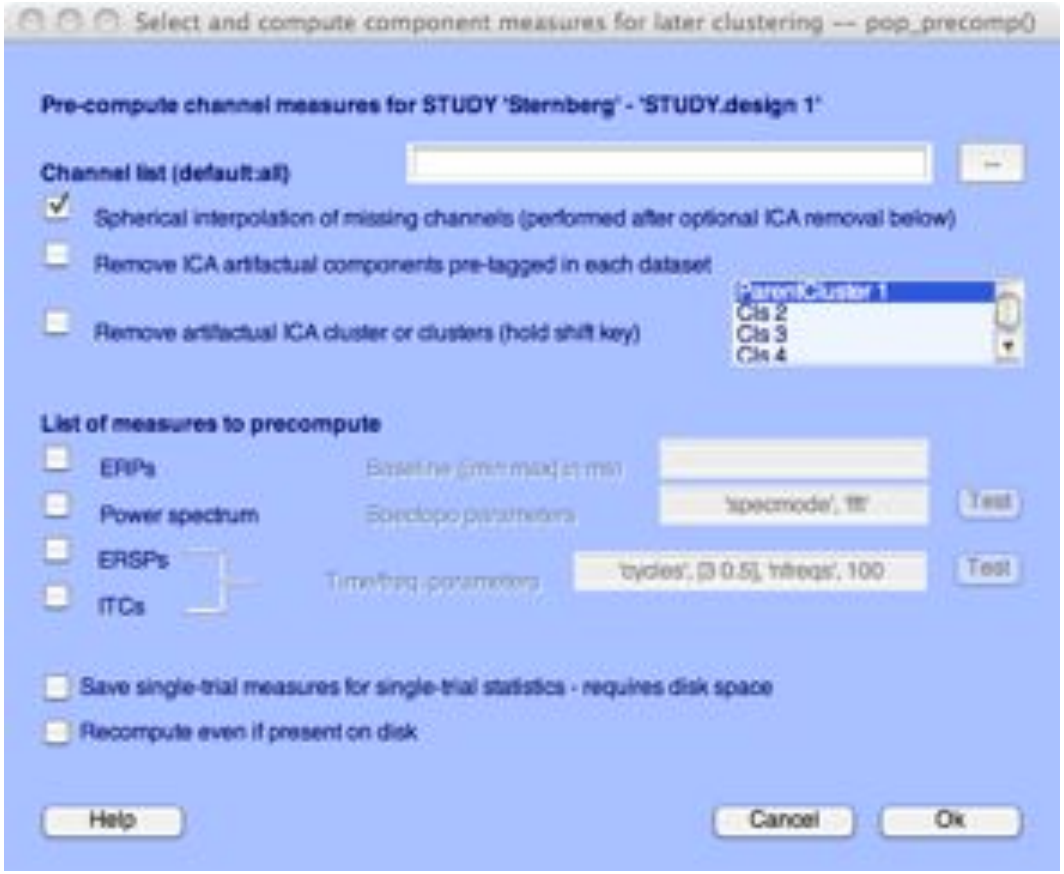
STEP 4

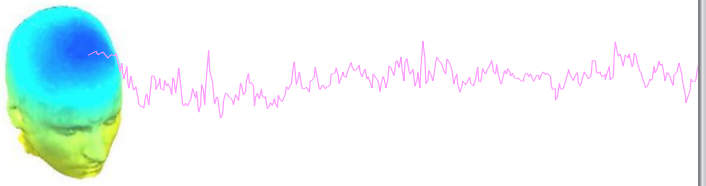
Plot the data

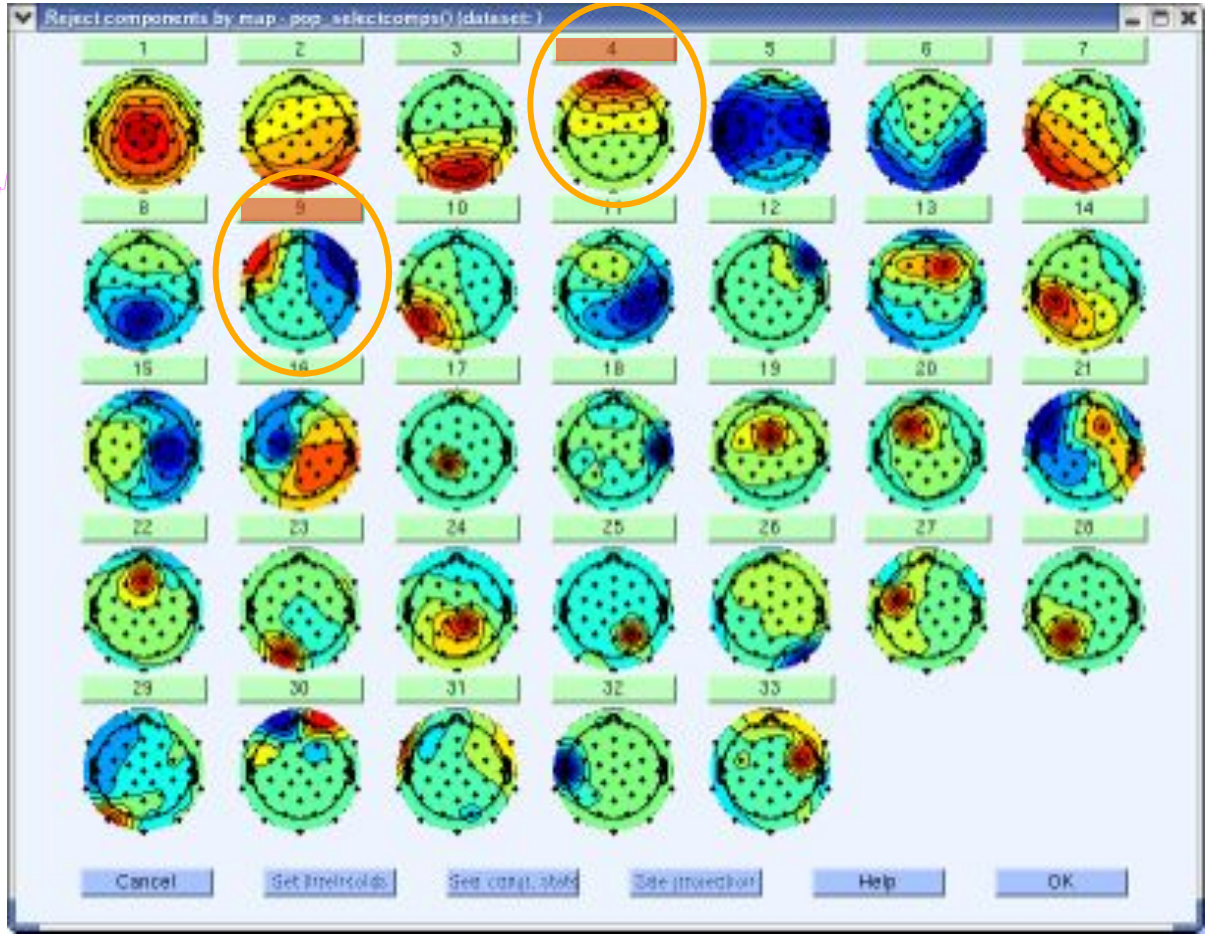
Exercise...

Precompute data measures








Reject components by map - pop_selectcomps() (dataset:)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
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21
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24
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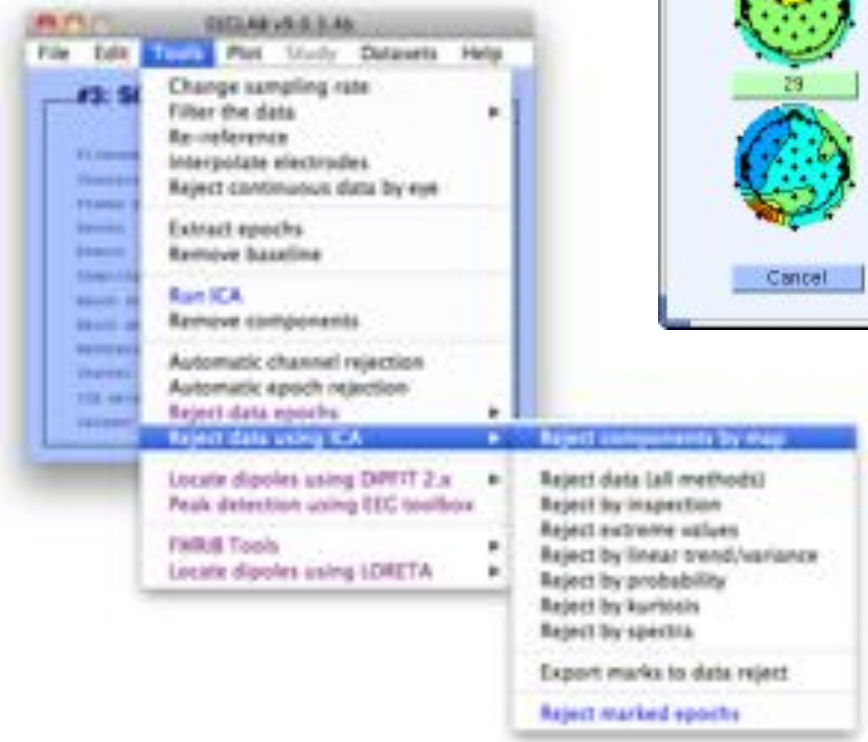
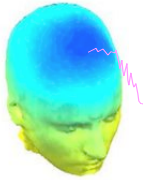
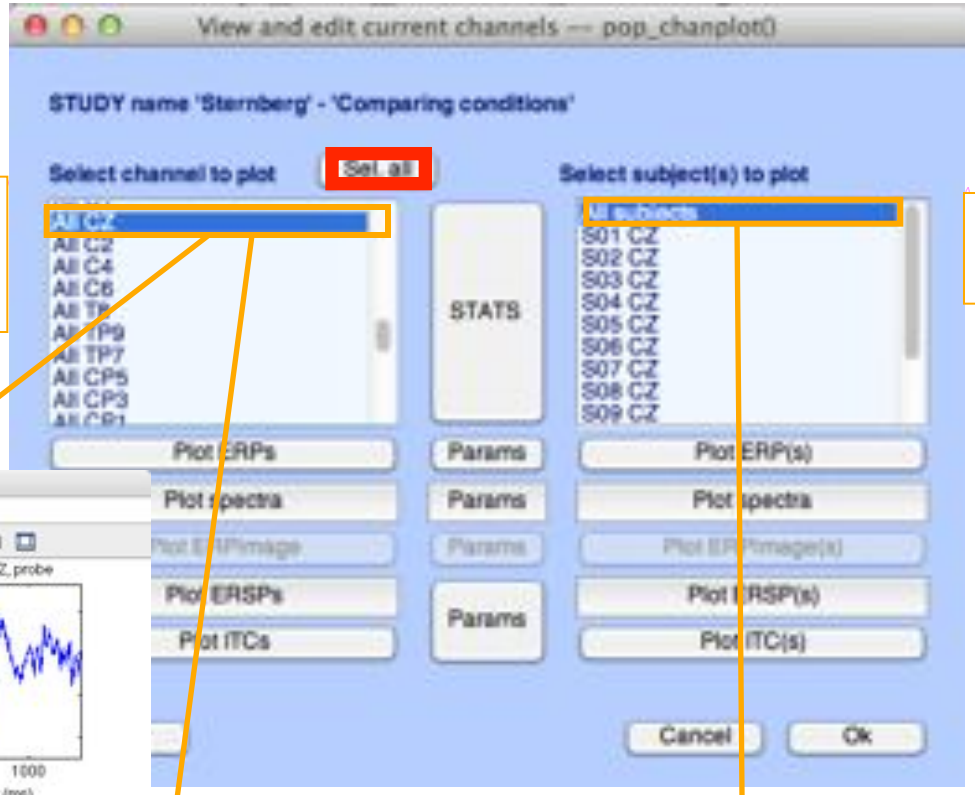
26
27
28
29
30
31
32
33
Cancel
Help
OK

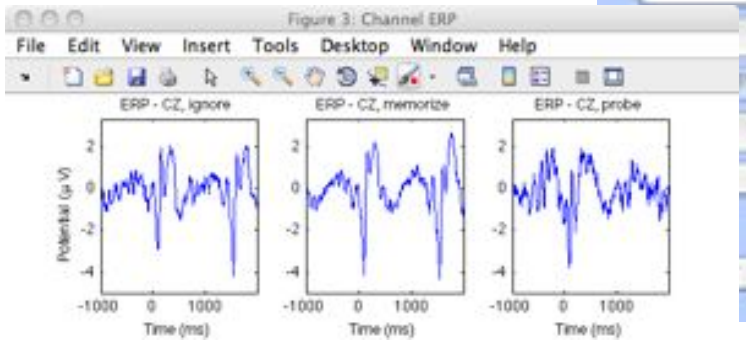

File
Edit
Tools
Plot
Datasets
Help
Change sampling rate
Filter the data
Re-reference
Interpolate electrodes
Reject continuous data by eye
Extract epochs
Remove baseline
Run ICA
Remove components
Automatic channel rejection
Automatic epoch rejection
Reject data epochs
Reject data using ICA
Locate dipoles using DIPFIT 2.x
Peak detection using EEG toolbox
FMRIB Tools
Locate dipoles using LORETA
Reject components by map
Reject data (all methods)
Reject by inspection
Reject extreme values
Reject by linear trend/variance
Reject by probability
Reject by kurtosis
Reject by spectra
Export marks to data reject
Reject marked epochs

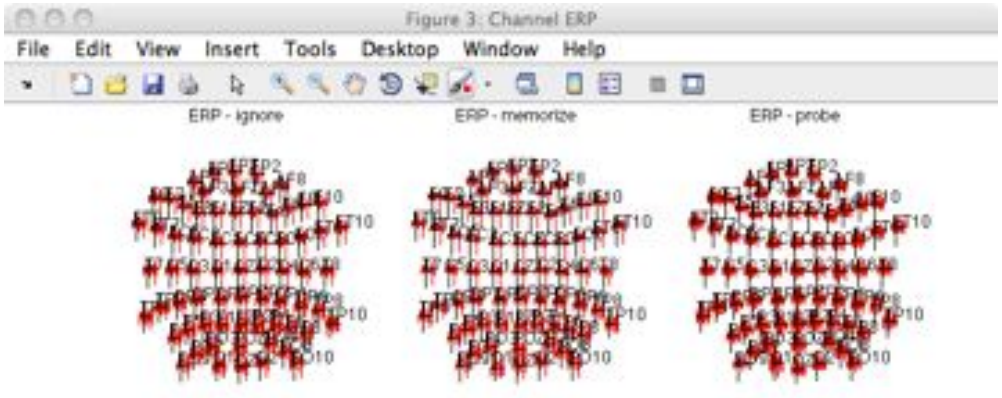


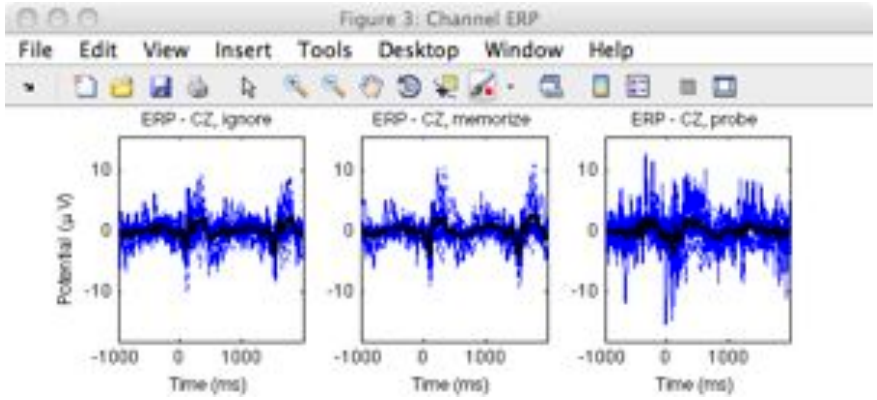
Choose which channel

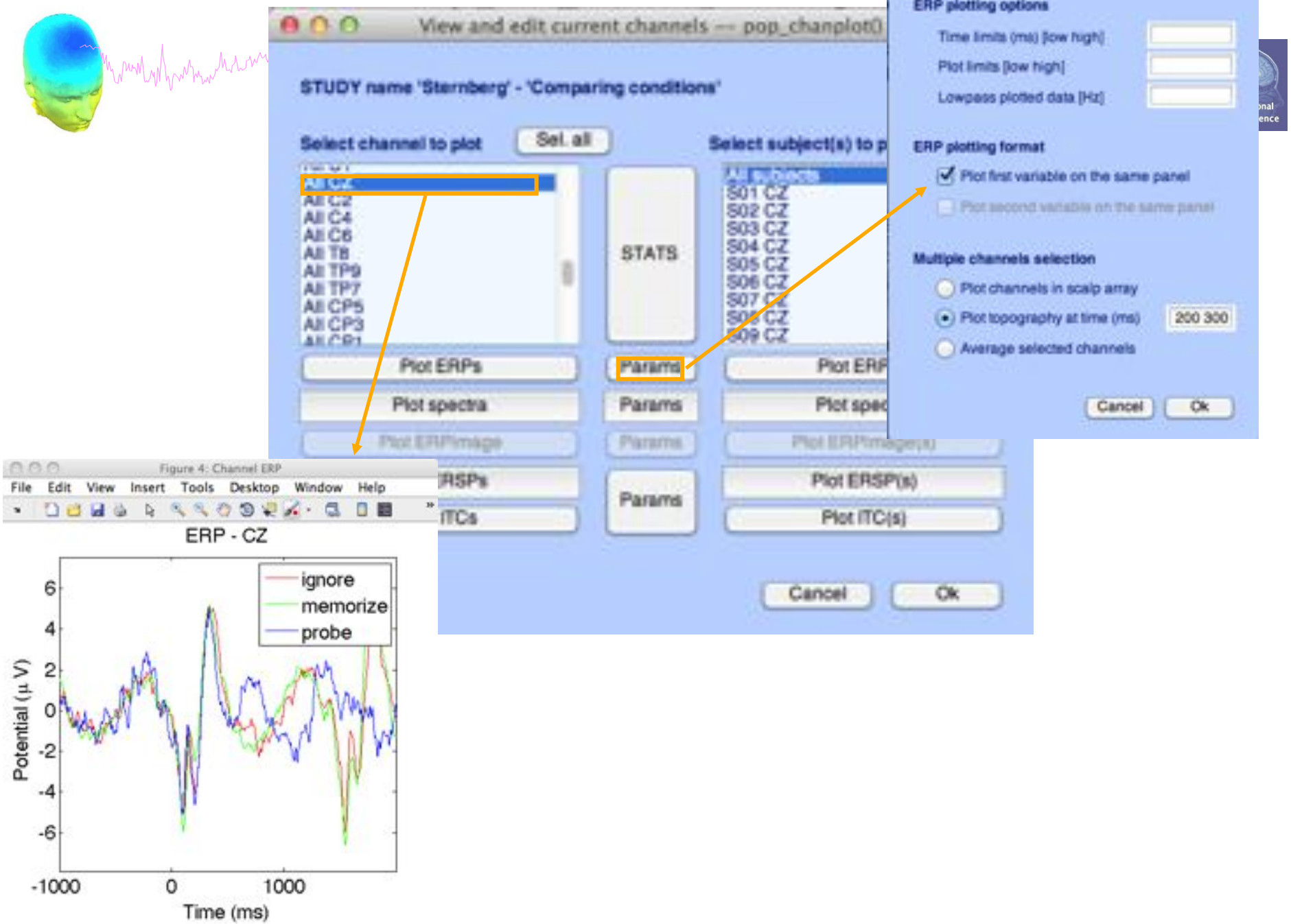


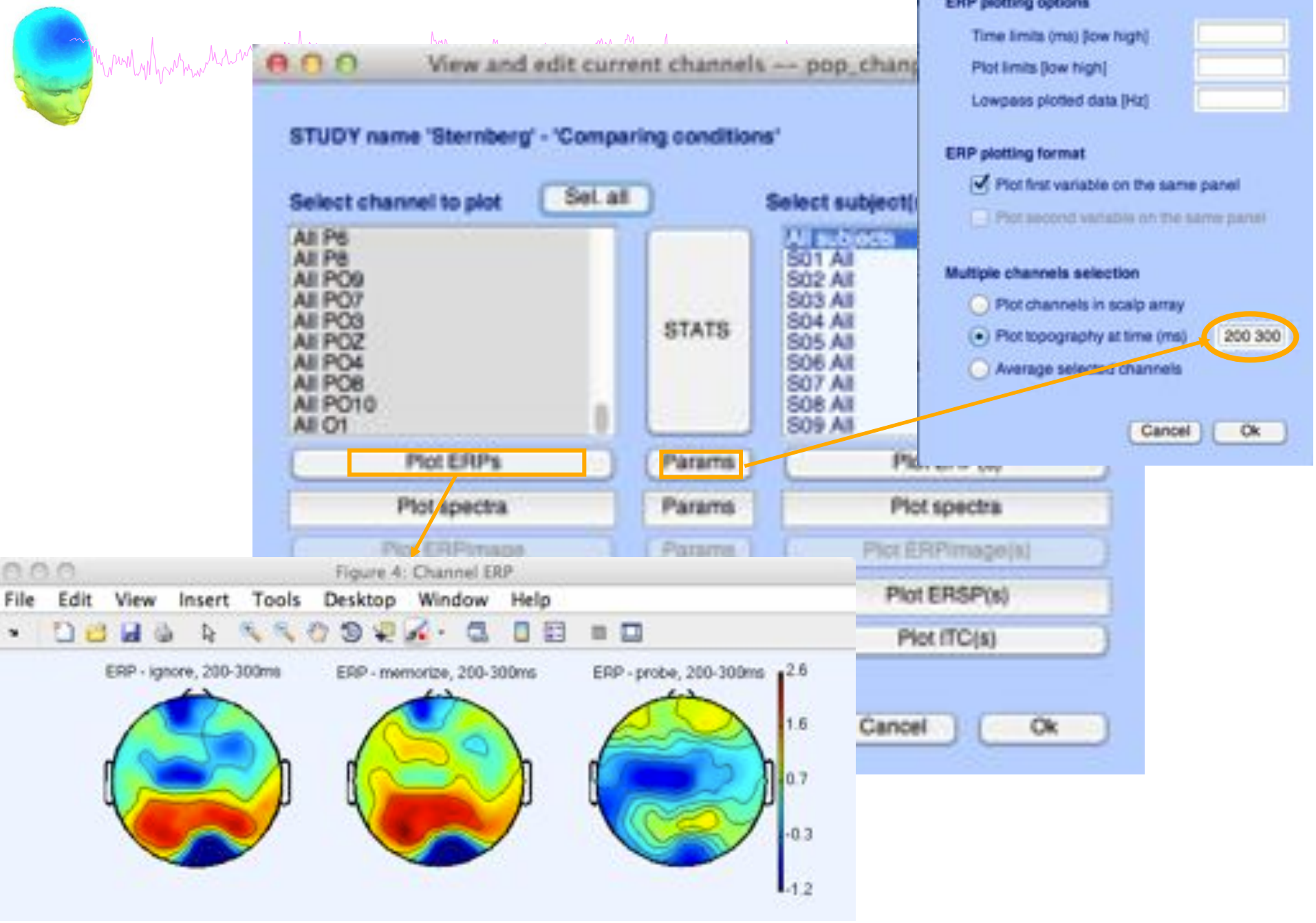
Choose which subject

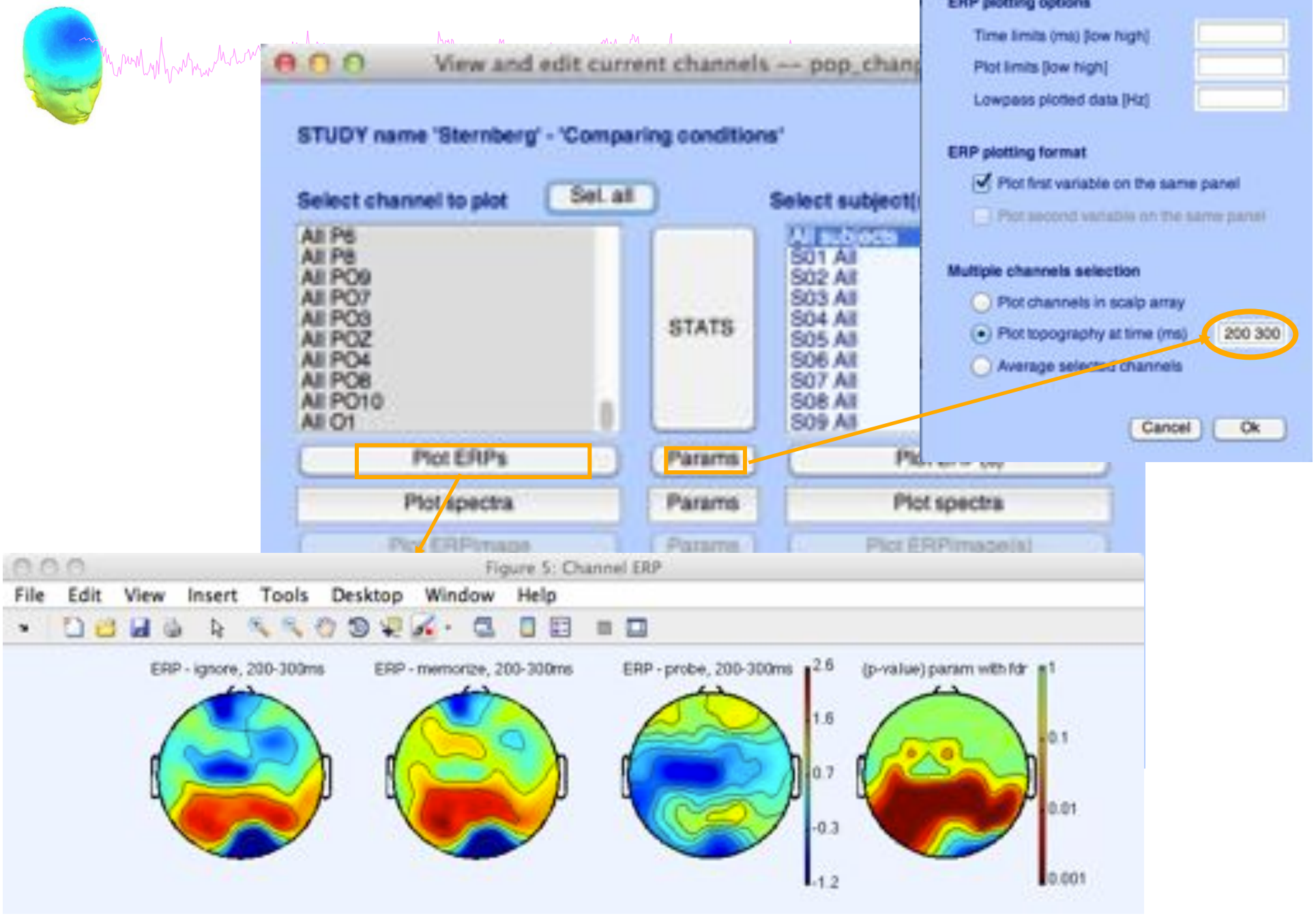




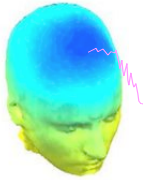


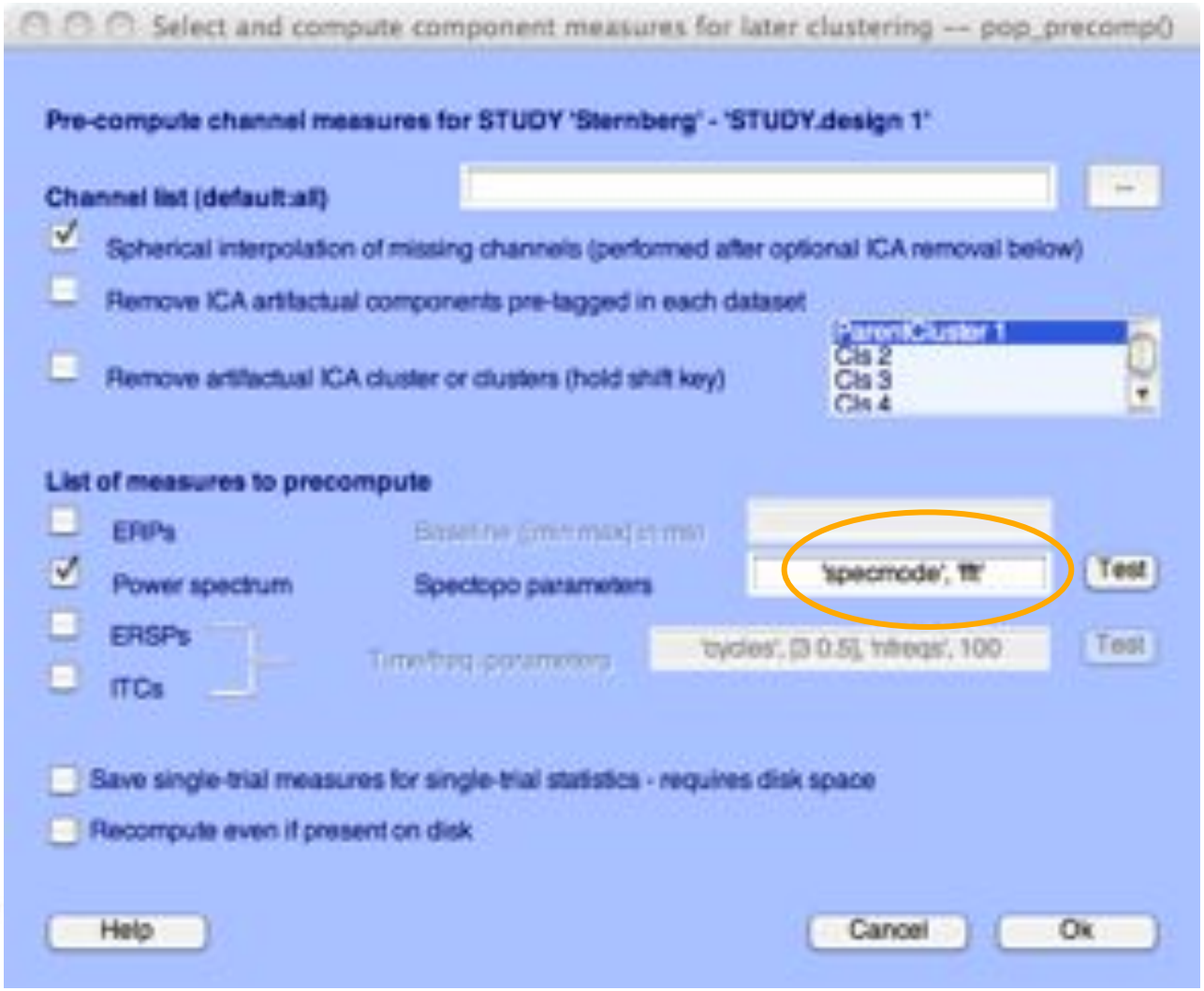

View and edit current channels -- pop_chanplot()
STUDY name 'Sternberg' - 'Comparing conditions'
Select channel to plot
Sel. all
Select subject(s) to p
STATS
Plot ERPs
Params
Plot spectra
Params
Plot ERSP(s)
Params
Plot ITC(s)
Cancel
Ok
ERP plotting options -- pop_erppar...
ERP plotting options
Time limits (ms) [low high]
Plot limits [low high]
Lowpass plotted data [Hz]
ERP plotting format
Plot first variable on the same panel
Multiple channels selection
Plot channels in scalp array
Plot topography at time (ms)
200 300
Average selected channels
Cancel
Ok
Figure 4: Channel ERP
File Edit View Insert Tools Desktop Window Help
ERP - CZ
ignore
memorize
probe
Potential (μ V)
Time (ms)

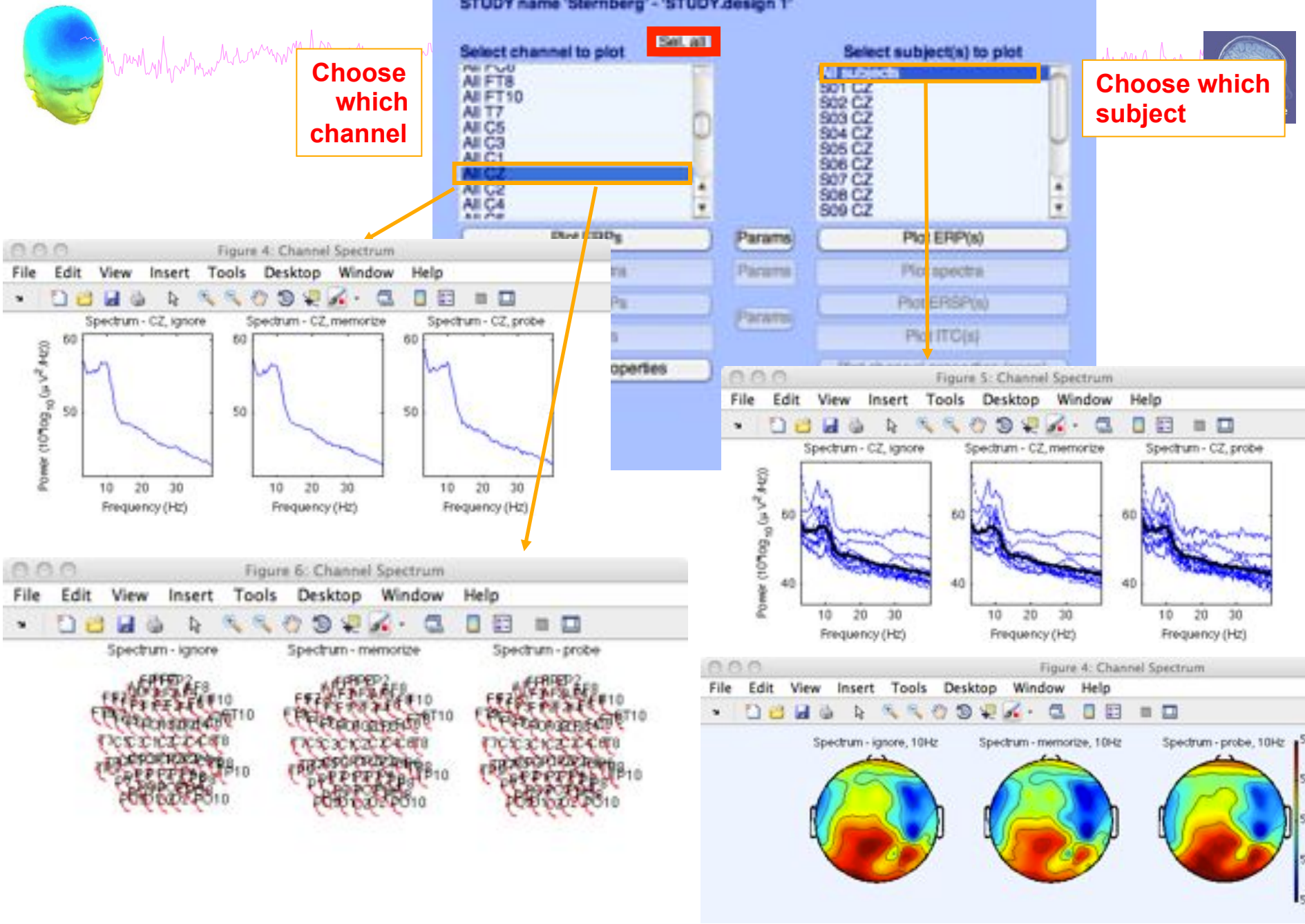

View and edit current channels -- pop_chan
STUDY name 'Sternberg' - 'Comparing conditions'
Select channel to plot
Sel. all
Select subject(
All P6
All P8
All PO9
All PO7
All PO3
All POZ
All PO4
All PO8
All PO10
All O1
STATS
S01 All
S02 All
S03 All
S04 All
S05 All
S06 All
S07 All
S08 All
S09 All
Plot ERPs
Params
Plot spectra
Params
Plot spectra
Plot ERPimage(s)
Plot ERSP(s)
Plot ITC(s)
Cancel
Ok
ERP plotting options -- pop_erppar...
ERP plotting options
Time limits (ms) [low high]
Plot limits [low high]
Lowpass plotted data [Hz]
ERP plotting format
Plot first variable on the same panel
Plot second variable on the same panel
Multiple channels selection
Plot channels in scalp array
Plot topography at time (ms)
200 300
Average selected channels
Cancel
Ok
Figure 4: Channel ERP
File Edit View Insert Tools Desktop Window Help
ERP - ignore, 200-300ms
ERP - memorize, 200-300ms
ERP - probe, 200-300ms
2.6
1.6
0.7
-0.3
-1.2


View and edit current channels -- pop_chang
STUDY name 'Sternberg' - 'Comparing conditions'
Select channel to plot
Sel. all
Select subject(
All P6
All P8
All PO9
All PO7
All PO3
All POZ
All PO4
All PO8
All PO10
All O1
STATS
S01 All
S02 All
S03 All
S04 All
S05 All
S06 All
S07 All
S08 All
S09 All
Plot ERPs
Params
Plot spectra
Params
Plot spectra
ERP plotting options -- pop_erppar...
ERP plotting options
Time limits (ms) [low high]
Plot limits [low high]
Lowpass plotted data [Hz]
ERP plotting format
Plot first variable on the same panel
Multiple channels selection
Plot channels in scalp array
Plot topography at time (ms)
200 300
Average selected channels
Cancel
Ok
Figure 5: Channel ERP
File Edit View Insert Tools Desktop Window Help
ERP - ignore, 200-300ms
ERP - memorize, 200-300ms
ERP - probe, 200-300ms
2.6
1.6
0.7
-0.3
-1.2
(p-value) param with fdr
1
0.1
0.01
0.001

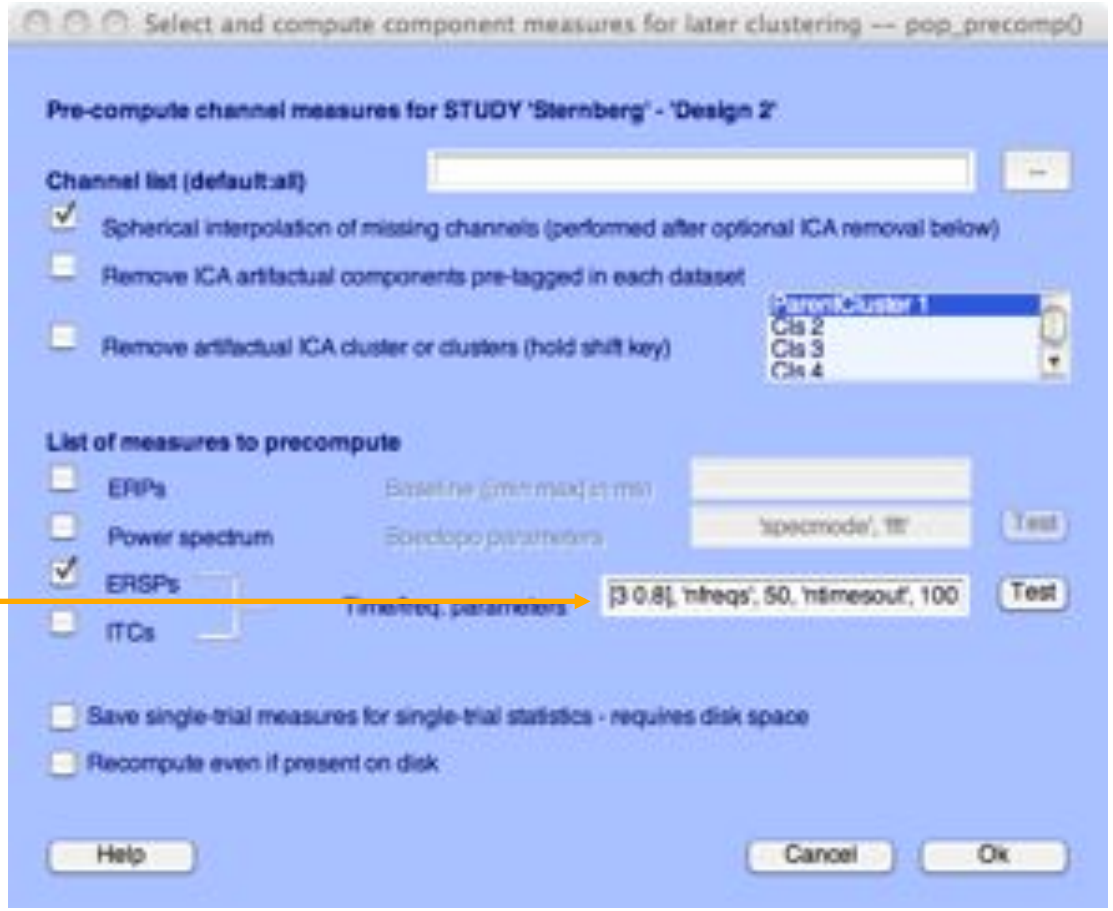
Computing Spectrum



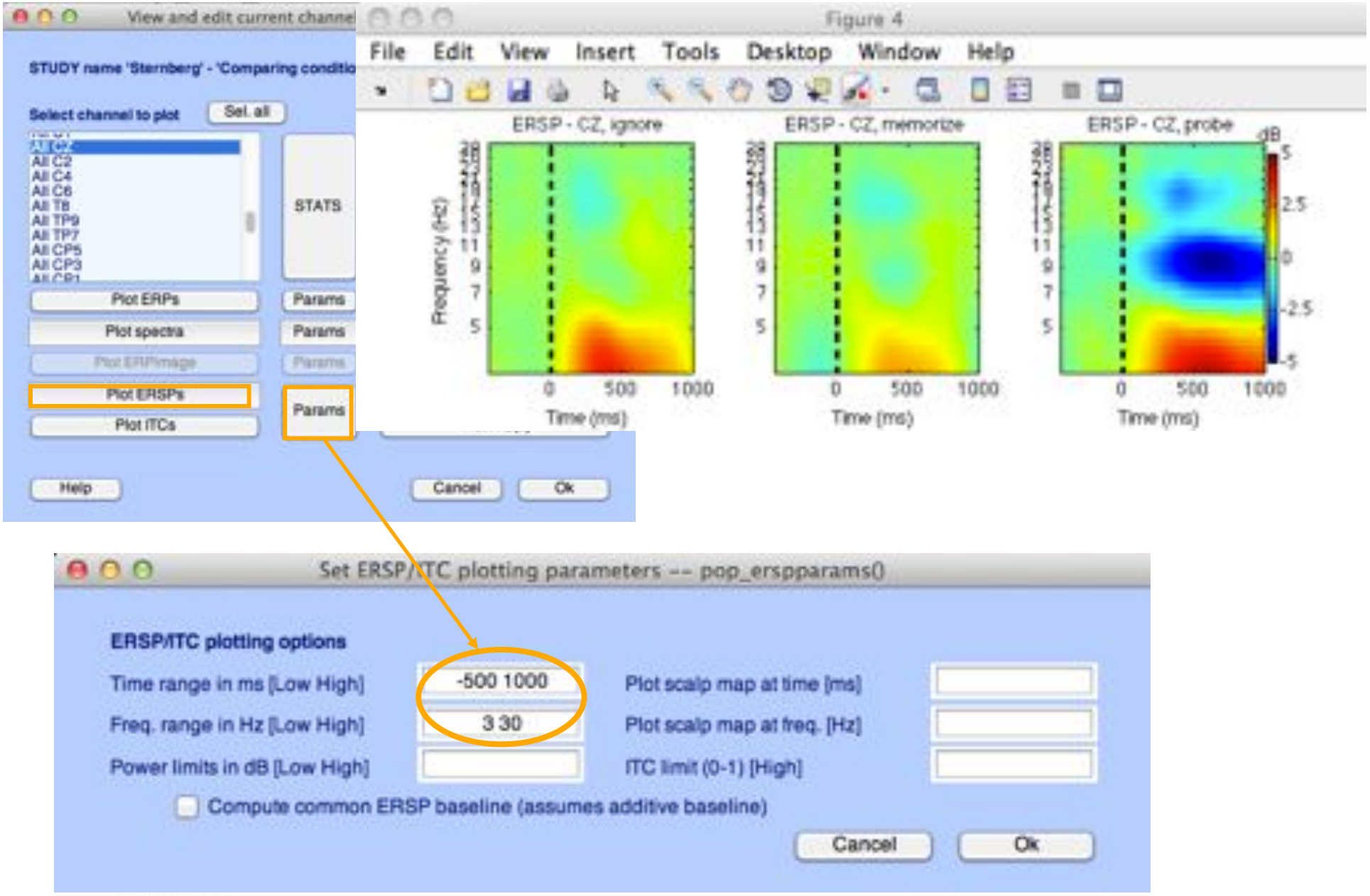



Choose which channel
Choose which subject
View and edit current channels -- pop_chanplot()
STUDY name 'Sternberg' - 'STUDY.design 1'
Select channel to plot
Select all
All FT8
All FT10
All T7
All C5
All C3
All C1
All CZ
All C2
All C4
Select subject(s) to plot
501 CZ
502 CZ
503 CZ
504 CZ
505 CZ
506 CZ
507 CZ
508 CZ
509 CZ
Params
Plot ERP(s)
Plot spectra
Plot ERSP(s)
Plot ITC(s)
Figure 4: Channel Spectrum
File Edit View Insert Tools Desktop Window Help
Spectrum - CZ, ignore
Spectrum - CZ, memorize
Spectrum - CZ, probe
Power (10*log10 (uV^2/Hz))
Frequency (Hz)
Figure 5: Channel Spectrum
Figure 6: Channel Spectrum
Spectrum - ignore
Spectrum - memorize
Spectrum - probe
Figure 4: Channel Spectrum
Spectrum - ignore, 10Hz
Spectrum - memorize, 10Hz
Spectrum - probe, 10Hz

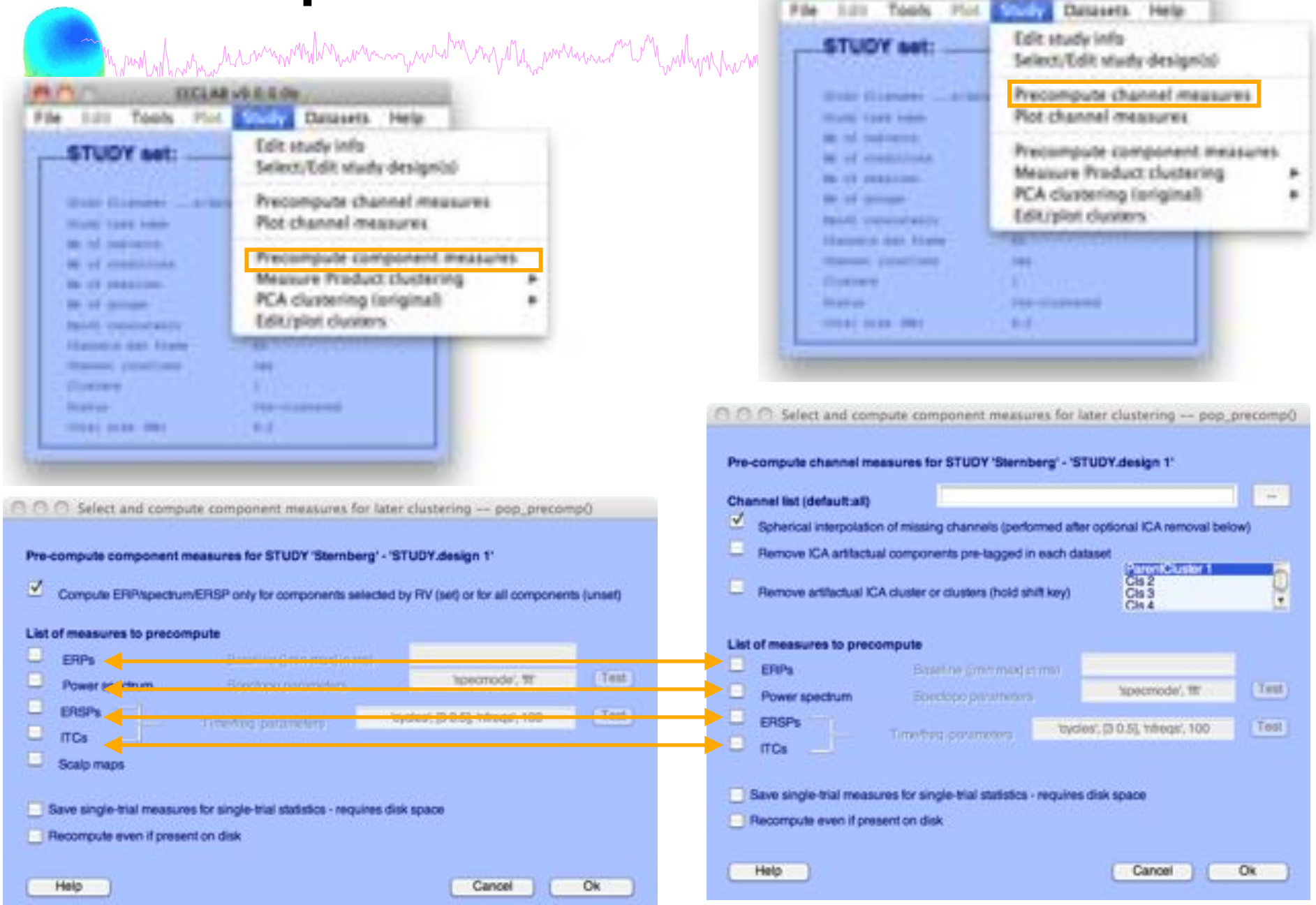
Computing ERSP



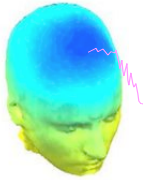
'cycles', [3 0.8], 'nfreqs', 50, 'ntimesout', 100

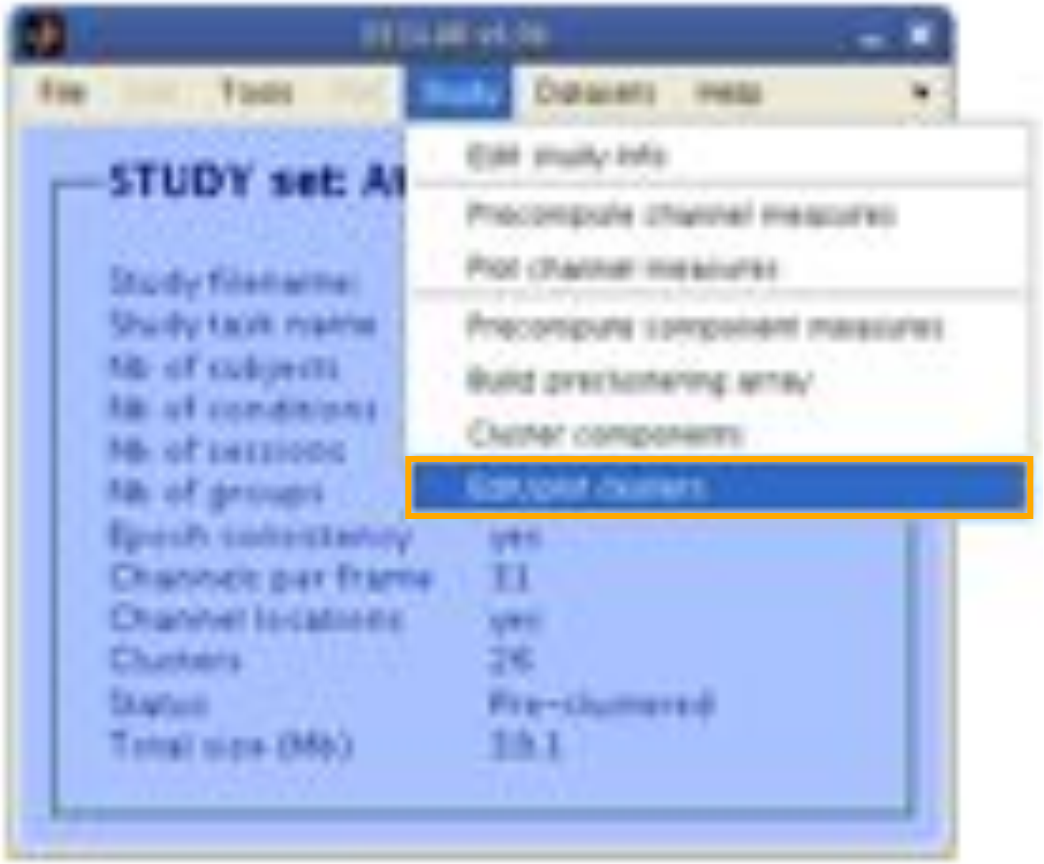

View and edit current channe
STUDY name 'Sternberg' - 'Comparing conditio
Select channel to plot
Sel. all
All C2
All C4
All C6
All T8
All TP9
All TP7
All CP5
All CP3
STATS
Plot ERPs
Params
Plot spectra
Params
Plot ERPimage
Params
Plot ERSPs
Params
Plot ITCs
Help
Cancel
Ok
Figure 4
File Edit View Insert Tools Desktop Window Help
ERSP - CZ, ignore
ERSP - CZ, memorize
ERSP - CZ, probe
Frequency (Hz)
Time (ms)
dB
Set ERSP/ITC plotting parameters -- pop_erspparams()
ERSP/ITC plotting options
Time range in ms [Low High]
-500 1000
Freq. range in Hz [Low High]
3 30
Power limits in dB [Low High]
Plot scalp map at time [ms]
Plot scalp map at freq. [Hz]
ITC limit (0-1) [High]
Compute common ERSP baseline (assumes additive baseline)
Cancel
Ok

Pre-compute measures

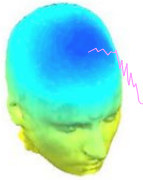


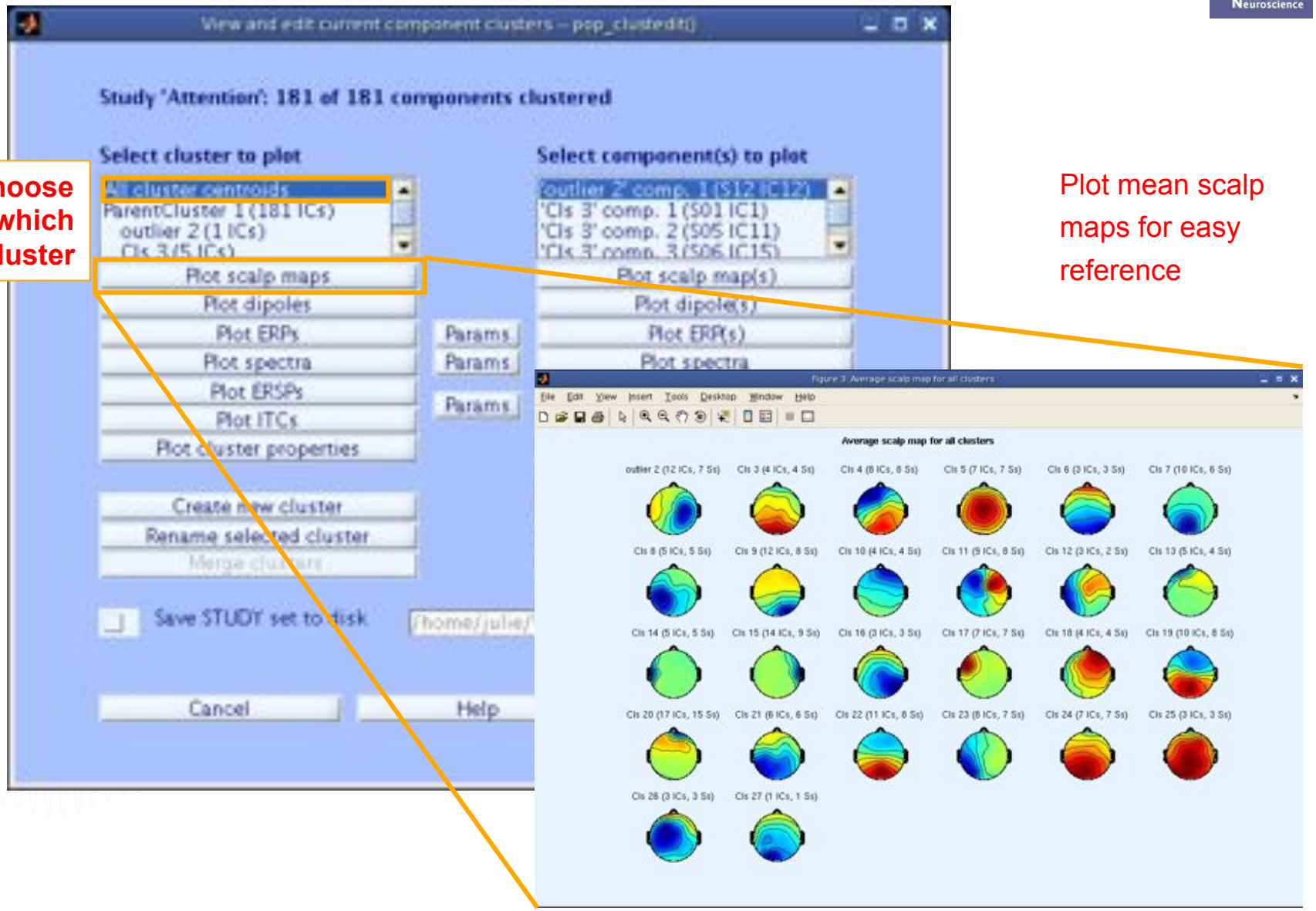
View and edit clusters





Plot cluster data

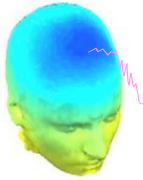


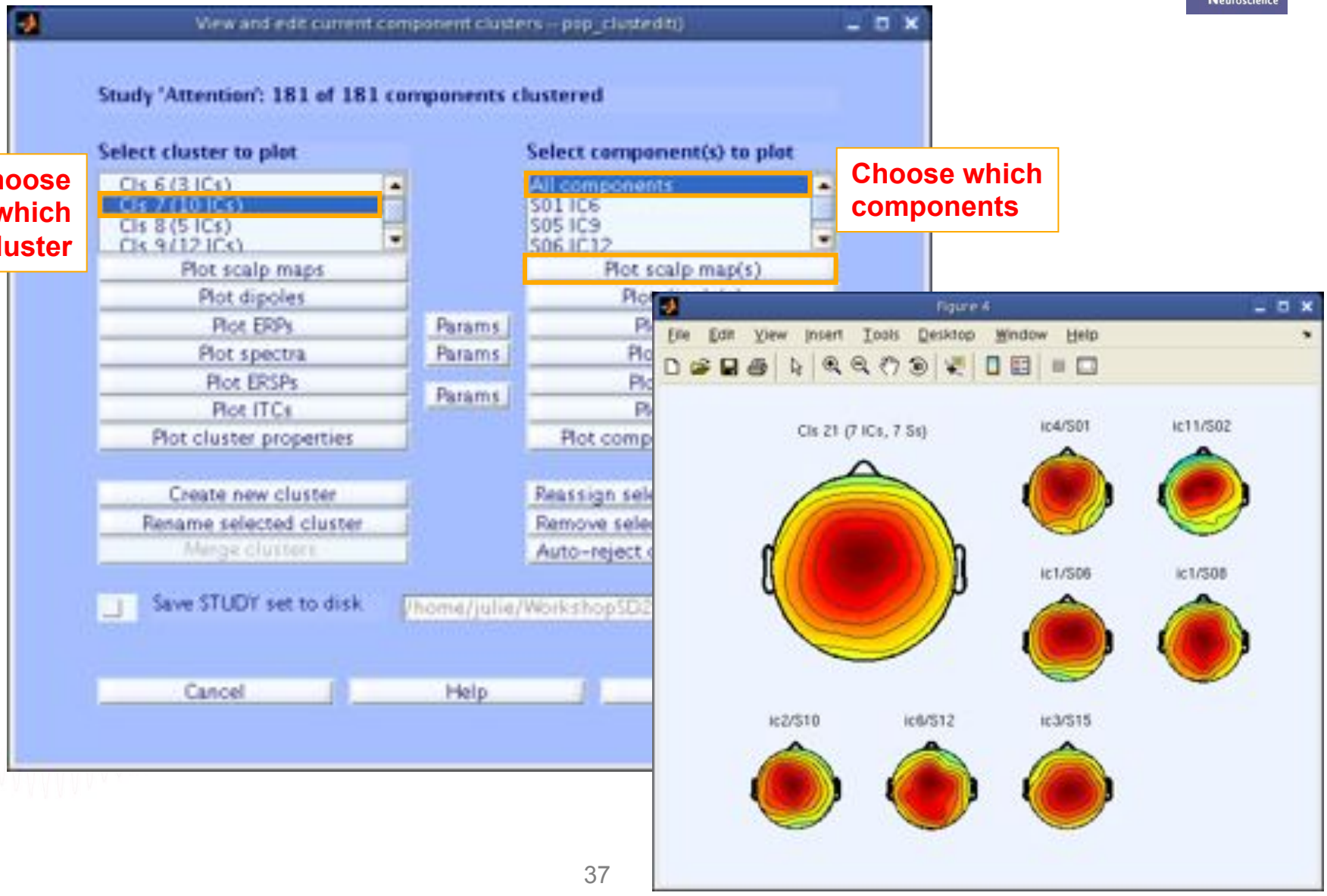


Choose which cluster

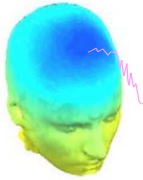
Plot mean scalp maps for easy reference

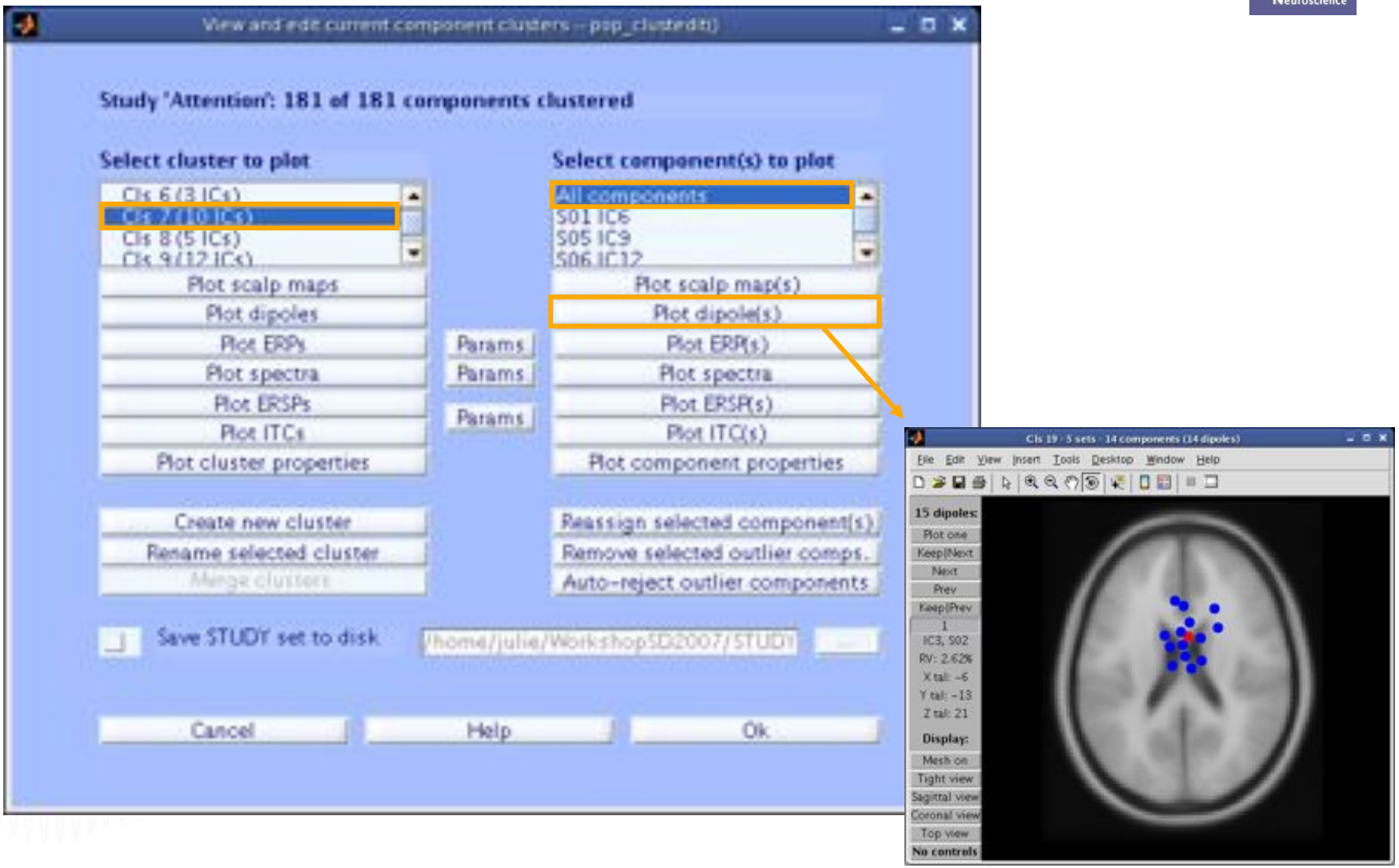
Plot cluster data



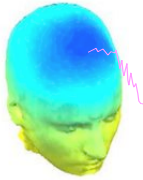


Plot cluster data





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