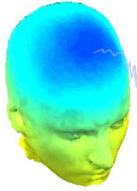


STUDY design and plotting overview



STEP 1

Build a STUDY

STEP 2

Build design(s)

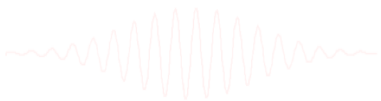
STEP 3

Precompute the data

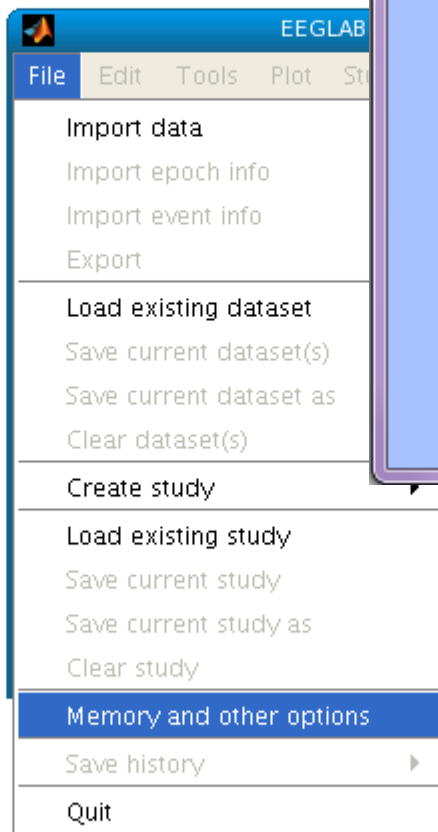
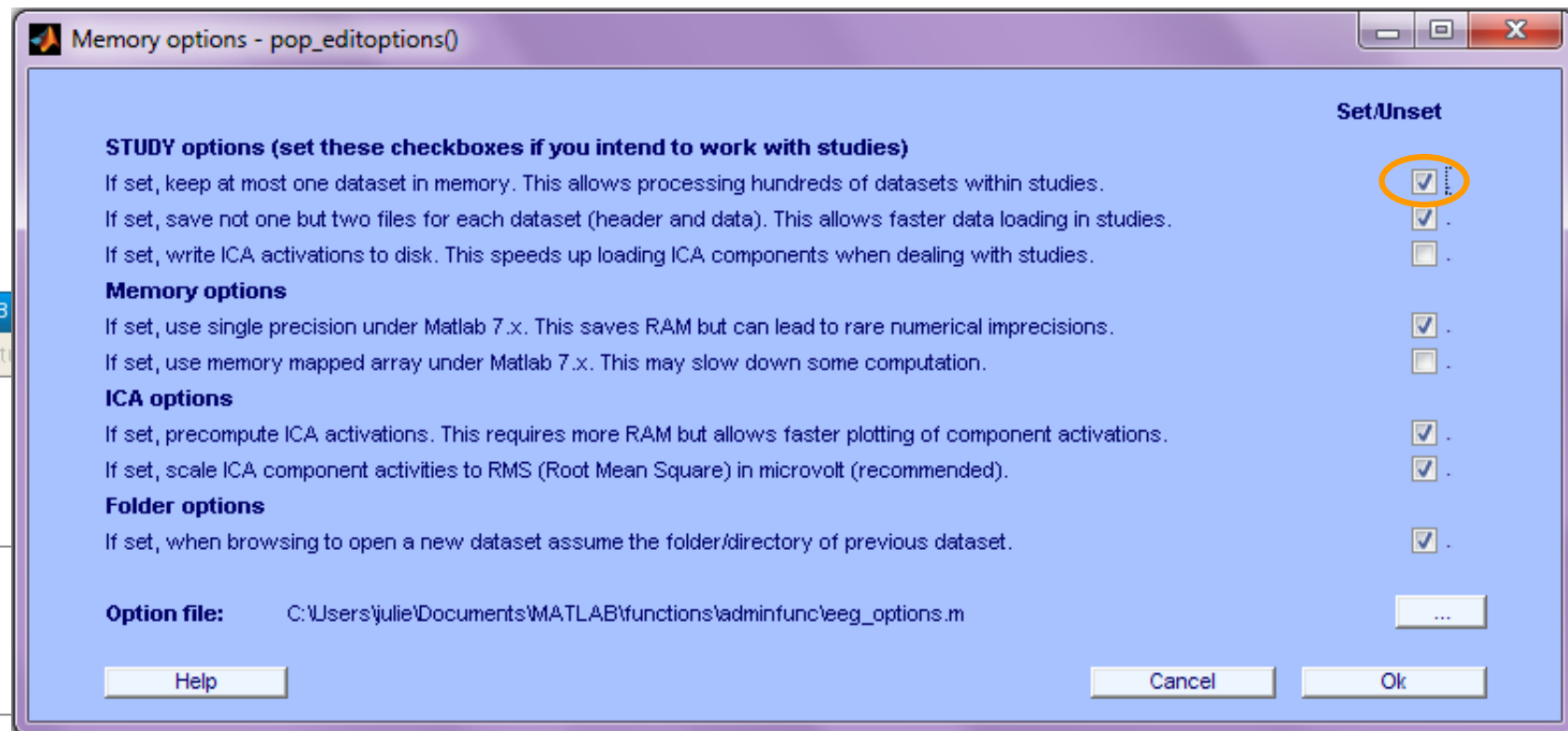
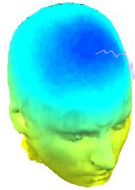
STEP 4

Plot the data

Exercise...

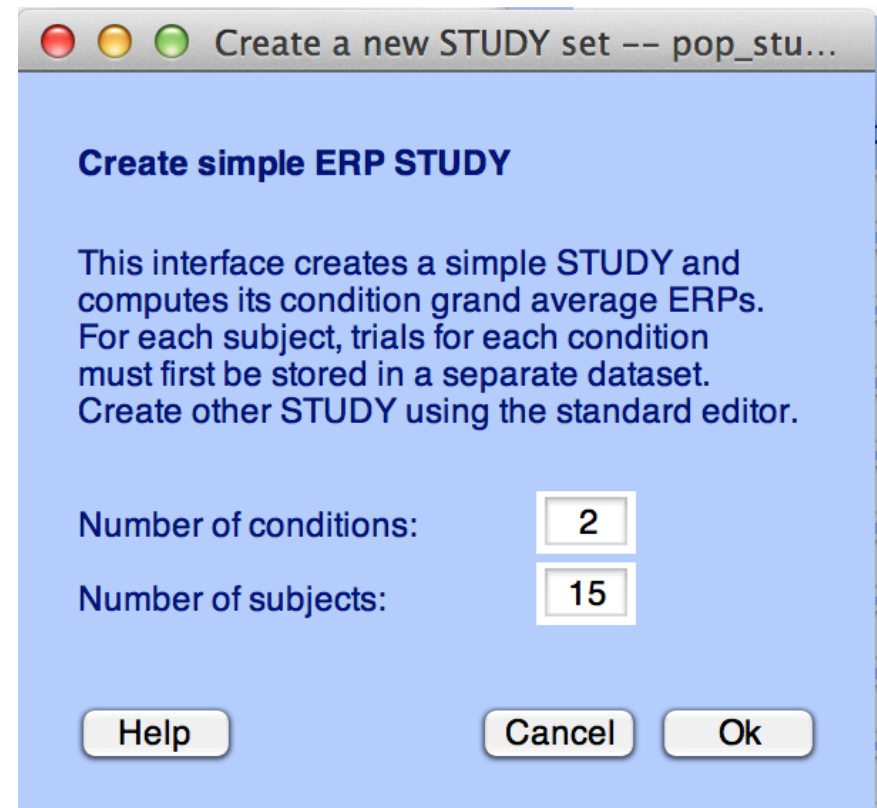
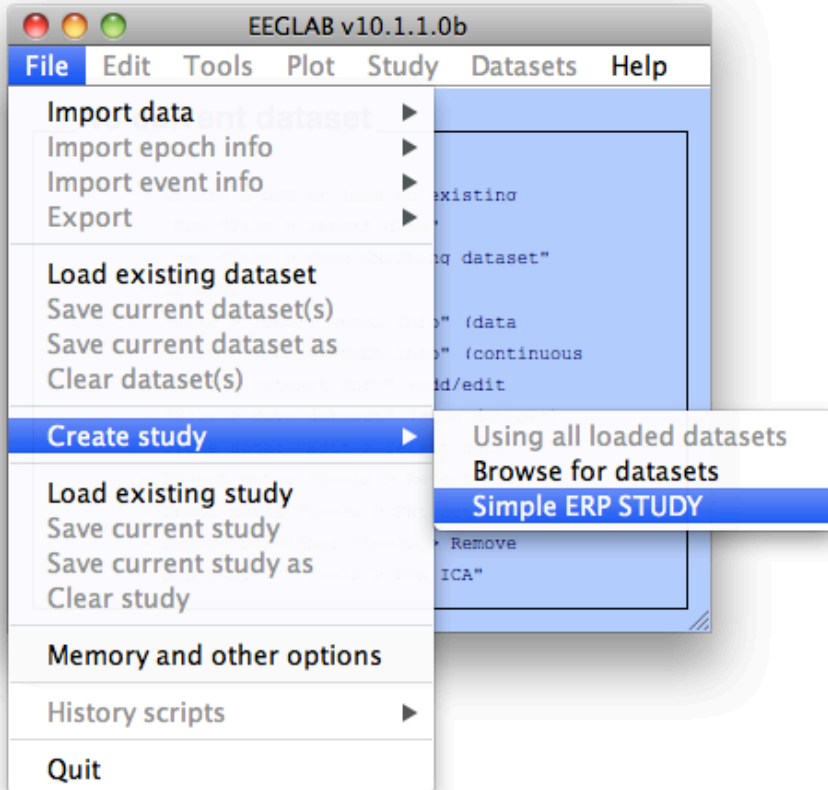
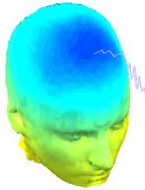


Memory options



**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:

Condition 1 name

Condition 2 name

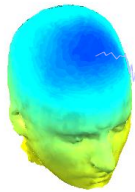
Condition 1 datasets

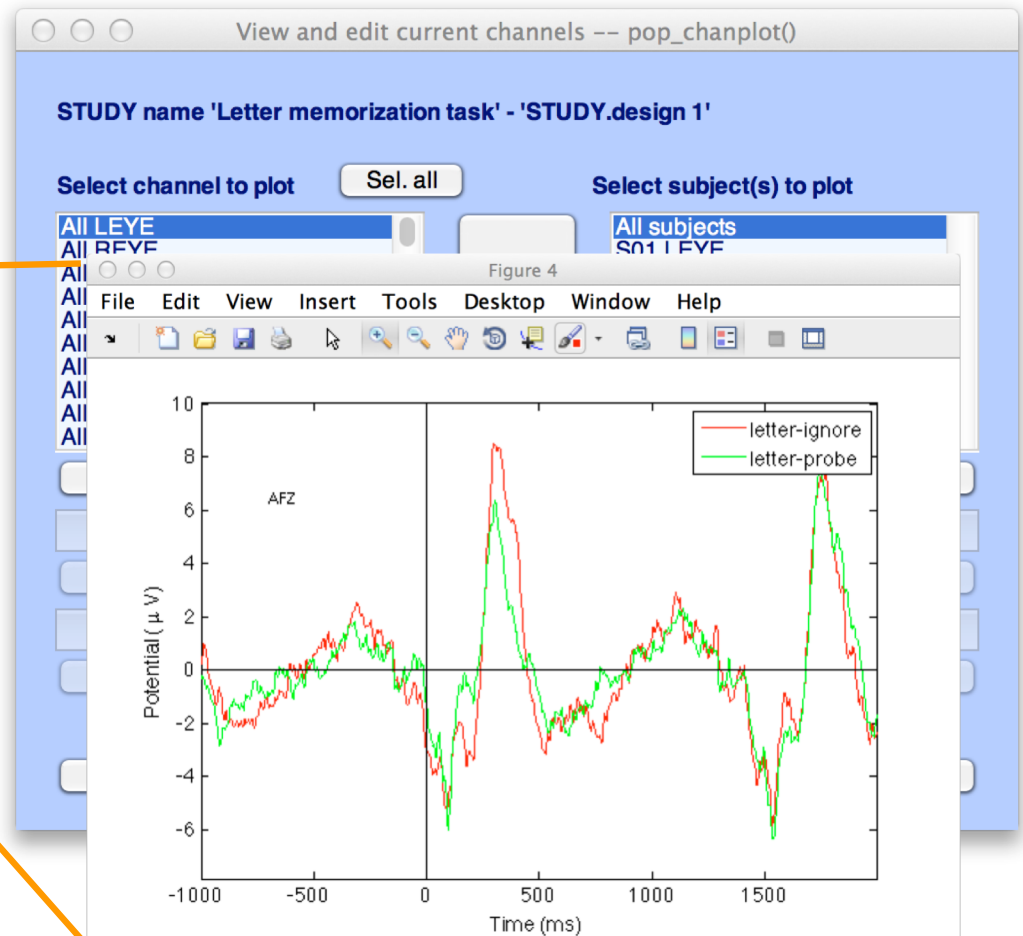
<input type="text" value="/data/STUDY/S01/Ignore.set"/>	<input data-bbox="951 548 1003 589" type="button" value="..."/>
<input type="text" value="/data/STUDY/S02/Ignore.set"/>	<input data-bbox="951 605 1003 646" type="button" value="..."/>
<input type="text" value="/data/STUDY/S03/Ignore.set"/>	<input data-bbox="951 662 1003 703" type="button" value="..."/>
<input type="text"/>	<input data-bbox="951 719 1003 760" type="button" value="..."/>
<input type="text"/>	<input data-bbox="951 776 1003 816" type="button" value="..."/>
<input type="text"/>	<input data-bbox="951 833 1003 873" type="button" value="..."/>
<input type="text"/>	<input data-bbox="951 889 1003 930" type="button" value="..."/>
<input type="text"/>	<input data-bbox="951 946 1003 987" type="button" value="..."/>
<input type="text"/>	<input data-bbox="951 1003 1003 1044" type="button" value="..."/>
<input type="text"/>	<input data-bbox="951 1060 1003 1101" type="button" value="..."/>
<input type="text"/>	<input data-bbox="951 1117 1003 1157" type="button" value="..."/>
<input type="text"/>	<input data-bbox="951 1174 1003 1214" type="button" value="..."/>
<input type="text"/>	<input data-bbox="951 1230 1003 1271" type="button" value="..."/>
<input type="text"/>	<input data-bbox="951 1287 1003 1328" type="button" value="..."/>
<input type="text"/>	<input data-bbox="951 1344 1003 1385" type="button" value="..."/>

Condition 2 datasets

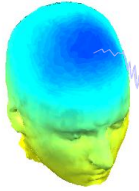
<input type="text" value="/data/STUDY/S01/Memorize.set"/>	<input data-bbox="1549 548 1602 589" type="button" value="..."/>
<input type="text" value="/data/STUDY/S02/Memorize.set"/>	<input data-bbox="1549 605 1602 646" type="button" value="..."/>
<input type="text" value="/data/STUDY/S03/Memorize.set"/>	<input data-bbox="1549 662 1602 703" type="button" value="..."/>
<input type="text"/>	<input data-bbox="1549 719 1602 760" type="button" value="..."/>
<input type="text"/>	<input data-bbox="1549 776 1602 816" type="button" value="..."/>
<input type="text"/>	<input data-bbox="1549 833 1602 873" type="button" value="..."/>
<input type="text"/>	<input data-bbox="1549 889 1602 930" type="button" value="..."/>
<input type="text"/>	<input data-bbox="1549 946 1602 987" type="button" value="..."/>
<input type="text"/>	<input data-bbox="1549 1003 1602 1044" type="button" value="..."/>
<input type="text"/>	<input data-bbox="1549 1060 1602 1101" type="button" value="..."/>
<input type="text"/>	<input data-bbox="1549 1117 1602 1157" type="button" value="..."/>
<input type="text"/>	<input data-bbox="1549 1174 1602 1214" type="button" value="..."/>
<input type="text"/>	<input data-bbox="1549 1230 1602 1271" type="button" value="..."/>
<input type="text"/>	<input data-bbox="1549 1287 1602 1328" type="button" value="..."/>
<input type="text"/>	<input data-bbox="1549 1344 1602 1385" type="button" value="..."/>

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



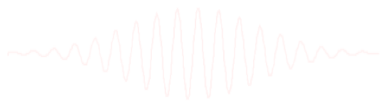


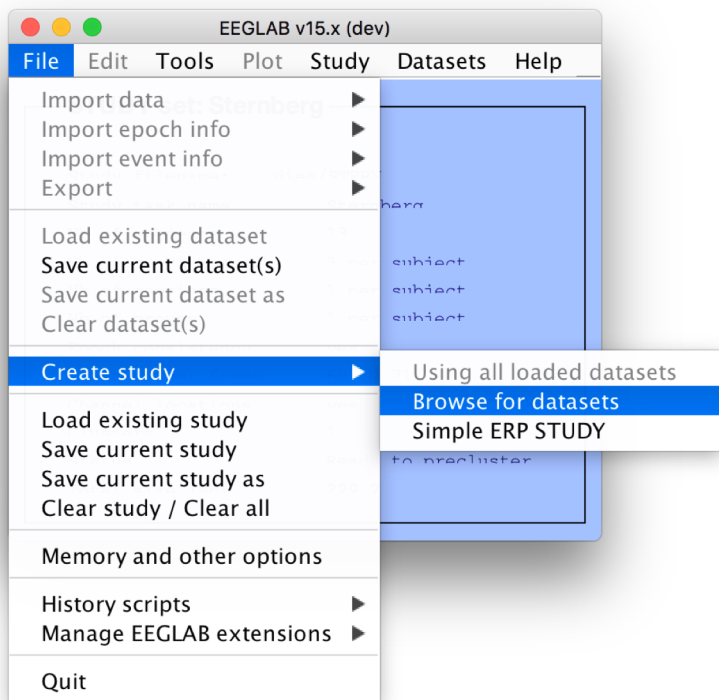
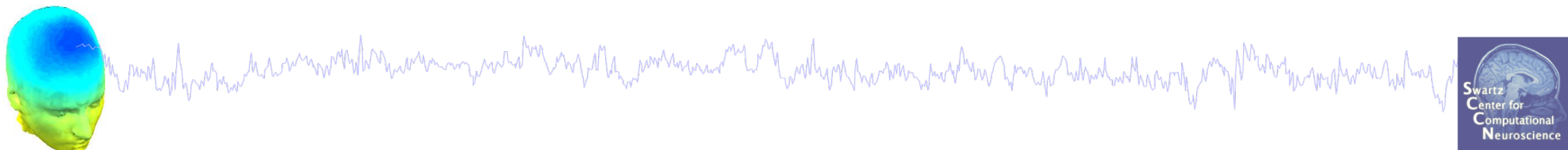
Exercises



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 “memorize.set” for 3 subjects S01, S02, S03 (in the STUDY folder)
5. Press OK.





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:

	dataset filename	browse	subject	session	condition	group	Select by r.v.	
1	/data/oral/EEGLAB/ASPET_2017/L	...	S01	1	memorize	1	Comp.: 3 5 ...	Clear
2	/data/oral/EEGLAB/ASPET_2017/L	...	S01	1	ignore	1	Comp.: 3 5 ...	Clear
3	/data/oral/EEGLAB/ASPET_2017/L	...	S01	1	probe	1	Comp.: 3 5 ...	Clear
4	/data/oral/EEGLAB/ASPET_2017/L	...	S02	1	memorize	1	Comp.: 5 6 ...	Clear
5	/data/oral/EEGLAB/ASPET_2017/L	...	S02	1	ignore	1	Comp.: 5 6 ...	Clear
6	/data/oral/EEGLAB/ASPET_2017/L	...	S02	1	probe	1	Comp.: 5 6 ...	Clear
7	/data/oral/EEGLAB/ASPET_2017/L	...	S03	1	memorize	1	Comp.: 6 8 ...	Clear
8	/data/oral/EEGLAB/ASPET_2017/L	...	S03	1	ignore	1	Comp.: 6 8 ...	Clear
9	/data/oral/EEGLAB/ASPET_2017/L	...	S03	1	probe	1	Comp.: 6 8 ...	Clear
10	/data/oral/EEGLAB/ASPET_2017/L	...	S04	1	memorize	1	Comp.: 1 2 ...	Clear

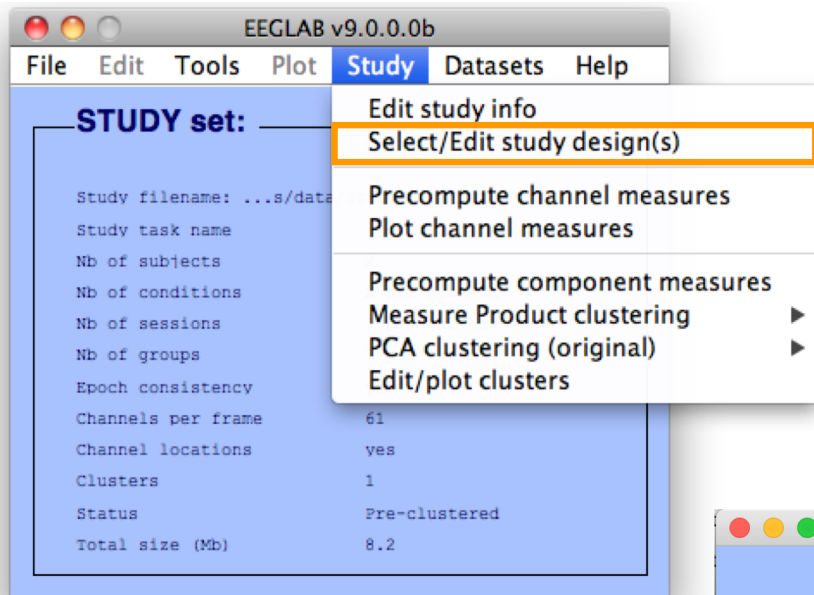
Important note: Removed datasets will not be saved before being deleted from EEGLAB memory

< Page 1 >

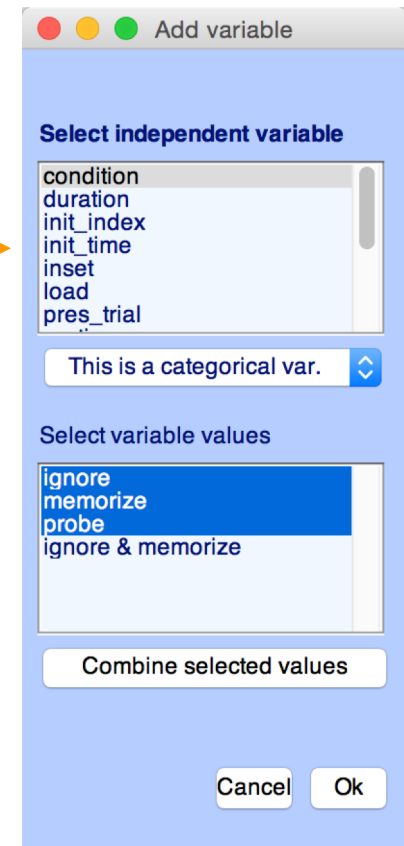
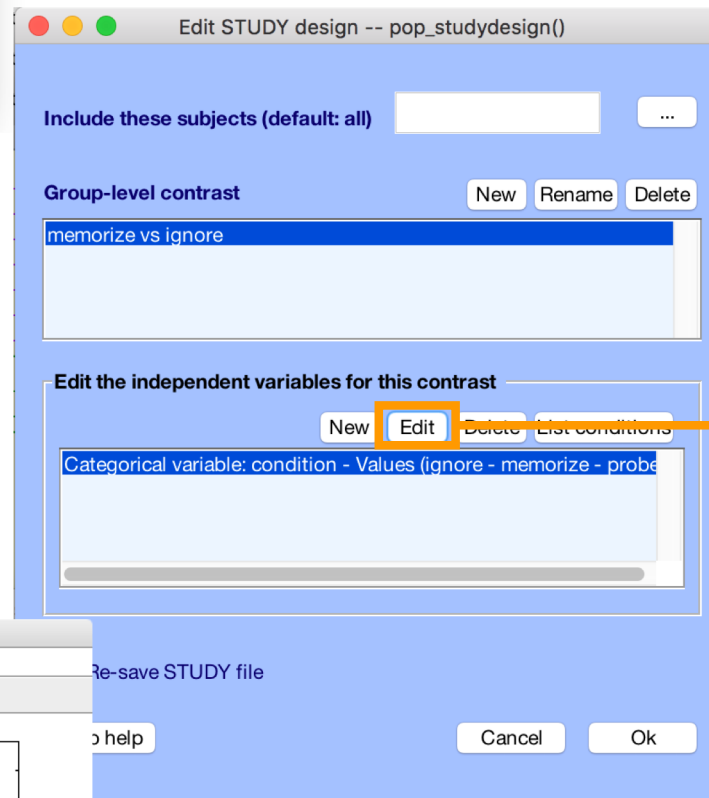
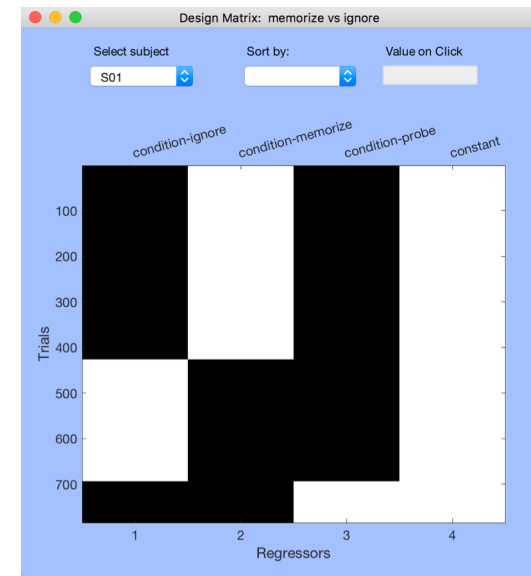
☐ Dataset info (condition, group, ...) differs from study info. [set] = Overwrite dataset info for each dataset on disk.

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

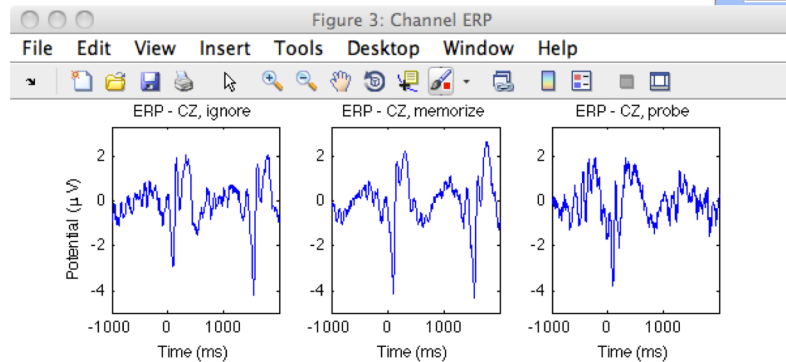
Help Cancel Ok

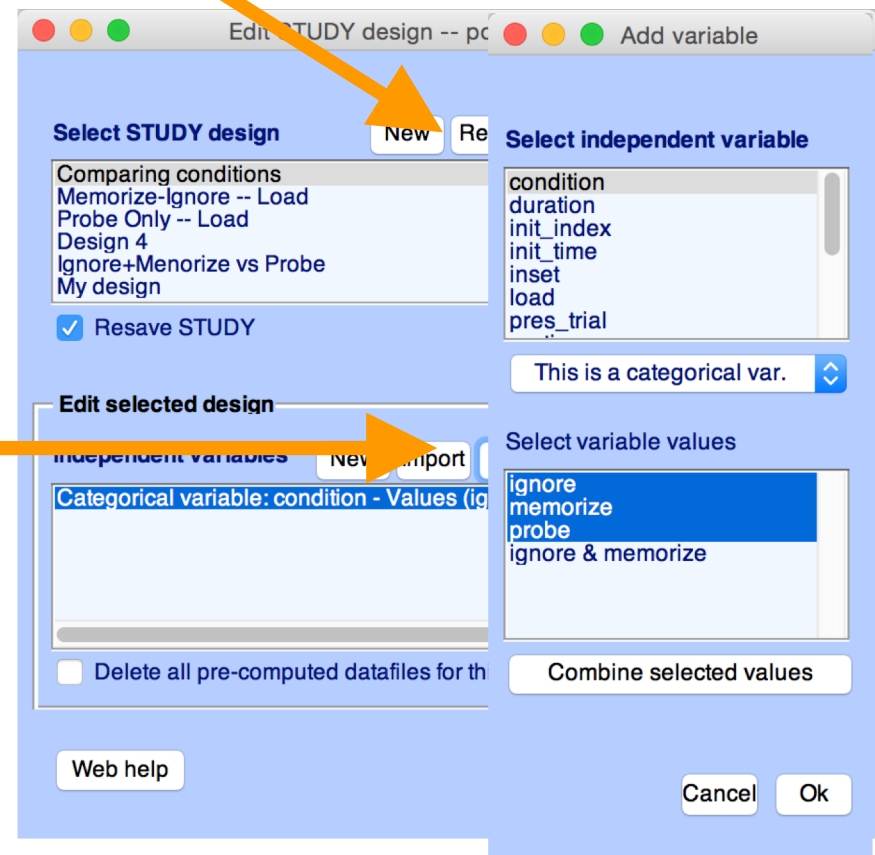
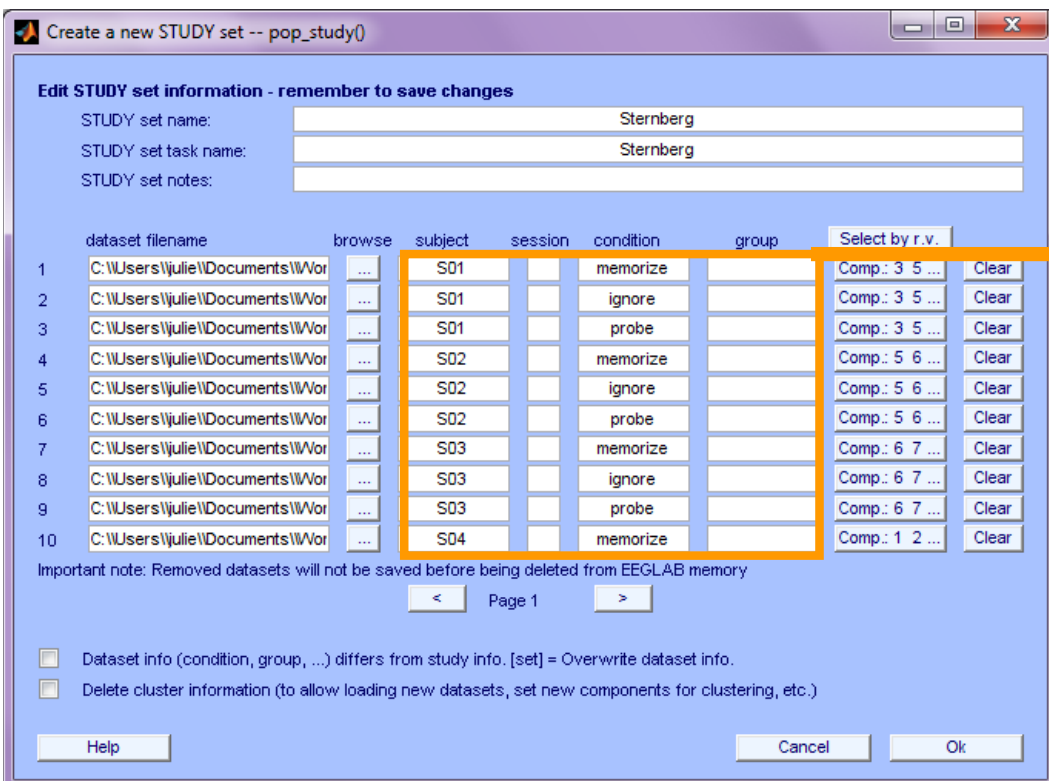
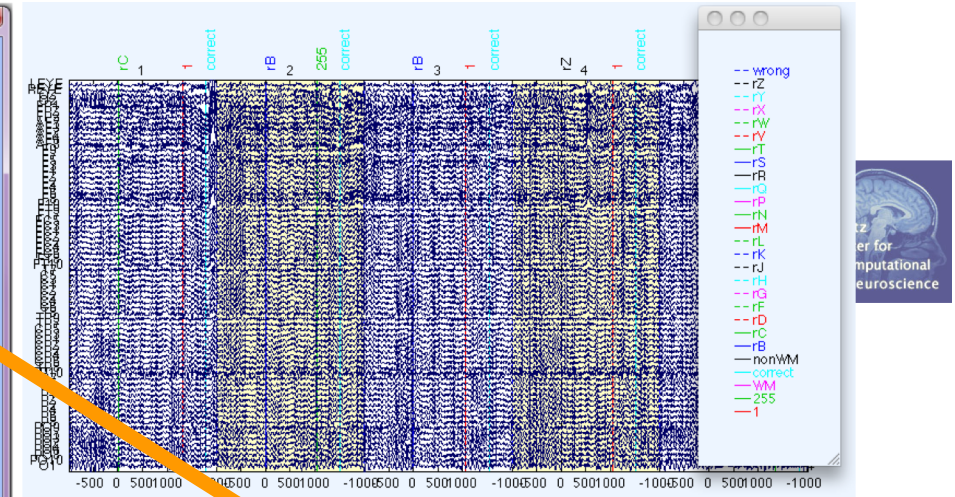
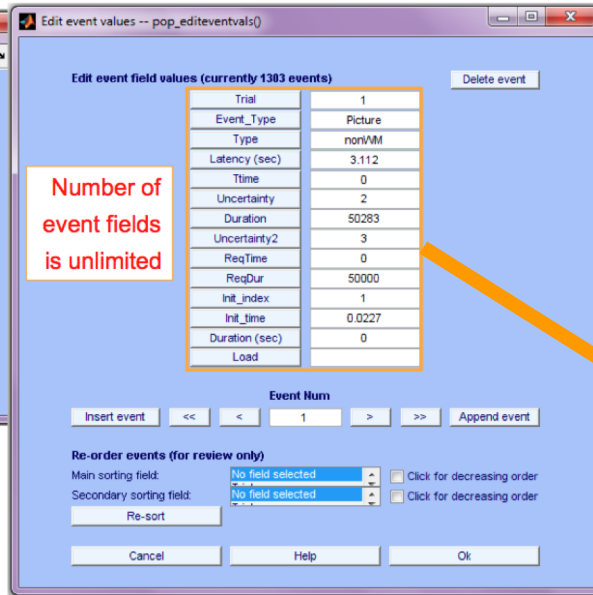
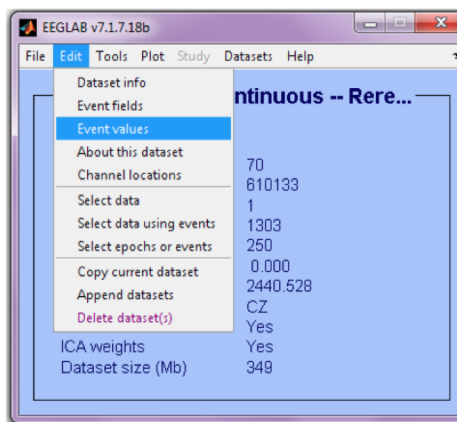


Create design



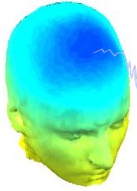
1x3 design





Design independent of # of files per subject

STUDY design and plotting overview



STEP 1

Build a STUDY

STEP 2

Build design(s)

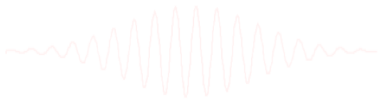
STEP 3

Precompute the data

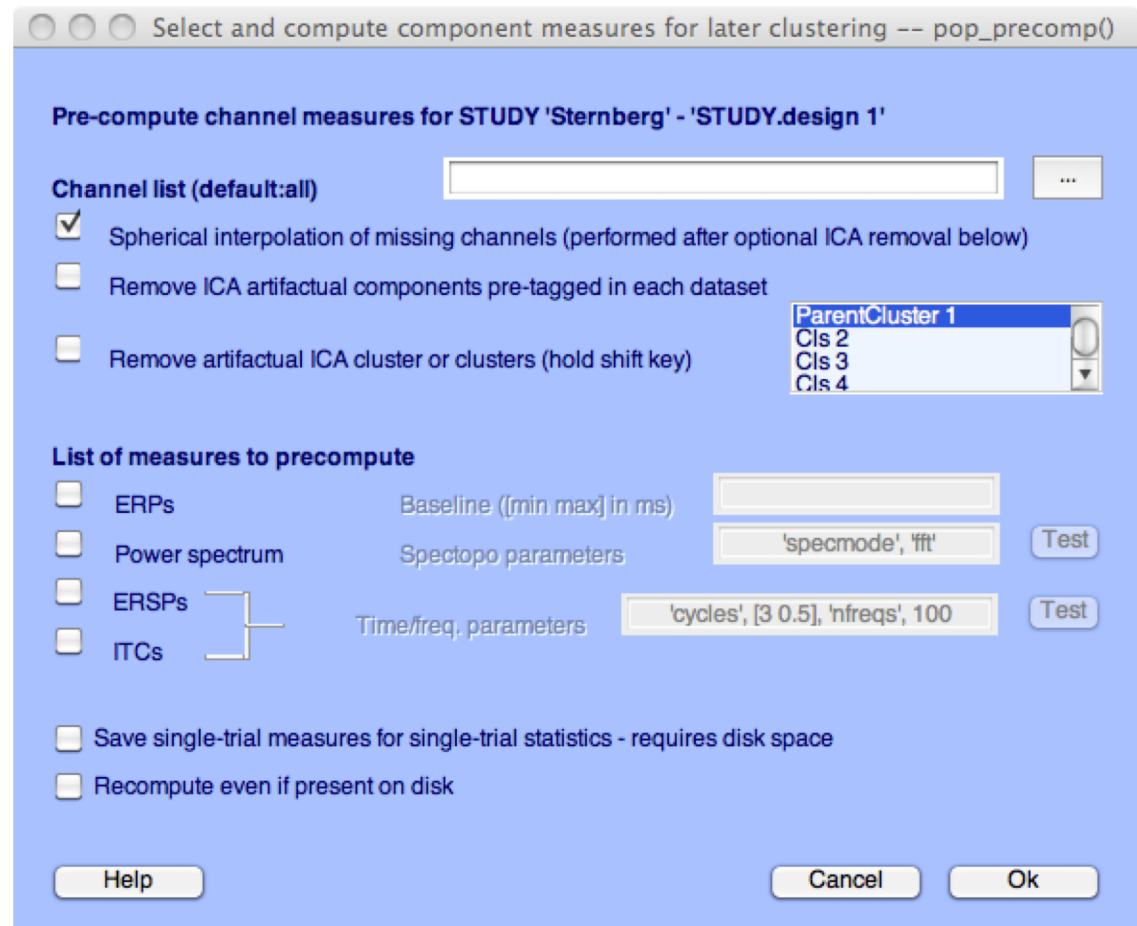
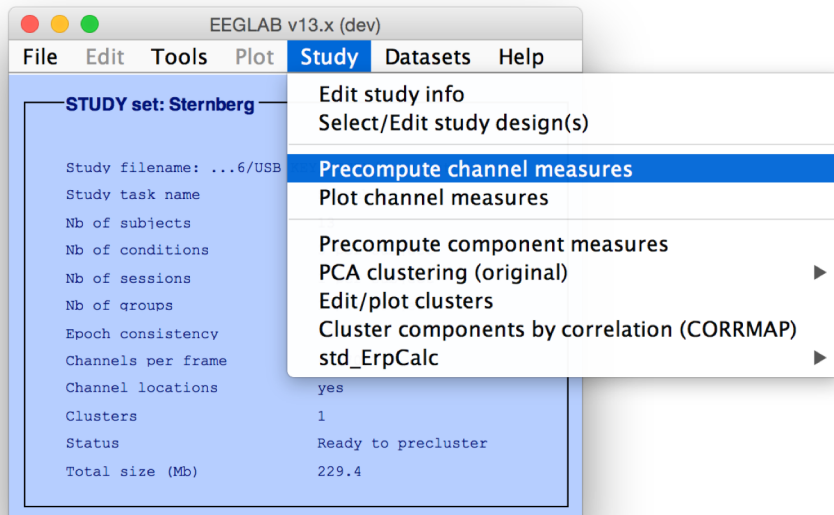
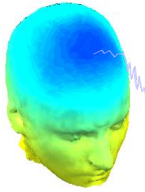
STEP 4

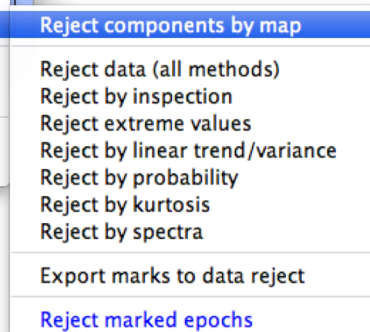
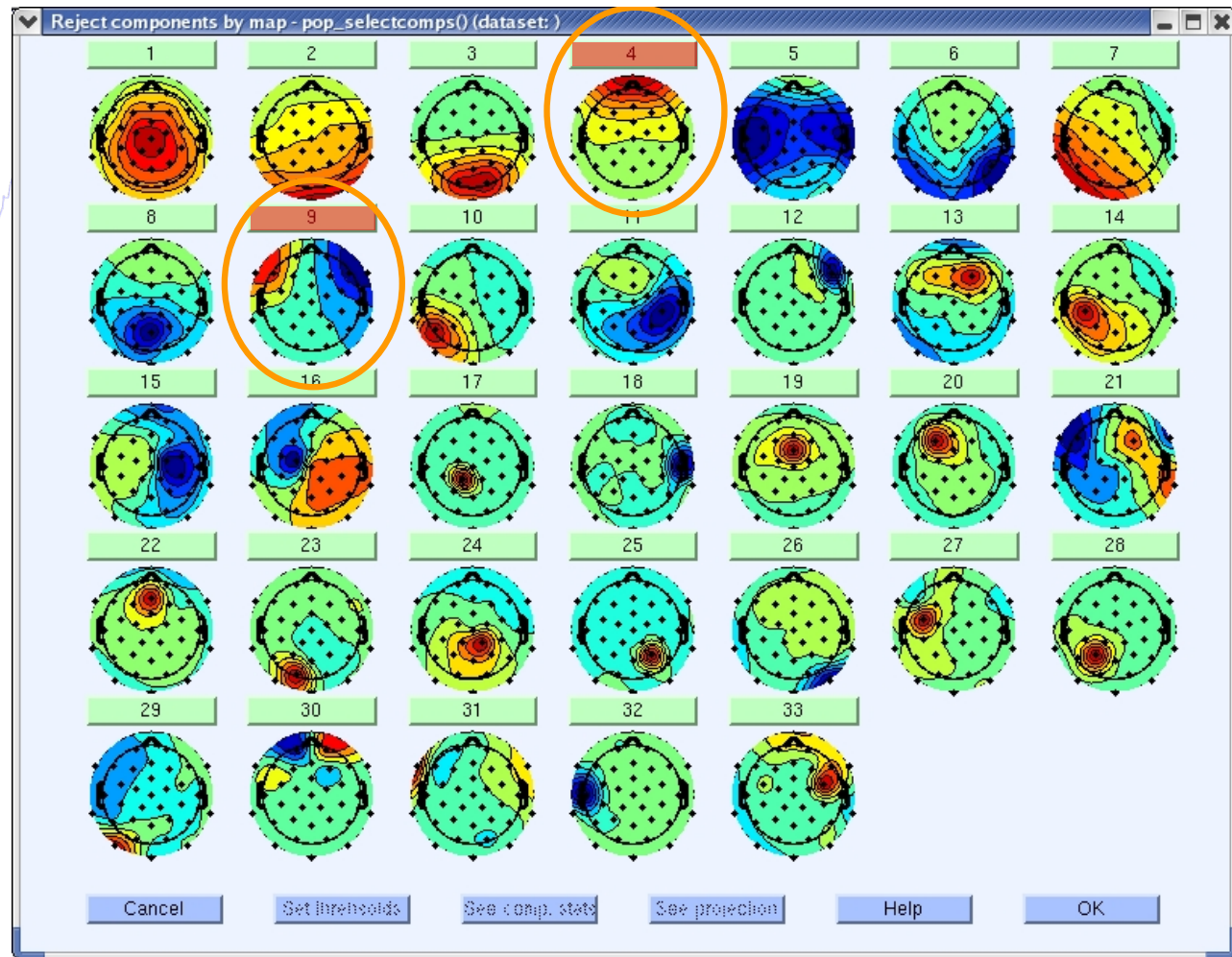
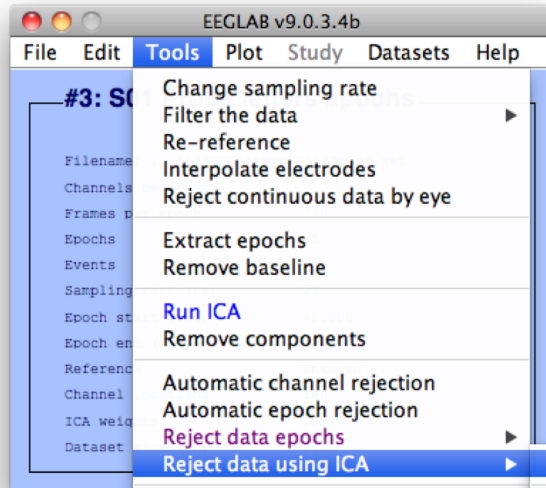
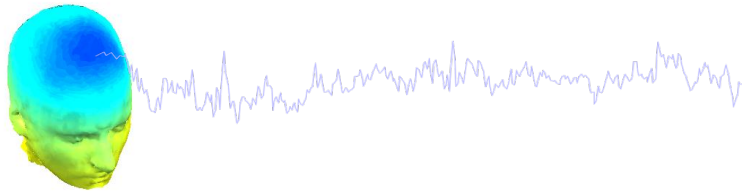
Plot the data

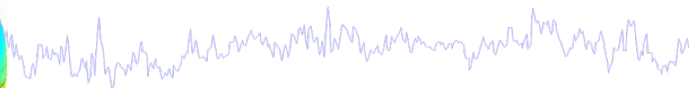
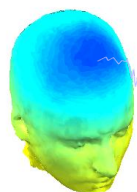
Exercise...



Precompute data measures

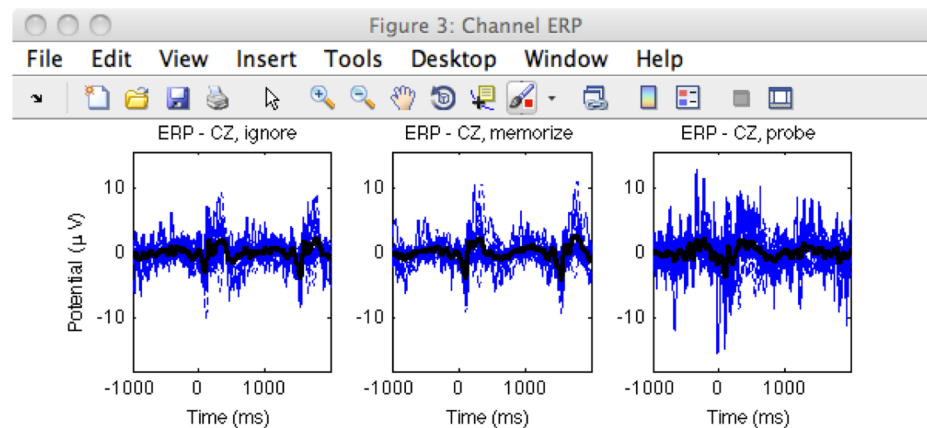
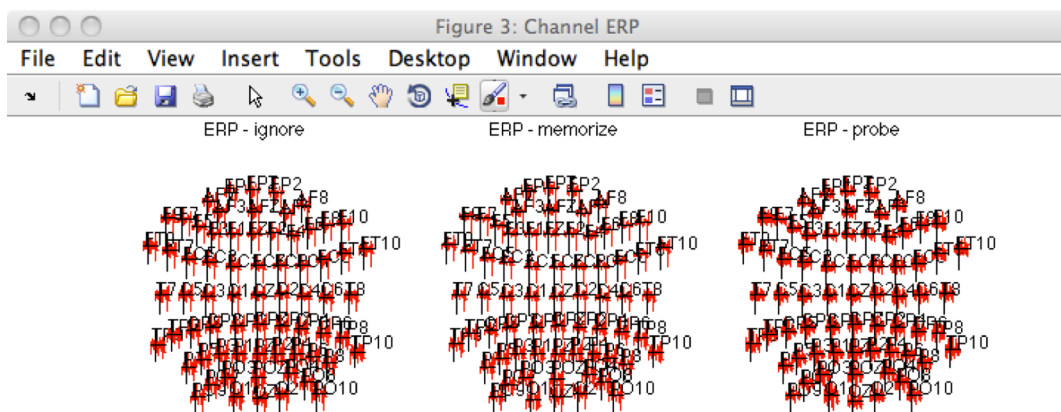
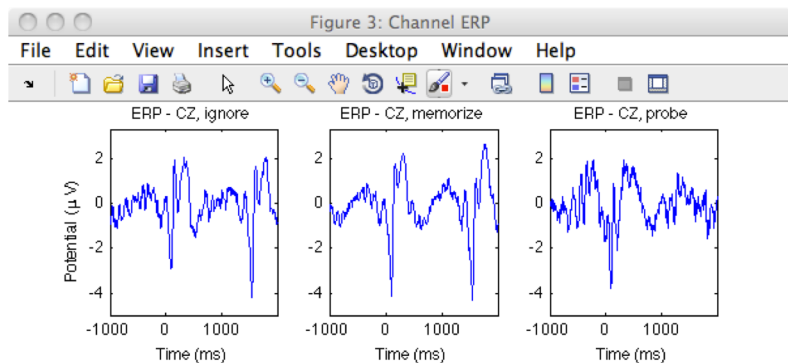
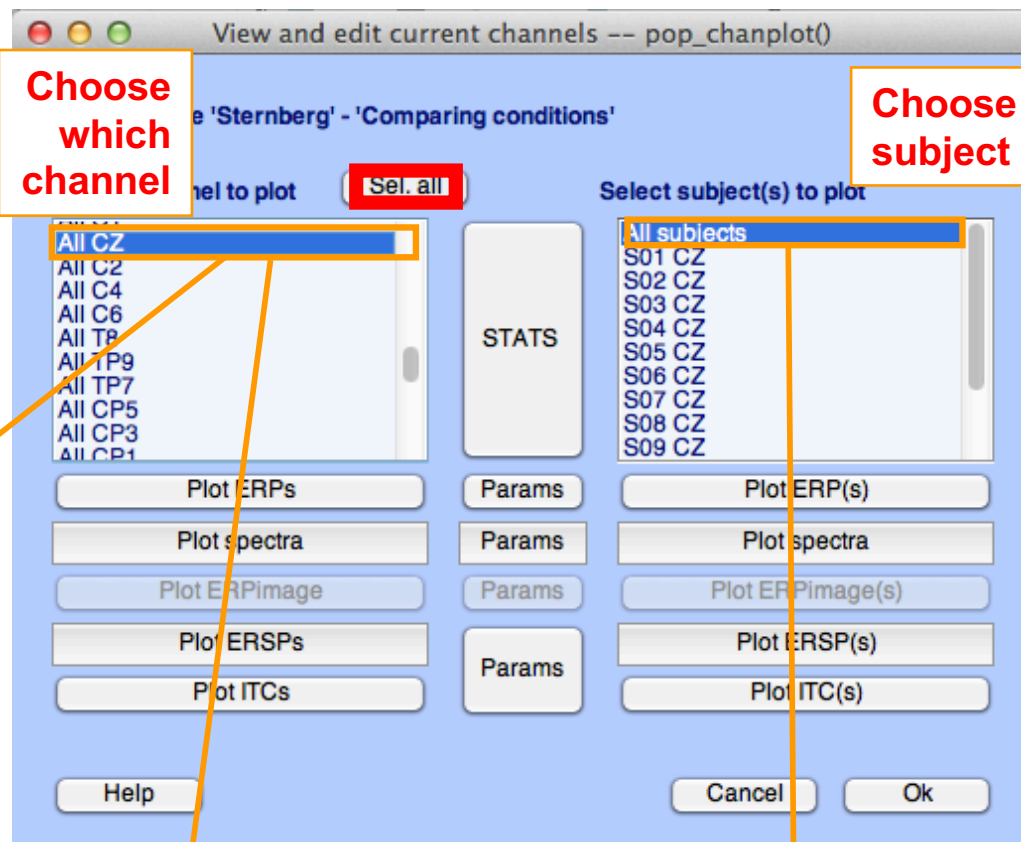


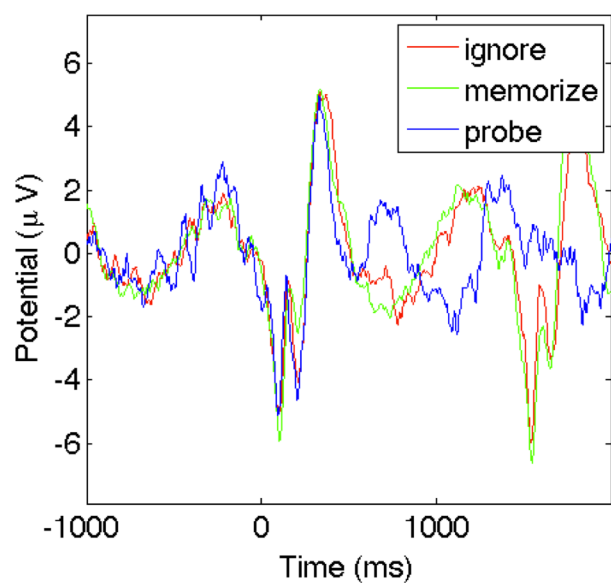
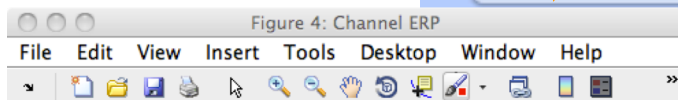
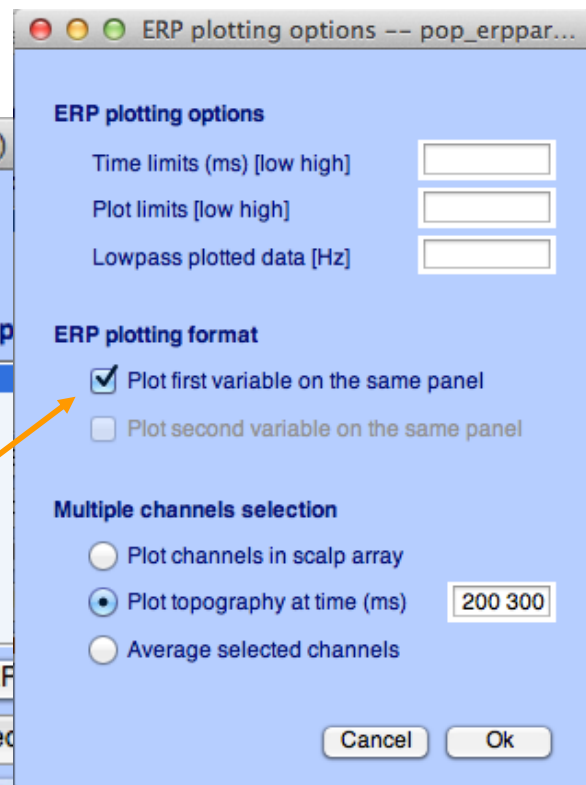
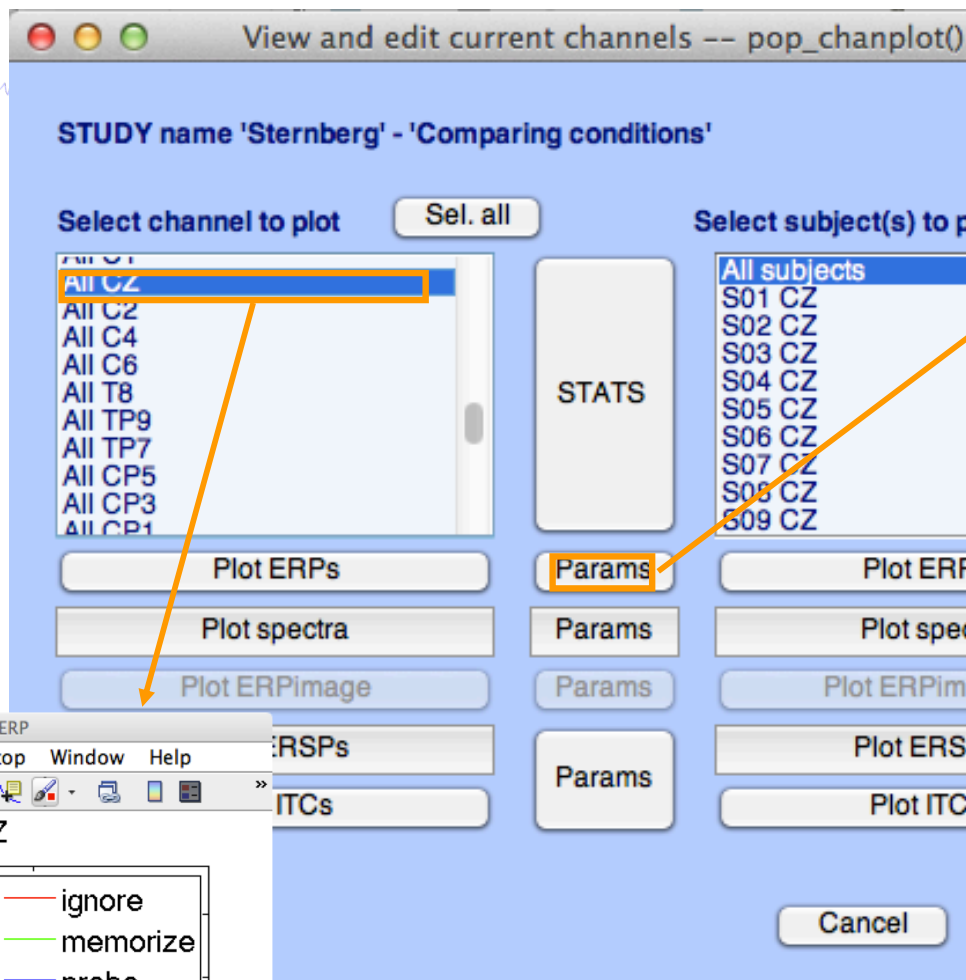
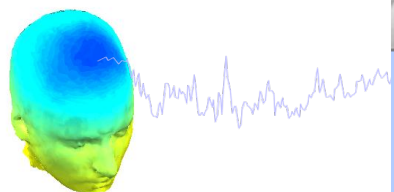


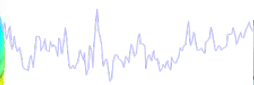
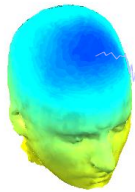


Choose which channel

Choose which subject







View and edit current channels -- pop_chan...

STUDY name 'Sternberg' - 'Comparing conditions'

Select channel to plot Sel. all

All P6
All P8
All PO9
All PO7
All PO3
All POZ
All PO4
All PO8
All PO10
All O1

STATS

Select subject(s)

All subjects
S01 All
S02 All
S03 All
S04 All
S05 All
S06 All
S07 All
S08 All
S09 All

Plot ERPs
Plot spectra
Plot ERPimage
Plot ERSPs
Plot ITCs

Params
Params
Params
Params

Help

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

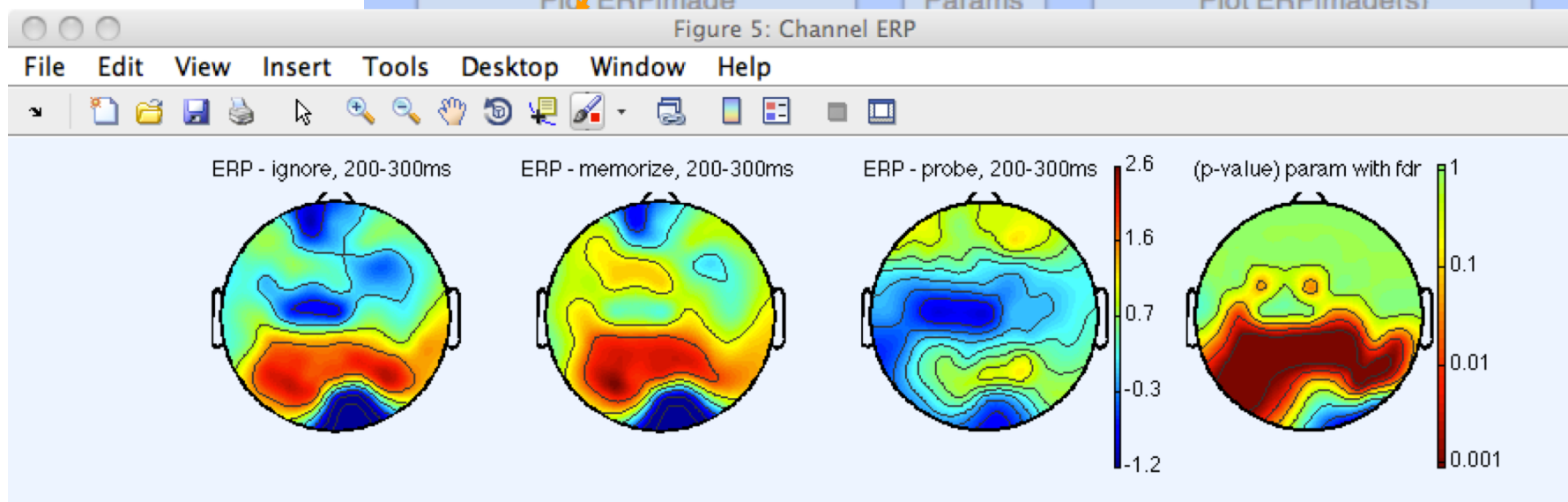
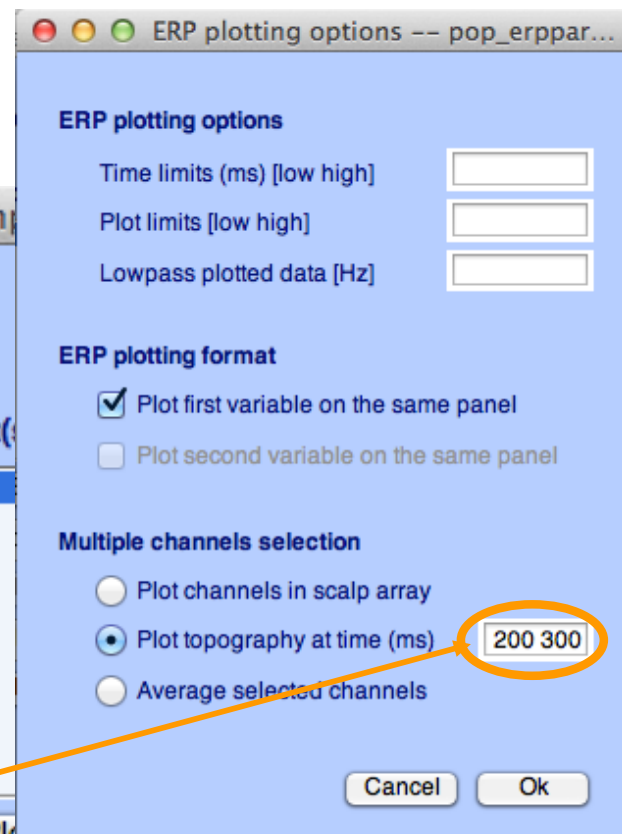
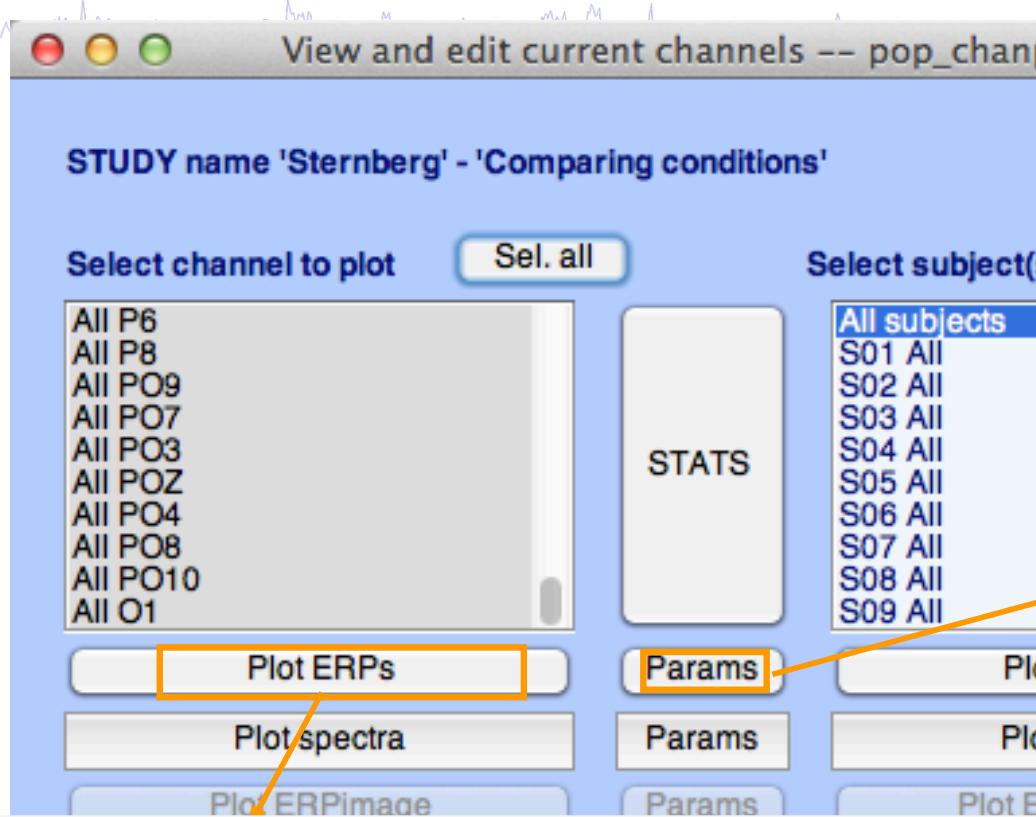
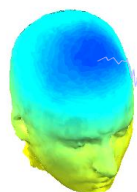
Multiple channels selection

☐ Plot channels in scalp array

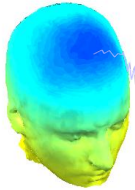
☒ Plot topography at time (ms)

☐ Average selected channels

Cancel Ok



Computing Spectrum



Select and compute component measures for later clustering -- pop_precomp()

Pre-compute channel measures for STUDY 'Sternberg' - 'STUDY.design 1'

Channel list (default:all) ...

☒ Spherical interpolation of missing channels (performed after optional ICA removal below)

☐ Remove ICA artifactual components pre-tagged in each dataset

☐ Remove artifactual ICA cluster or clusters (hold shift key)

ParentCluster 1
Cls 2
Cls 3
Cls 4

List of measures to precompute

☐ ERPs Baseline ([min max] in ms)

☒ Power spectrum Spectopo parameters 'specmode', 'fft' Test

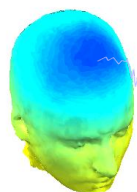
☐ ERSPs Time/freq. parameters 'cycles', [3 0.5], 'nfreqs', 100 Test

☐ ITCs

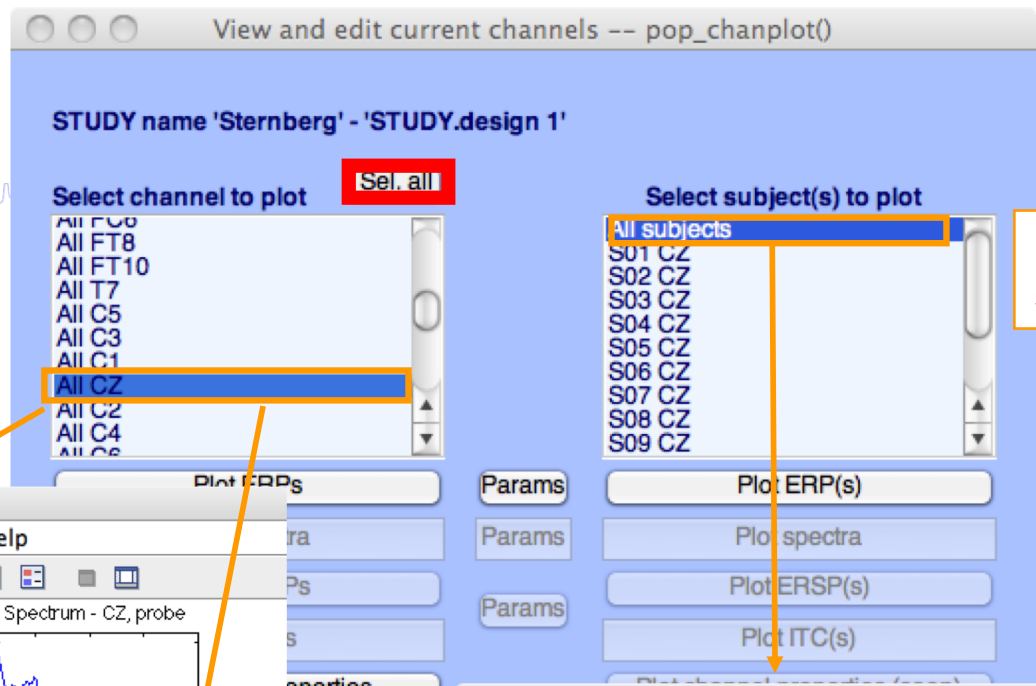
☐ Save single-trial measures for single-trial statistics - requires disk space

☐ Recompute even if present on disk

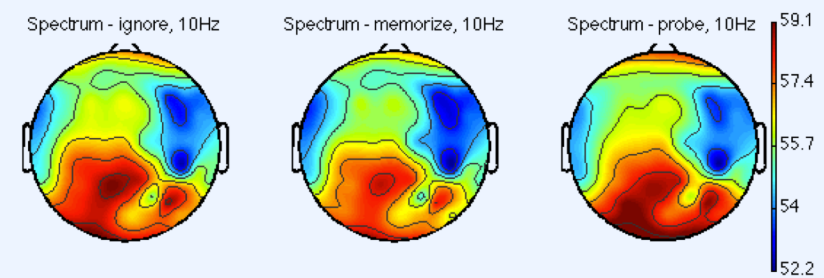
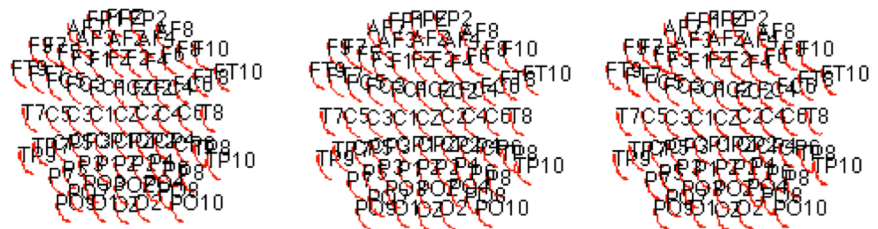
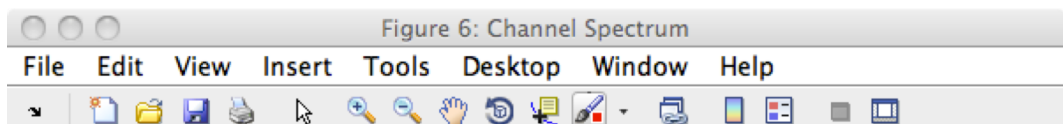
Help Cancel Ok



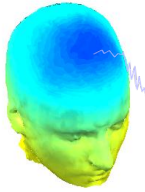
Choose which channel



Choose which subject



Computing ERSP



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

Select and compute component measures for later clustering -- pop_precomp()

Pre-compute channel measures for STUDY 'Sternberg' - 'Design 2'

Channel list (default:all) ...

☒ Spherical interpolation of missing channels (performed after optional ICA removal below)

☐ Remove ICA artifactual components pre-tagged in each dataset

☐ Remove artifactual ICA cluster or clusters (hold shift key)

ParentCluster 1
Cls 2
Cls 3
Cls 4

List of measures to precompute

☐ ERPs Baseline ([min max] in ms)

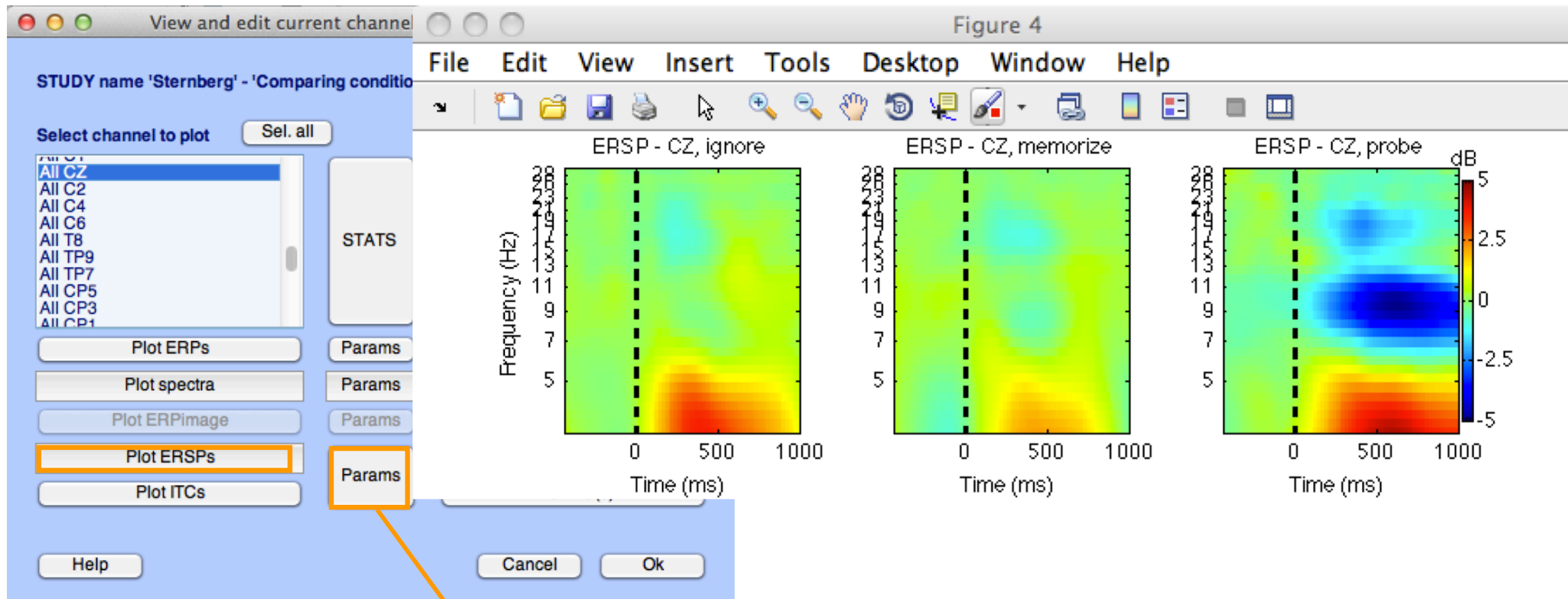
☐ Power spectrum Spectopo parameters 'specmode', 'fft'

☒ ERSPs [3 0.8], 'nfreqs', 50, 'ntimesout', 100

☐ ITCs

☐ Save single-trial measures for single-trial statistics - requires disk space

☐ Recompute even if present on disk



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]

☐ Compute common ERSP baseline (assumes additive baseline)

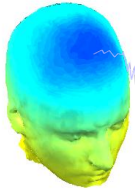
Plot scalp map at time [ms]

Plot scalp map at freq. [Hz]

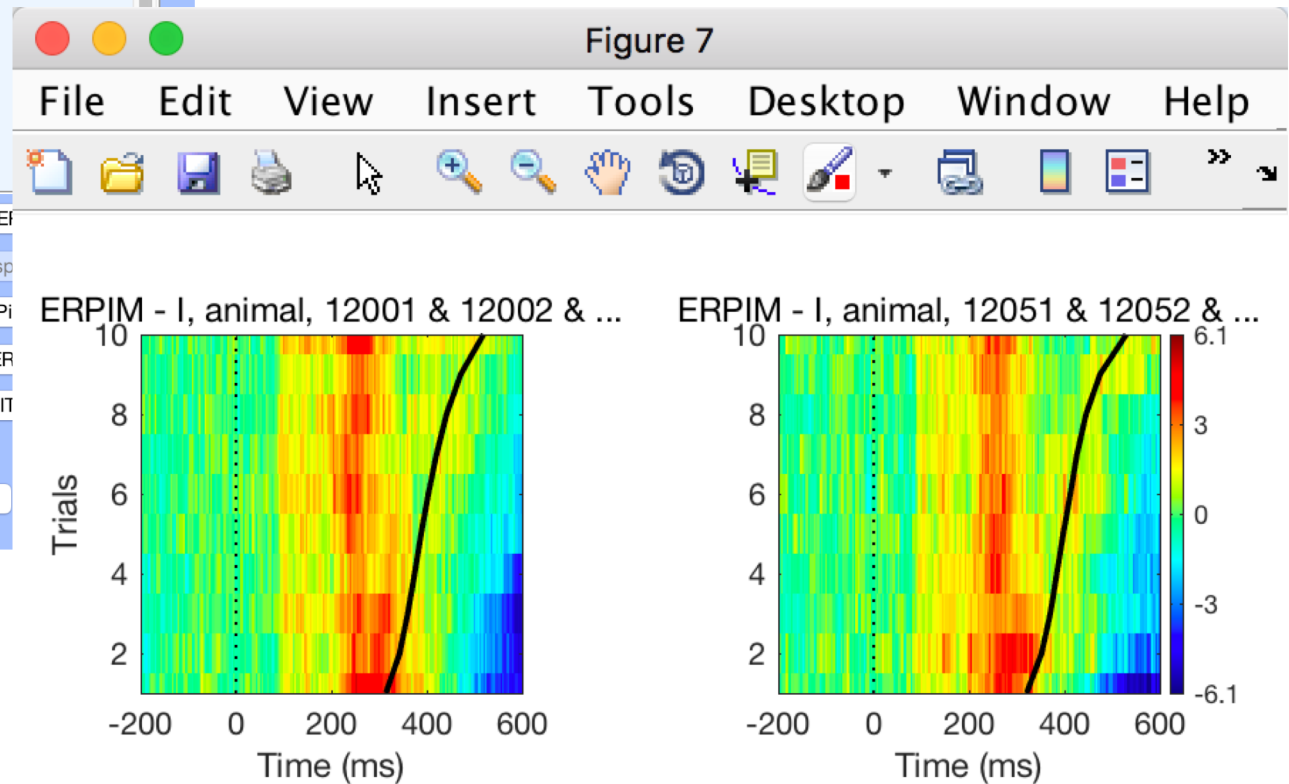
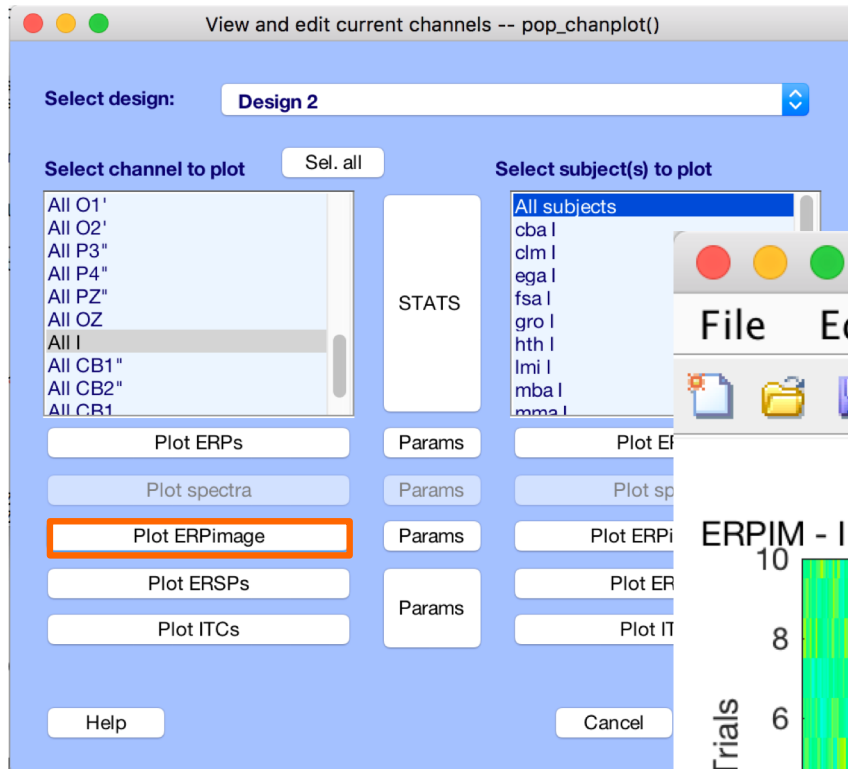
ITC limit (0-1) [High]

Cancel Ok

ERP-image across subjects



Delorme, A., Miyakoshi, M., Jung, T.P., Makeig, S. (2014) **Grand average ERP-image plotting and statistics: A method for comparing variability in event-related single-trial EEG activities across subjects and conditions.** J Neurosci Methods. 2014 Oct 22. pii: S0165-0270(14)00363-X. doi: 10.1016/j.jneumeth.2014.10.003



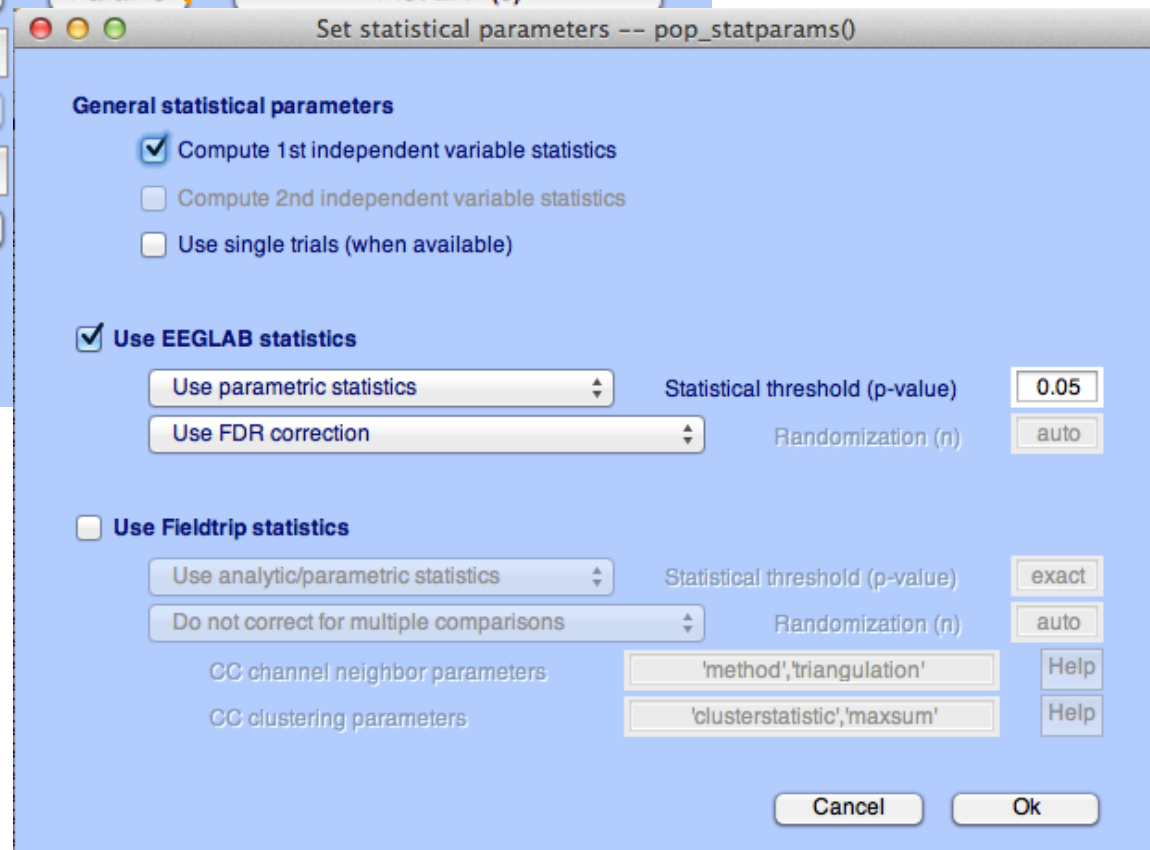
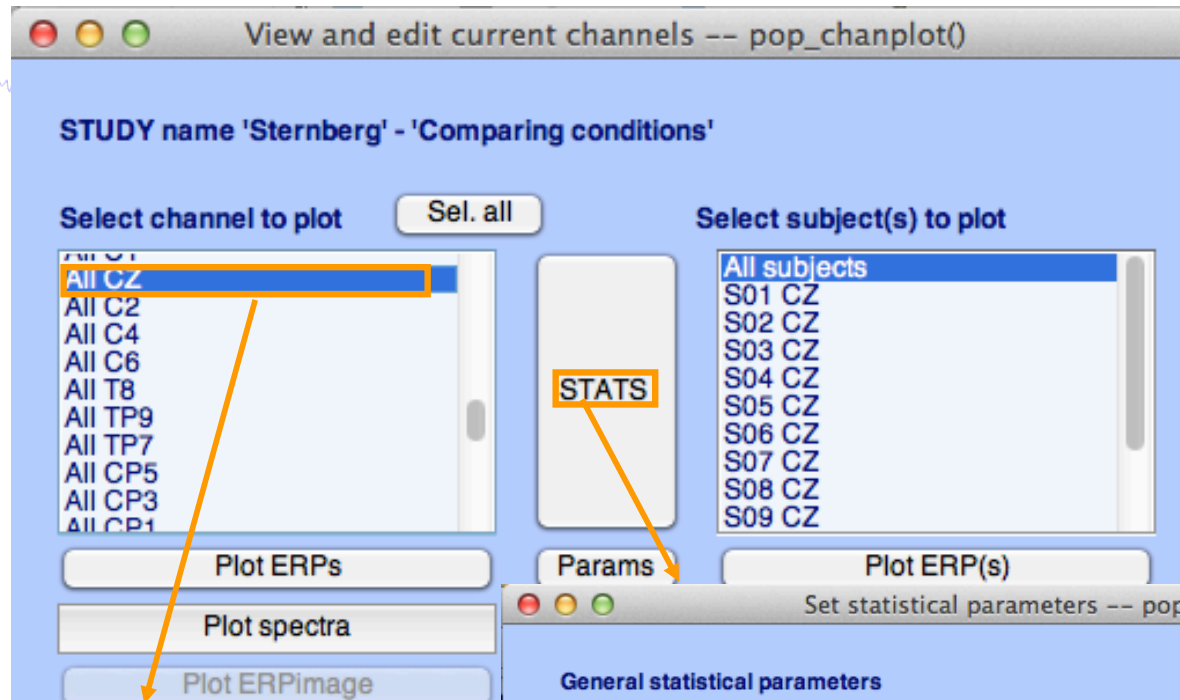
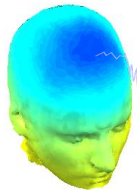
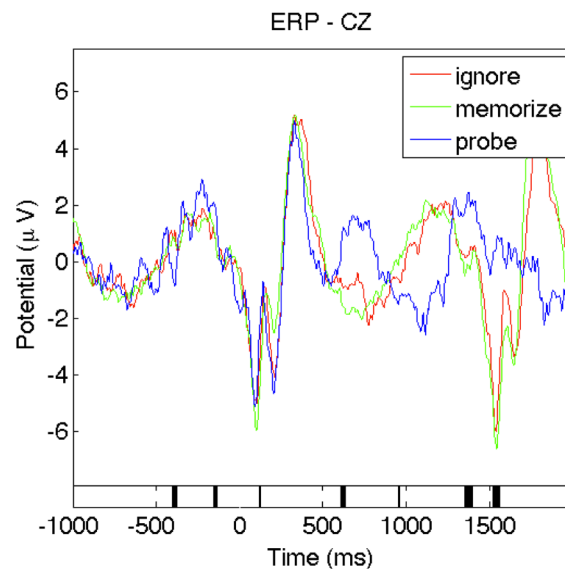


Figure 4: Channel ERP



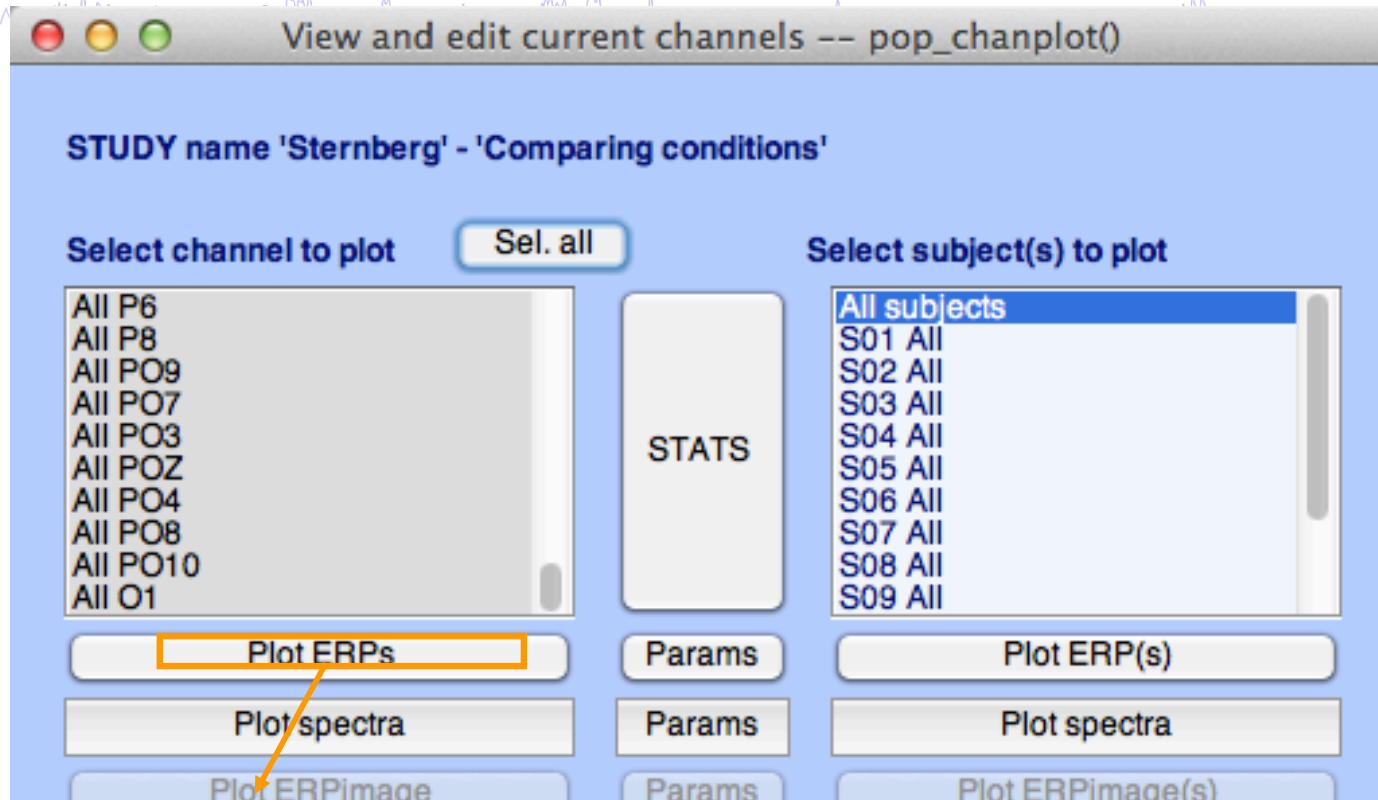
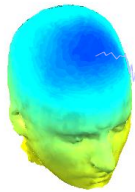
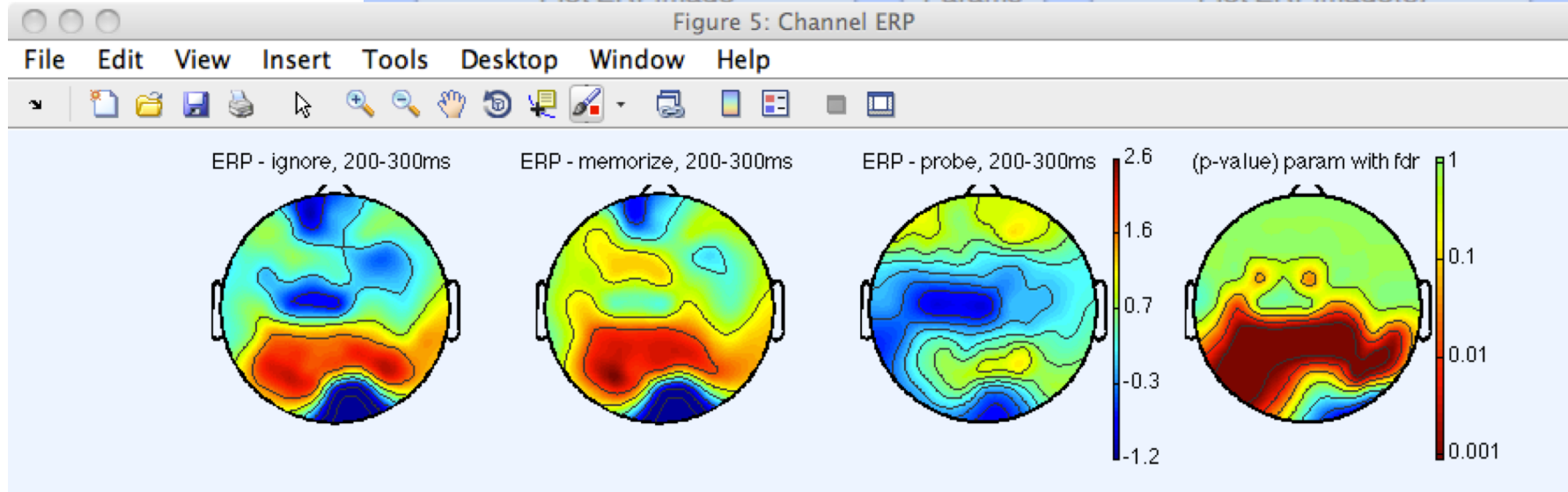


Figure 5: Channel ERP



Set statistical parameters -- pop_statparams()

General statistical parameters

☐ Compute 1st independent variable statistics

☐ Compute 2nd independent variable statistics

☐ Use single trials (when available)

☐ Use EEGLAB statistics

Use parametric statistics Statistical threshold (p-value) exact

Do not correct for multiple comparisons Randomization (n) auto

☒ Use Fieldtrip statistics

Use montecarlo/permutation statistics Statistical threshold (p-value) exact

Use cluster correction (CC) Randomization (n) auto

CC channel neighbor parameters 'method','triangulation' Help

CC clustering parameters 'clusterstatistic','maxsum' Help

Cancel Ok

✓ Use parametric statistics
Use permutation statistics
Use bootstrap statistics

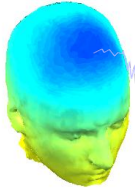
✓ Do not correct for multiple comparisons
Use Bonferoni correction
Use Holms correction
Use FDR correction

✓ Use analytic/parametric statistics
Use montecarlo/permutation statistics

✓ Do not correct for multiple comparisons
Use Bonferoni correction
Use Holms correction
Use FDR correction
Use max correction
Use cluster correction (CC)

std_stat() function in EEGLAB

Exercises



1. Load “stern.study” file in STUDY folder
2. Edit STUDY design and delete current variable(s)
3. Create a new indep. Variable design to compare Ignore vs. Memorize letter
4. Recompute spectrum and ERP.
5. Plot spectrum and ERP for electrode Cpz
6. Plot scalp topography at 10 Hz (spectrum) and 200-300 ms (ERP) for both conditions
7. Plot spectrum for electrode CPz within 1 to 50 Hz and compute parametric statistics (with and without FDR correction)
8. Plot scalp topography at 10Hz for both conditions using permutation statistics cluster correction (Fieldtrip – statistics)