Evaluating ICA components

Plot 1
Component ERP

Plot 2
Component spectral power

Plot 3
Component ERP images

Plot 4
Component ERSP

Plot 5
Component cross coherence

Exercise...
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Exercise...
Component ERP envelope
Definition: The data envelope

Data (all channels)

Data envelope (max/min traces)
IC back-projection envelope
IC back-projection envelope

IC envelopes plotted for simplicity (instead of all back-projected channels)
IC contributions to ERP envelope

- Enter time range (in ms) to plot:
- Enter time range (in ms) to rank component contributions:
- Number of largest contributing components to plot (1-20):
- Else plot these component numbers only (<21) (Ex: 2,4,7):
- Component numbers to remove from data before plotting:
- Plot title:
- Optional topoplot() and spectroplot() arguments:
- ERP components of faces_4 epochs

Largest ERP components of faces_4 epochs

- Profiles of ERP components at different time points: 3, 2, 5, 6, 1, 4
Component contribution to the dataset ERP

Artifact Components

Component contributions to the dataset ERP.

Component numbers to remove from data before plotting:
- 2, 4, 7, 9, 12, 17, 18, 25

Figure 5

Largest ERP components of faces_4 epochs

Potential (μV) vs Time (s)
What is the IC ERP difference between these 2 conditions?
IC ERP difference

#3: Stealing

Dataset indices to subtract (Ex: ‘1 2’ -> 1-2)
Enter time range (in ms) to plot:
Enter time range (in ms) to rank component contributions:
Number of largest contributing components to plot (7):
Else plot these component numbers only (Ex: 2:4,7):
Component numbers to remove from data before plotting:
Plot title:
Optional topoplot() and envtopo() arguments:

Cancel Help Ok
IC ERP difference

Largest ERP components of Memorize-Ignore epochs

Figure 2

Potential (nV)

Time (s)

ppaf 36.68%
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Exercise...
Plot component power

- Component spectra and maps -- pop_spectopo()

- Epoch time range to analyze [min_ms max_ms]:
  - Frequency (Hz) to analyze:
  - Electrode number to analyze: ([1]=elec with max power, [0]=whole scalp):
  - Percent data to sample (1 to 100):
  - Components to include in the analysis:

- Number of largest-contributing components to map:
  - Else, map only these component numbers:

- [Checked] Compute comp spectra; [Unchecked] (data-comp) spectra:

- Plotting frequency range (min max) Hz:

- Spectral and scalp map options (see topoplot):

- Figure 2: spectopo()
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Exercise...
Component ERP image
ERP Image basics

ERP Image

by default, sorted by time-on-task
(1st trial, 2nd trial, ...)

Trial 1

Trial 2

Trial 3

Trial 4
ERP Image basics

Trial 1:

Trial 2:

No Smoothing

Smoothed across 10 Trials
ERP Images: smoothing across trials

moving average 1

moving average 2

moving average 10
Component ERP Images

Component(s): 3
Project to channel #: 10
Smoothing: 10
Downsampling: 1
Time limits (ms): -800 to 1000

Sort trials by epoch event values
- Epoch-sorting field
- Event type(s)

Sort trials by phase
- Frequency (Hz | minHz maxHz)
- Percent low-amp. trials
- Inter-trial coherence options
- Frequency (Hz | minHz maxHz)
- Signif. level (<0.2)

Inter-trial coherence options
- Frequency (Hz | minHz maxHz)
- Signif. level (<0.2)

Other options
- Plot spectrum (minHz maxHz)
- Baseline ampl. (dB)

Figure title
- Plot scalp map
- Plot ERP
- Plot colorbar

ERP limits
Color limits (see Help): 0 to 2.1

Phase-sorted image

File Edit View Insert Tools Desktop Window Help

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Component ERP Images

Phase-sorted alpha power
Component ERP

Component(s)  3
Project to channel #  10
Smoothing  1
Downsampling  3
Time limits (ms) -800 1000

Figure title
- Plot scalp map
- Plot ERP
- Plot colorbar

Component ERP image -- pop_erpimage

Phase-sorted alpha power

'Same data: Sorted by alpha amplitude'

'ampsort' = [center_ms, prcnt, freq, maxfreq] Sort epochs by amplitude.
Component ERP Images

Same sorting order: Amplitude vs. activations
Evaluating ICA components

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Exercise...
Plot IC ERSP

Time points lost at beginning and end of epoch
Plot IC ERSP

Component number
Sub epoch time limits [min max] (msec)
Frequency limits [min max] (Hz) or sequence
Baseline limits [min max] (msec) (0->pre-stim.)
Wavelet cycles [min max/fact] or sequence
ERP color limits [max] (min=max)
ITC color limits [max]
Bootstrap significance level (Ex: 0.01 -> 1%)
Optional newtimef() arguments (see Help)

Use 200 time points
Use limits, padding 1
Log spaced
Use divisive baseline
No baseline

Plot event related spectral power
Plot inter trial coherence

Figure 2
ERSP (dB)
ITC

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Exercise...
IC cross coherence

Be sure to mask by bootstrap significance limits
IC cross coherence

Figure 3

Channel time-frequency
Channel cross-coherence
Component time-frequency
Component cross-coherence
Exercise

- **ALL**
  - Load stern.set, epoch on Memorize letters, reject noise

- **Novice**
  - From the GUI, plot component ERPs with maps
  - Pick an interesting IC and plot an ERP image of it
  - Try sorting by RT or phase, is there any relationship to the IC activation pattern? What about power in a frequency band of choice?

- **Intermediate**
  - Plot ERSPs for selected ICs
    - Compare FFT, wavelet(s), and multi-taper methods for ERSP
  - Plot cross coherence between two selected ICs
    - Compare this result with cross coherence between two channels that are highly weighted in the respective ICs