Tutorial

Preprocessing Checks/

Research question and GLM

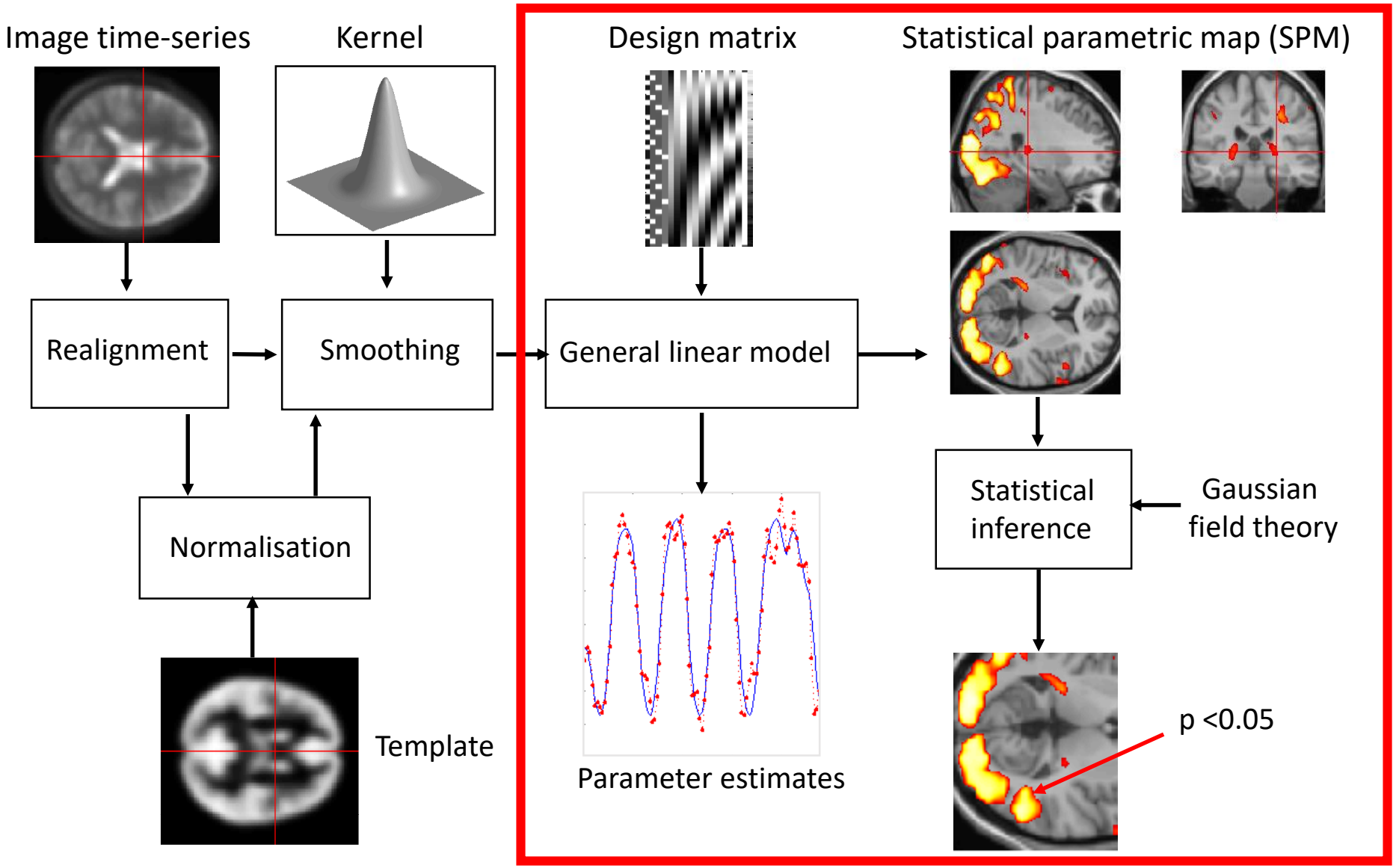
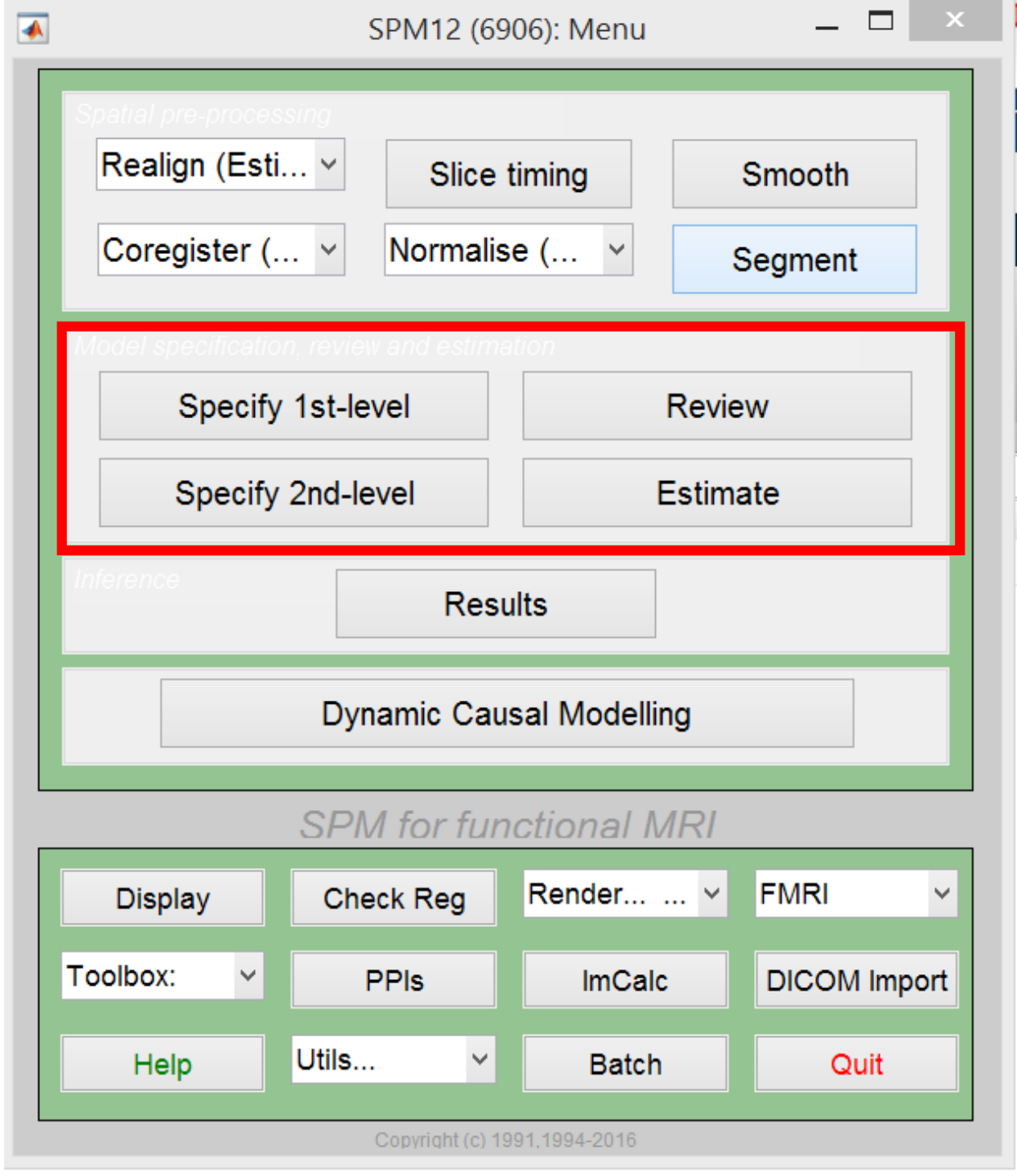


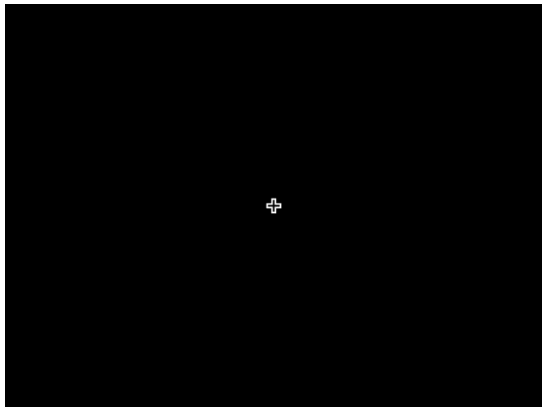
Image time-series
Kernel
Design matrix
Statistical parametric map (SPM)
Realignment
Smoothing
General linear model
Normalisation
Statistical inference
Gaussian field theory
Template
Parameter estimates
p <0.05

SPM main menu

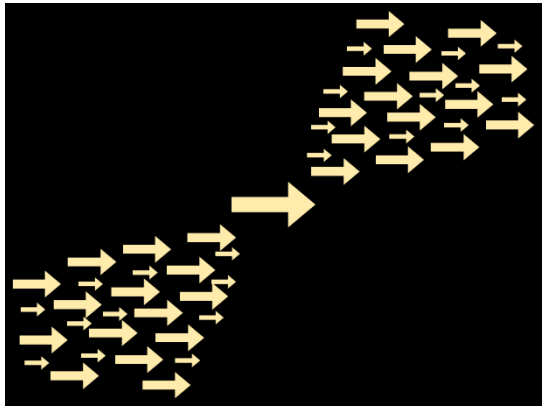
- Modeling data, performing statistics on the fMRI data.

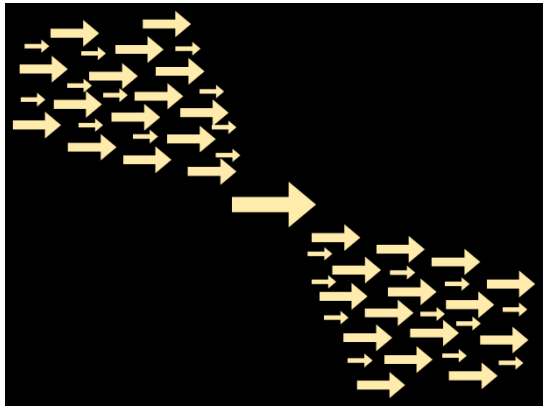


Task

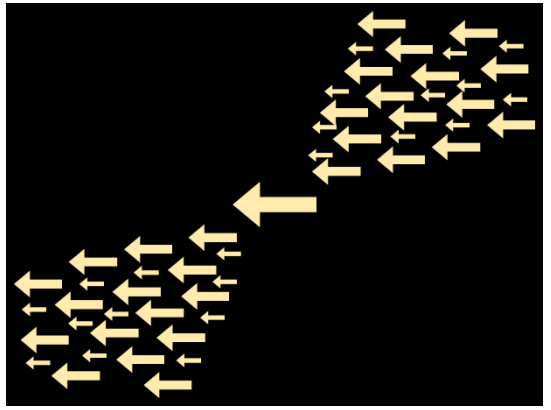


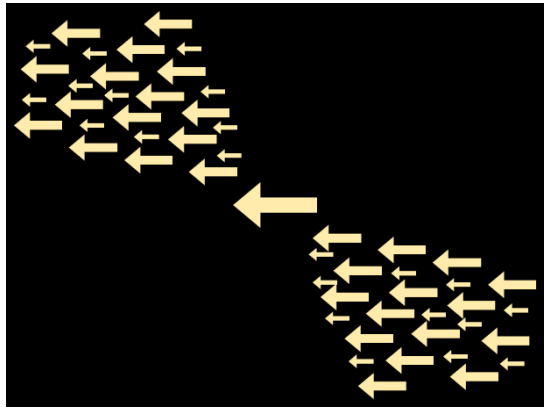
Fixation





Press right





Press left

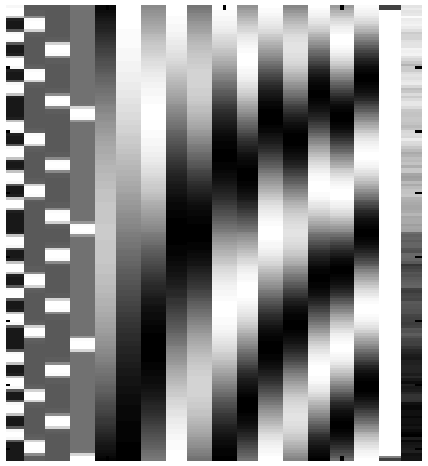
Task

What questions can we answer with this data set?

- Formulate research question
- Derive hypotheses
- How would your GLM look like?

?

Design matrix



?

Preparation

- If you still have the files from the preprocessing ready on your computer, you do not need to do anything.

- If not you can do the following:
  - For Sub01 copy the raw functional scans from scandata to functional, and the raw structural scan from scandata to structural
  - Open MATLAB, add path to SPM12, go to the folder where you have saved the function “teach_prepro_subject.m” and type:

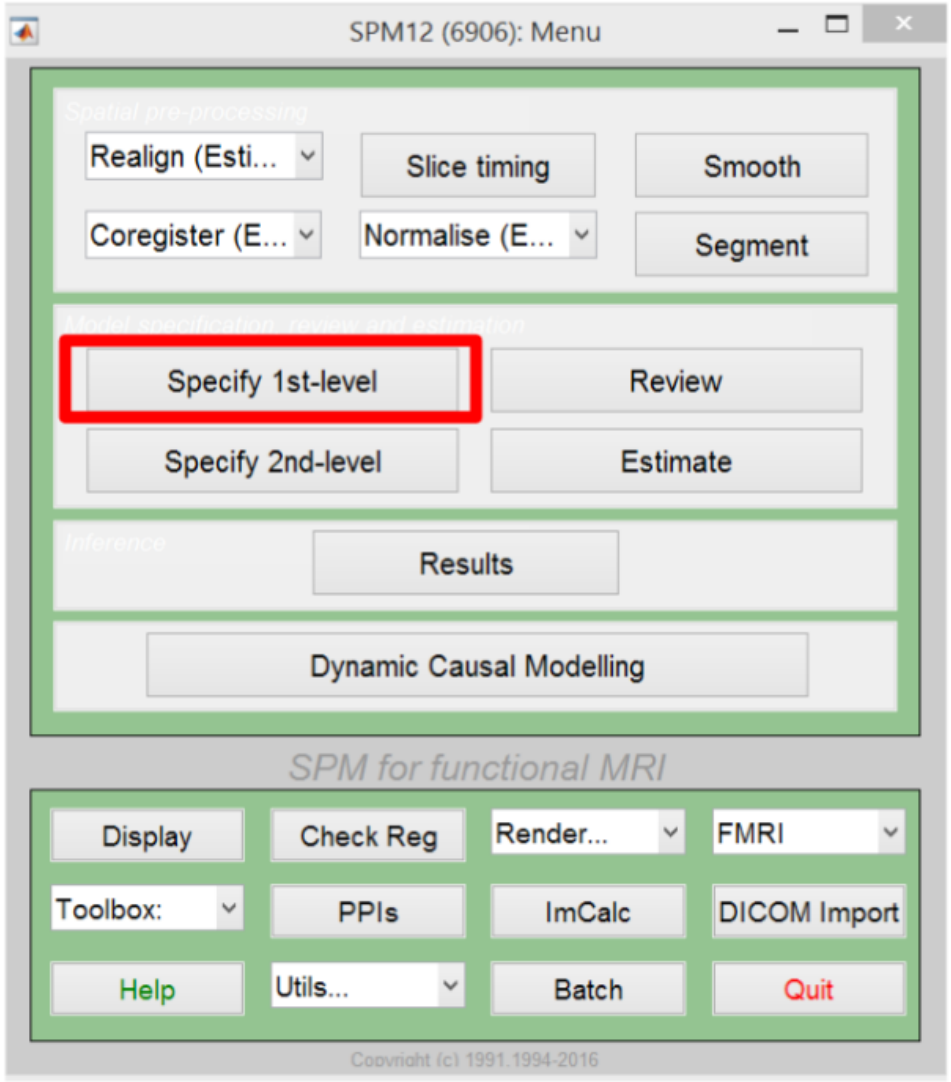
```
teach_prepro_subject('path/to/Sub01', 1);
```

GLM – General information

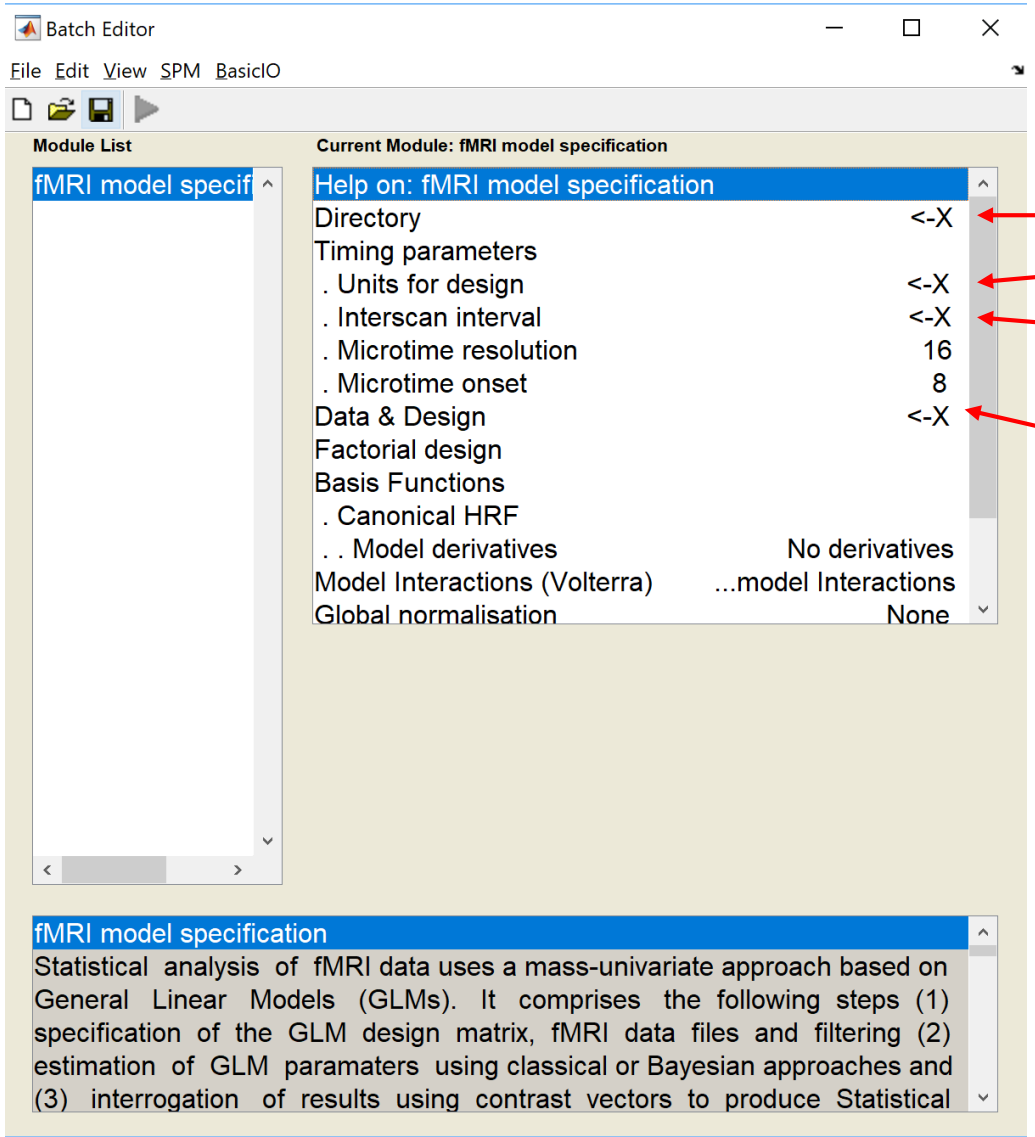
- Scanning parameters:TR = 2.2 s; slice order: ascending; number of slices = 32

- Behavioral parameters:
  - In the file Behavior Summary there are:
    - tLeftStim and tRightStim → time (after scanstart) of presentation of left or right arrow.
    - tLeftPress and tRightPress → time (after scanstart) of left or right button presses

GLM – Specify first level



GLM – Set up design



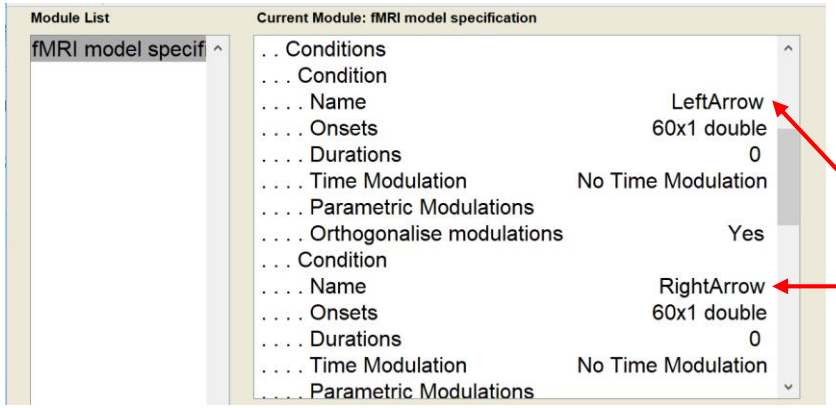
Choose directory

Choose seconds

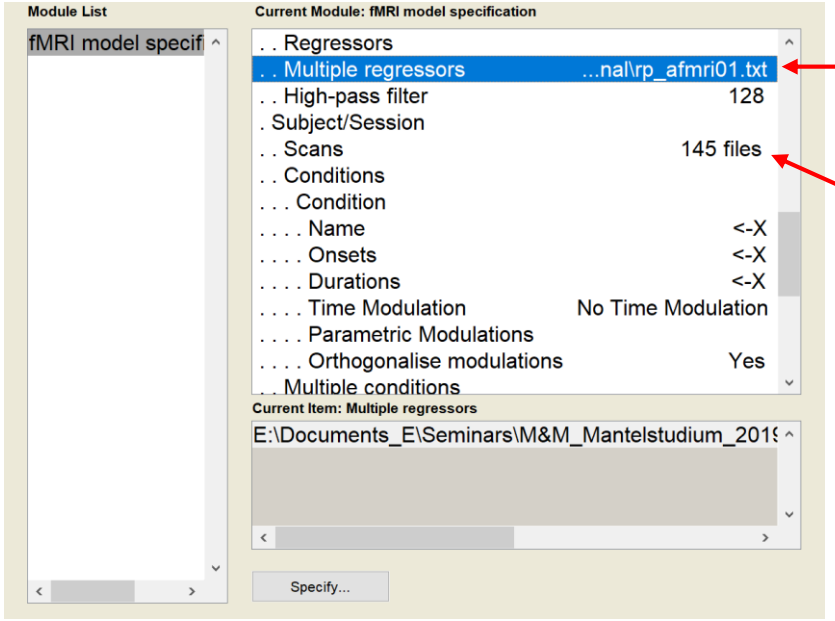
TR = 2.2 seconds

Then specify «Data & Design»

GLM – Set up design



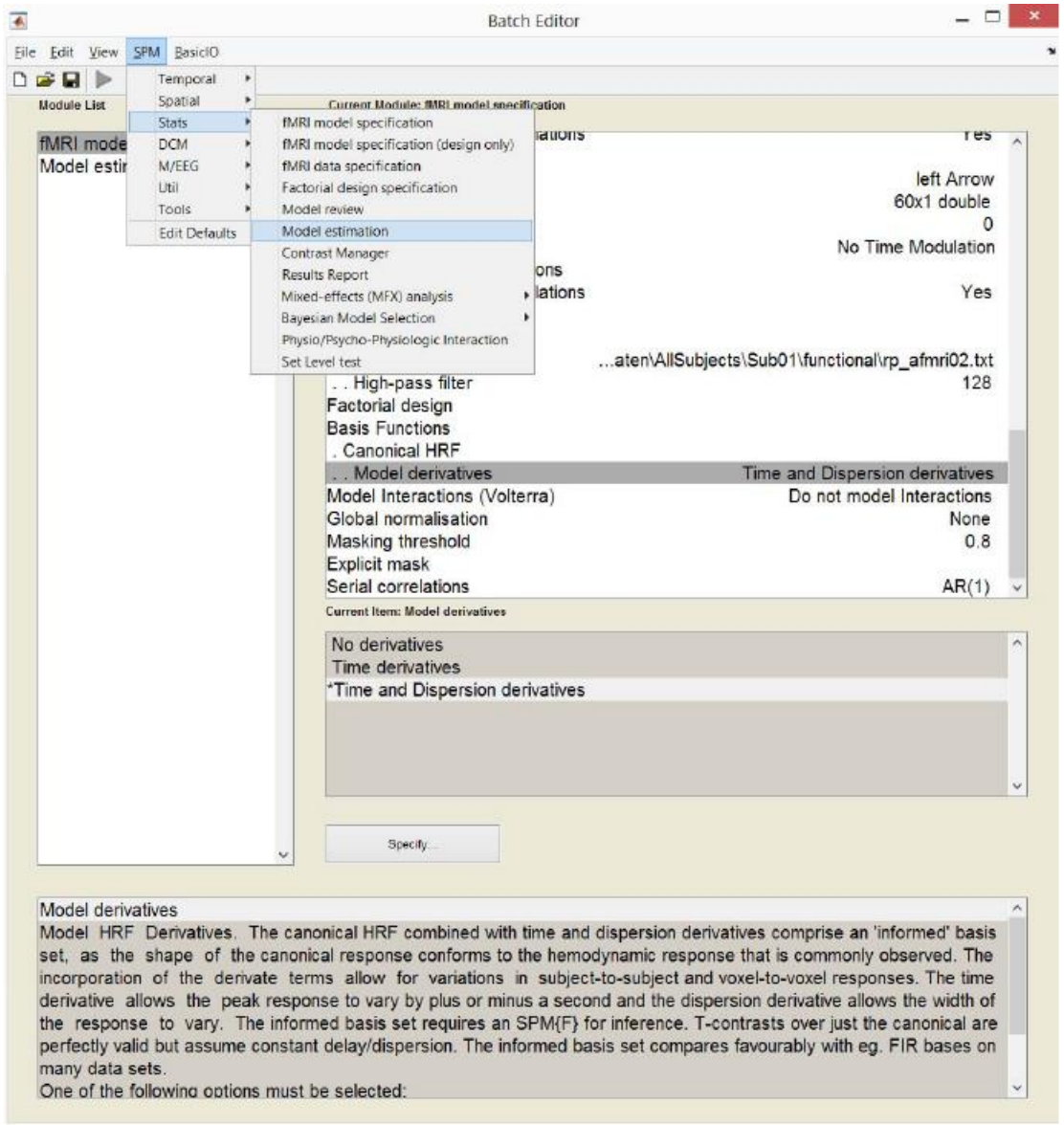
Specify design using timing from e.g. stimulus presentation.



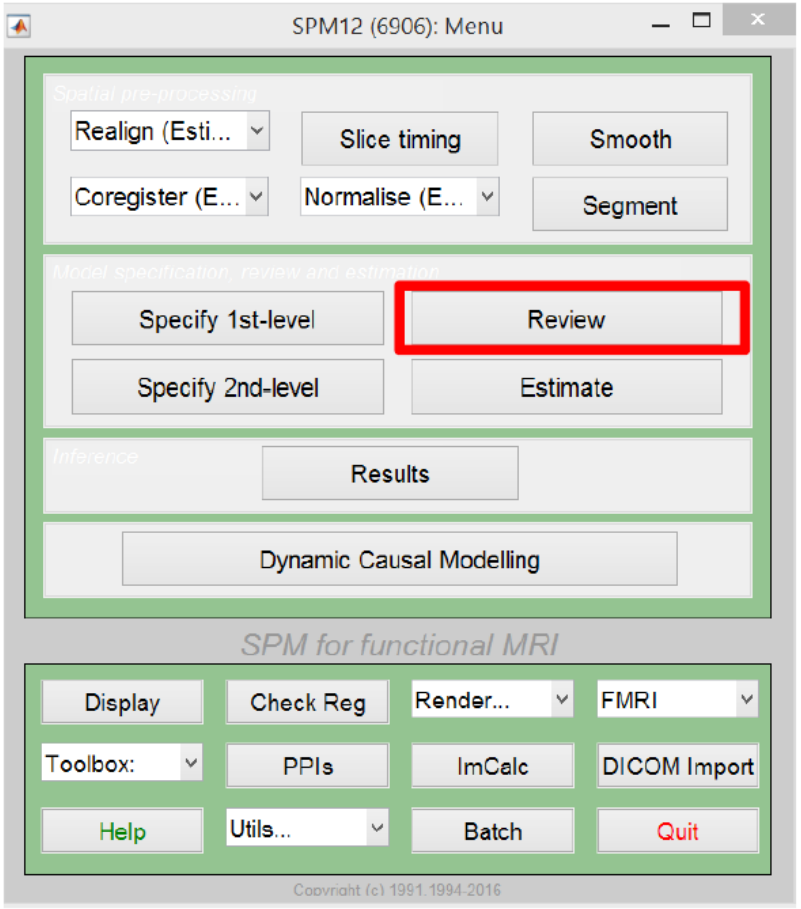
Include movement

Don’t forget 2nd condition!
Repeat for second run!

GLM – Estimate the model



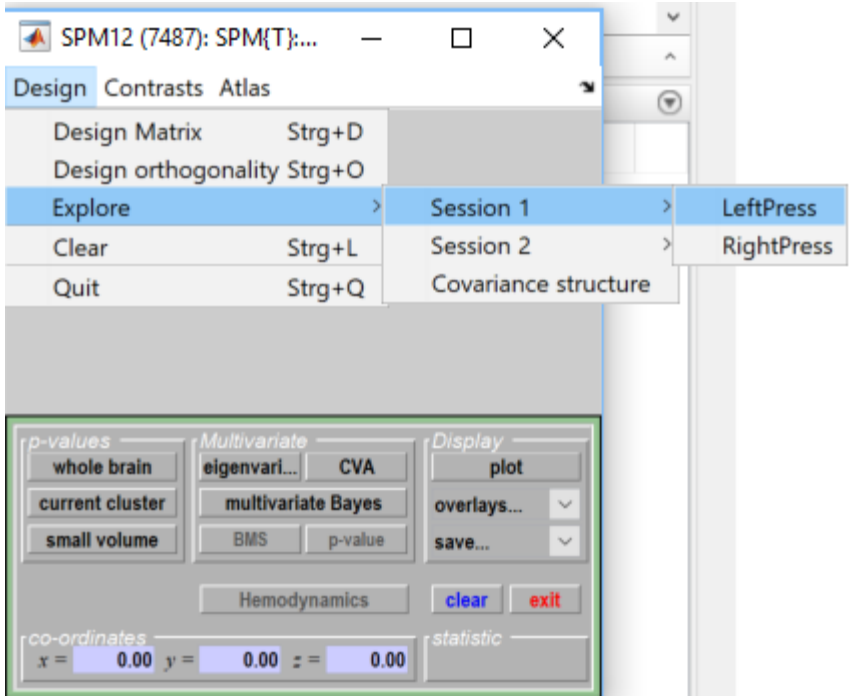
GLM – Review Design

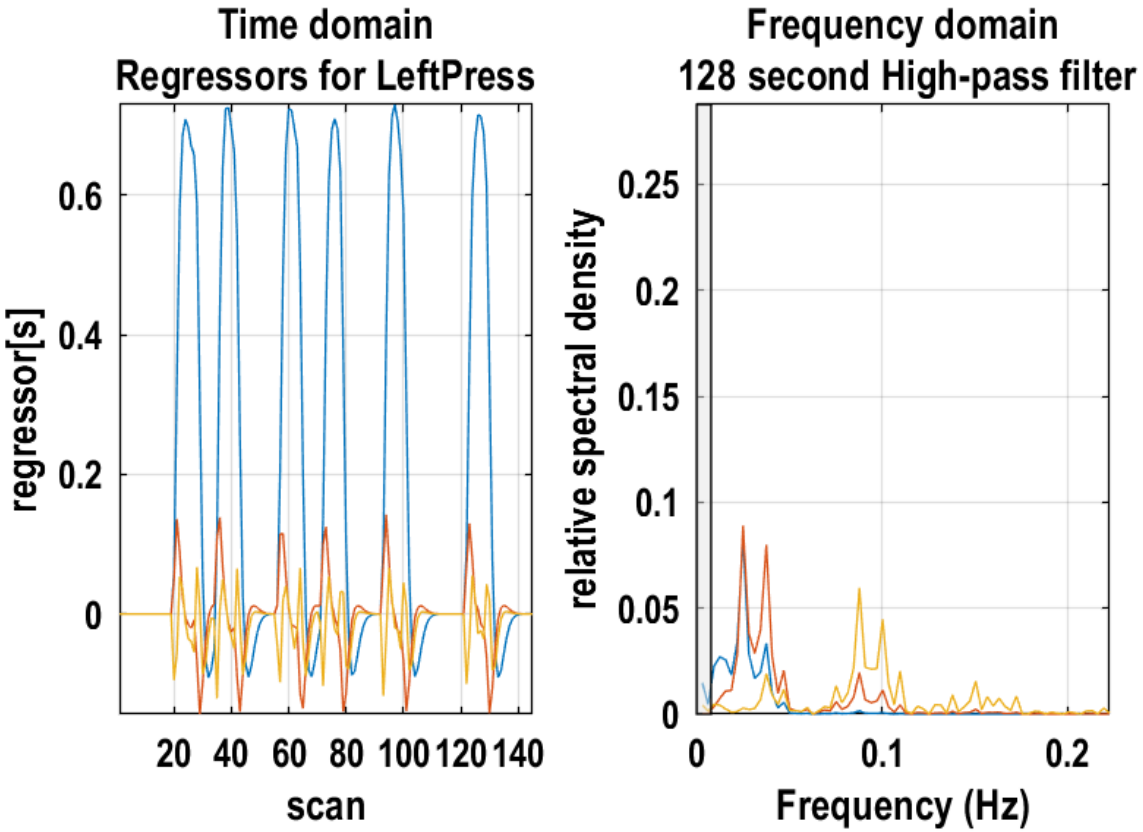


And also explore what is in the struct SPM, saved in SPM.mat

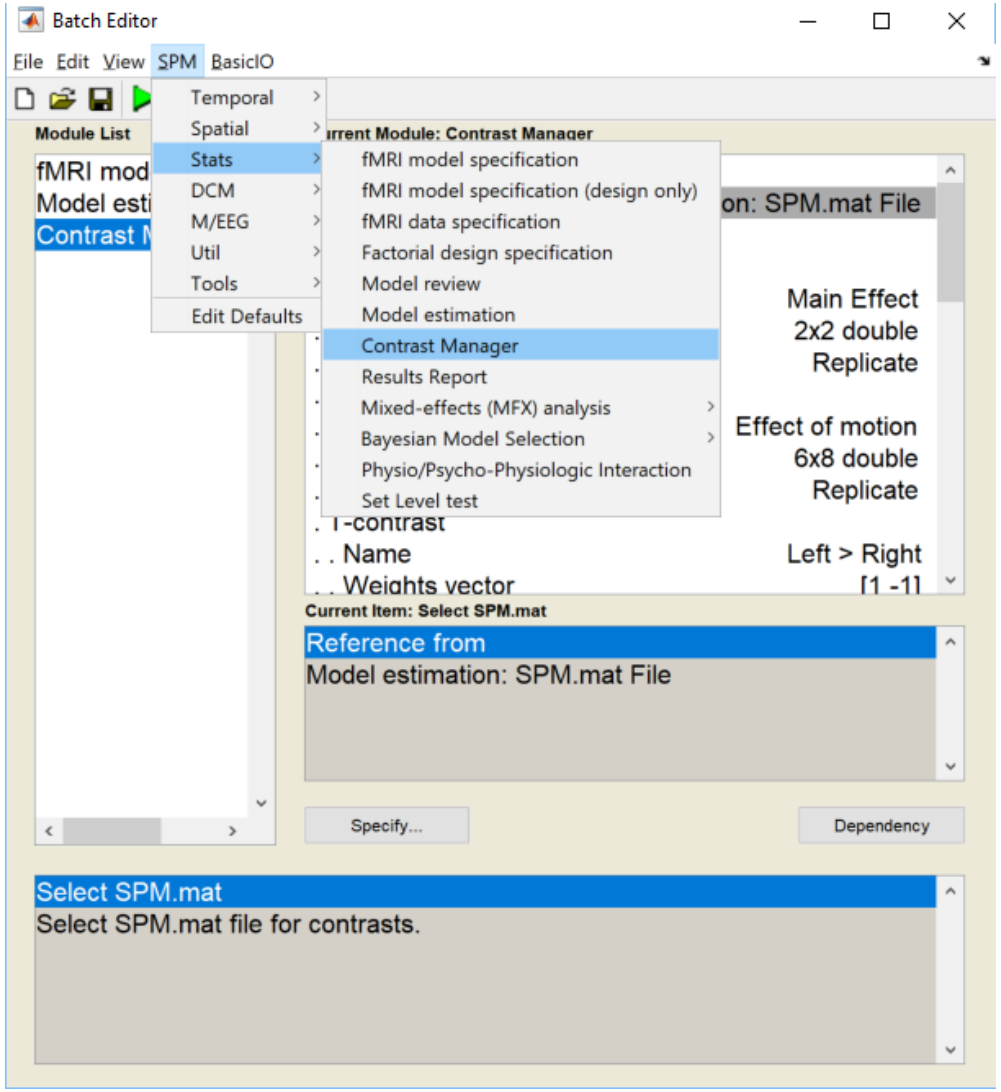
Use Check Reg to look at the new images:
beta_0001.nii etc,
ResMS.nii,
mask.nii,
RPV.nii

GLM – Review Design

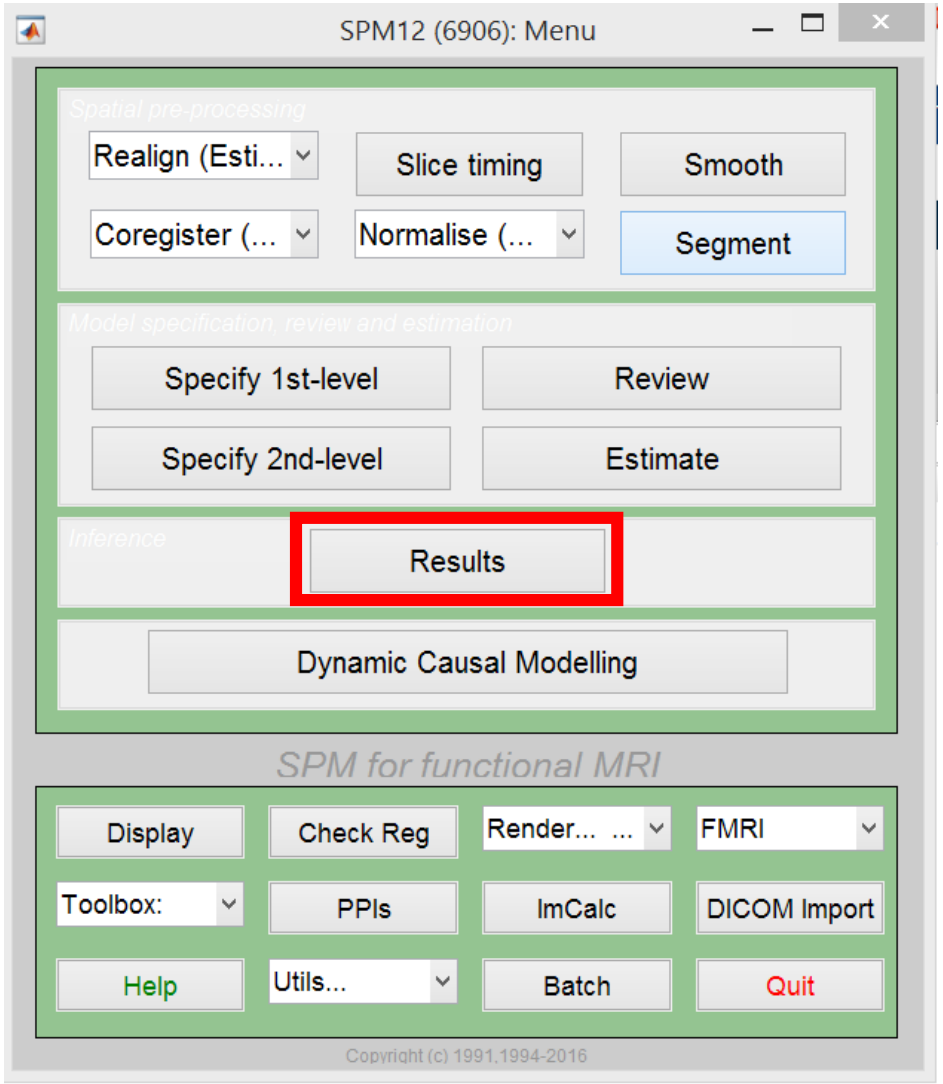




GLM – Specify contrasts

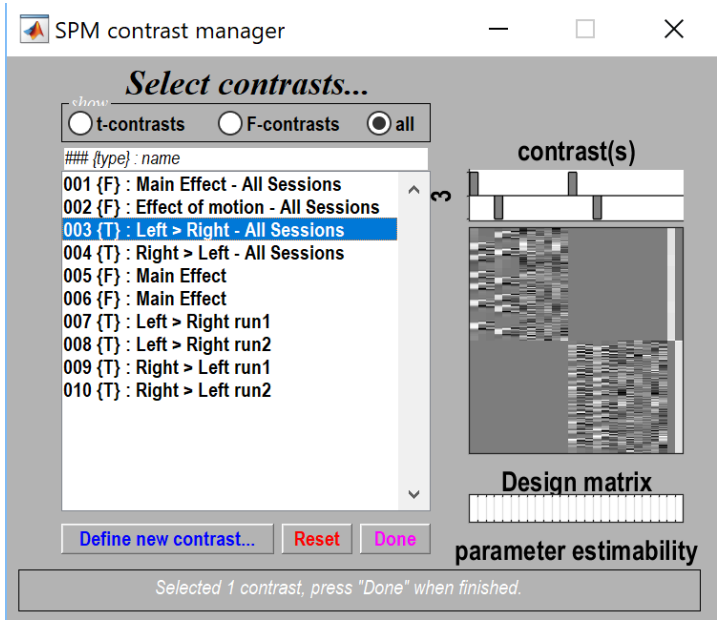


GLM – Display results

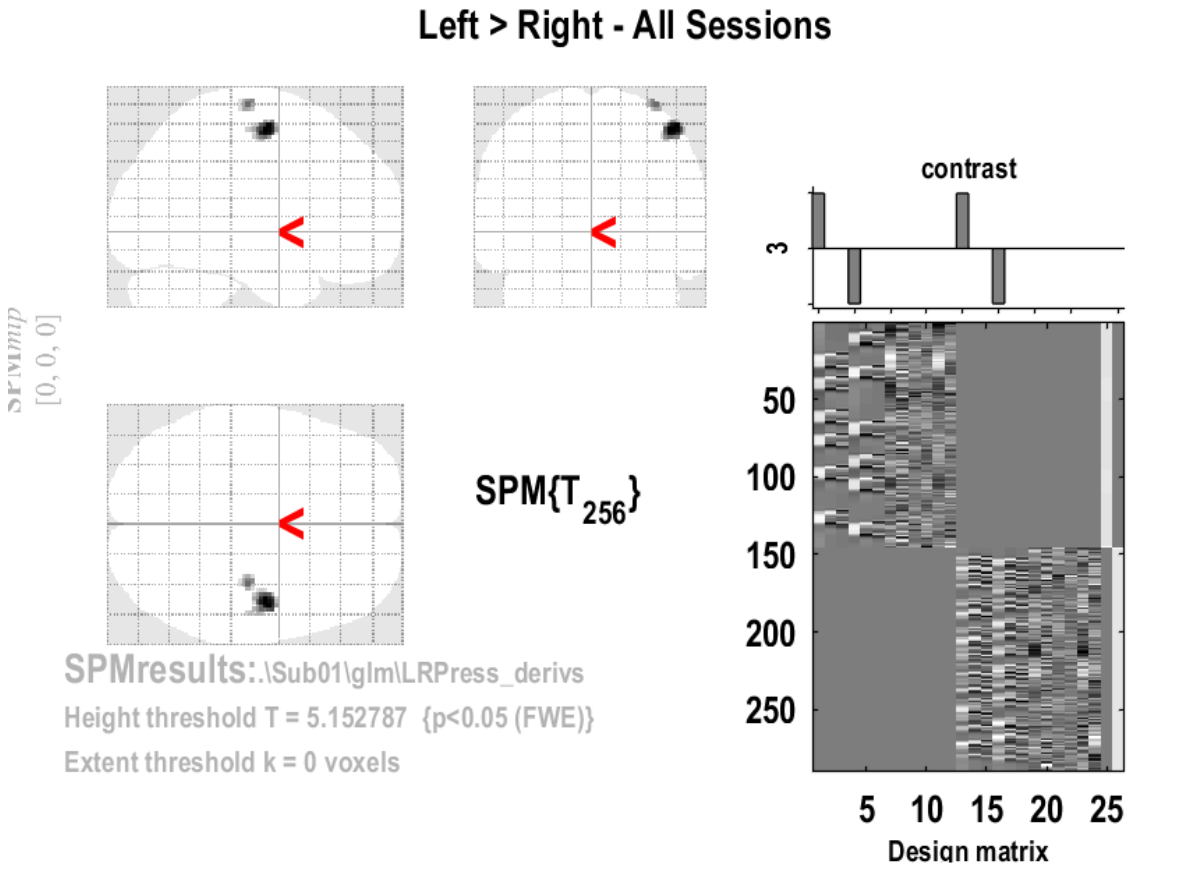


Click on Results and select SPM.mat file

Select Contrast of interest, e.g.:



GLM – Display results



Statistics: *p-values adjusted for search volume*

set-level		cluster-level				peak-level					mm mm mm
p	c	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	k_E	p_{uncorr}	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	T	$(Z_{=})$	p_{uncorr}	
0.002	2	0.000	0.000	105	0.000	0.000	0.000	7.91	7.48	0.000	44 -10 56
		0.000	0.000	25	0.000	0.000	0.001	6.58	6.32	0.000	36 -20 70

Select:
apply masking: none
p value adjustment to control: FWE
p value (FWE): 0.05
& extent threshold (voxels): 0