Checking the positive and negative voxels in a conjunction map

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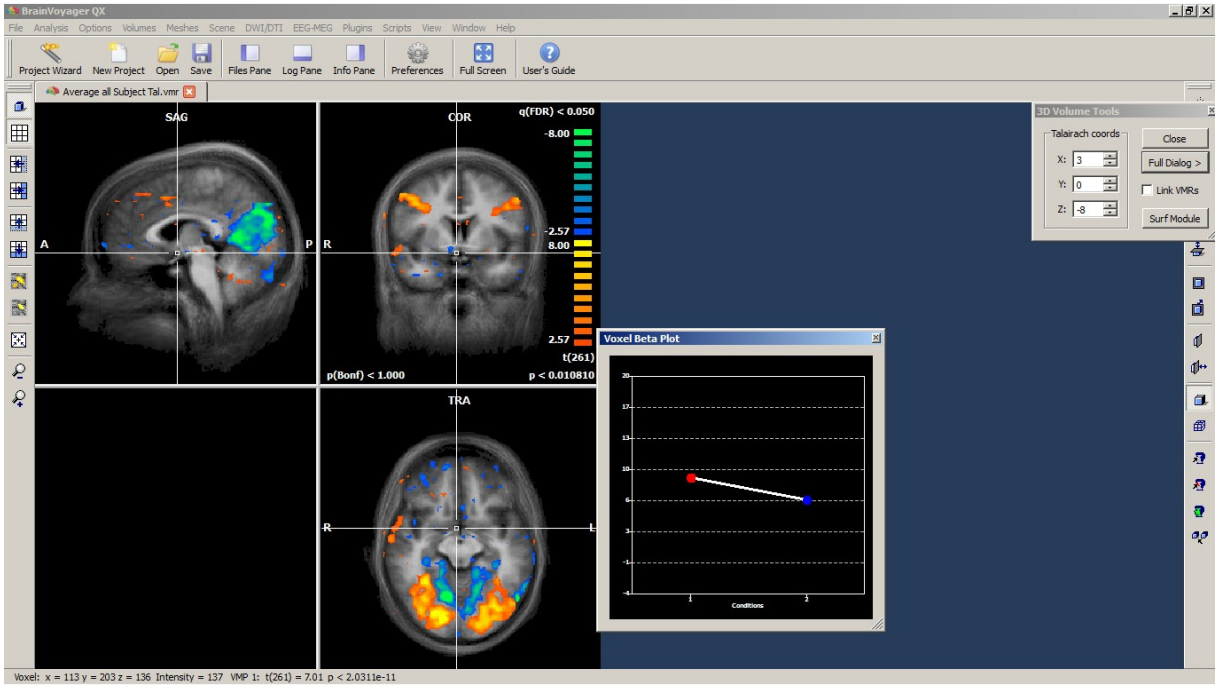
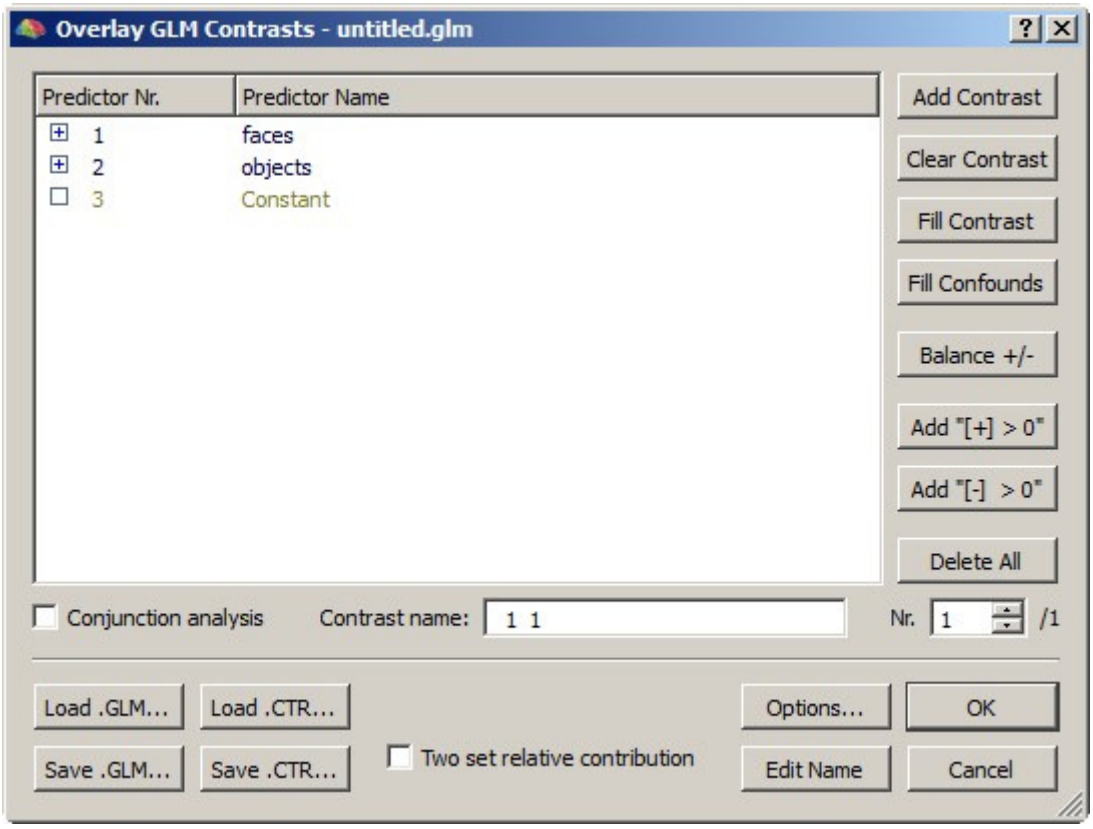
When running a conjunction contrast, the statistical map may contain positive as well as negative voxels. This document tries to check the underlying details constituting the conjunction map.

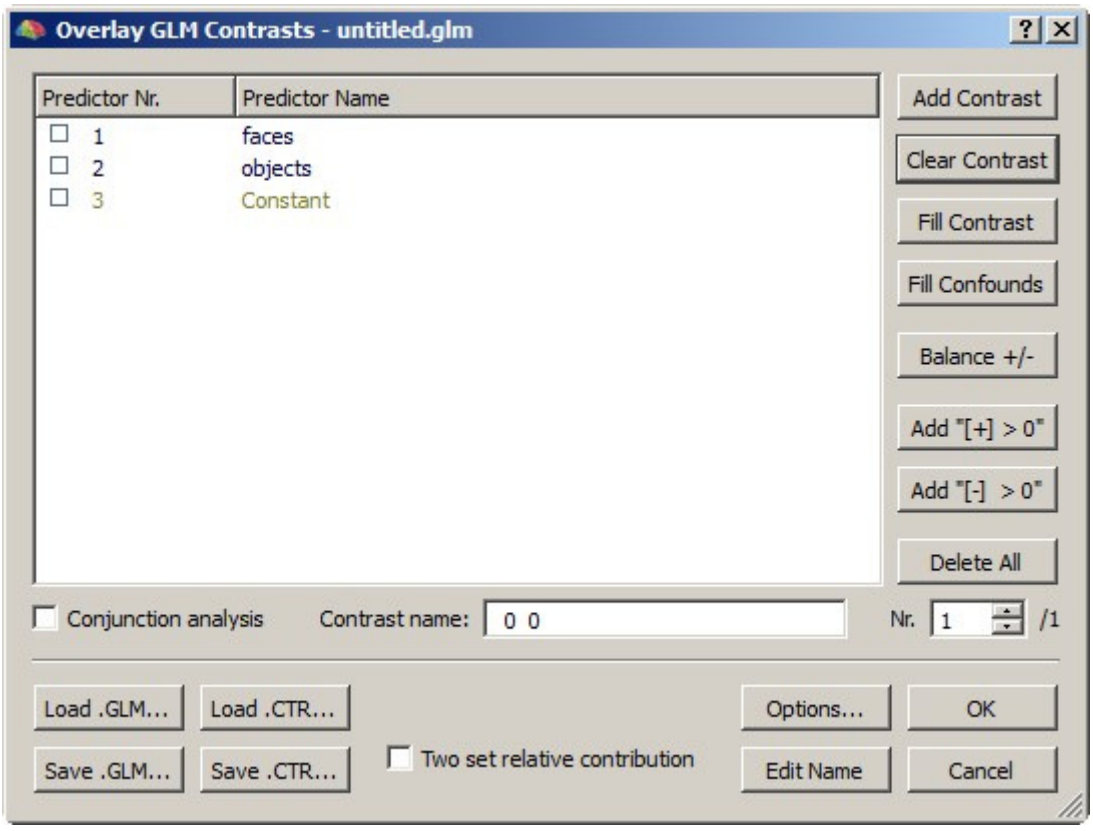
We load the result of a single subject GLM map. In this case, there are only two conditions called faces and objects contained in the design (simple face localizer study).



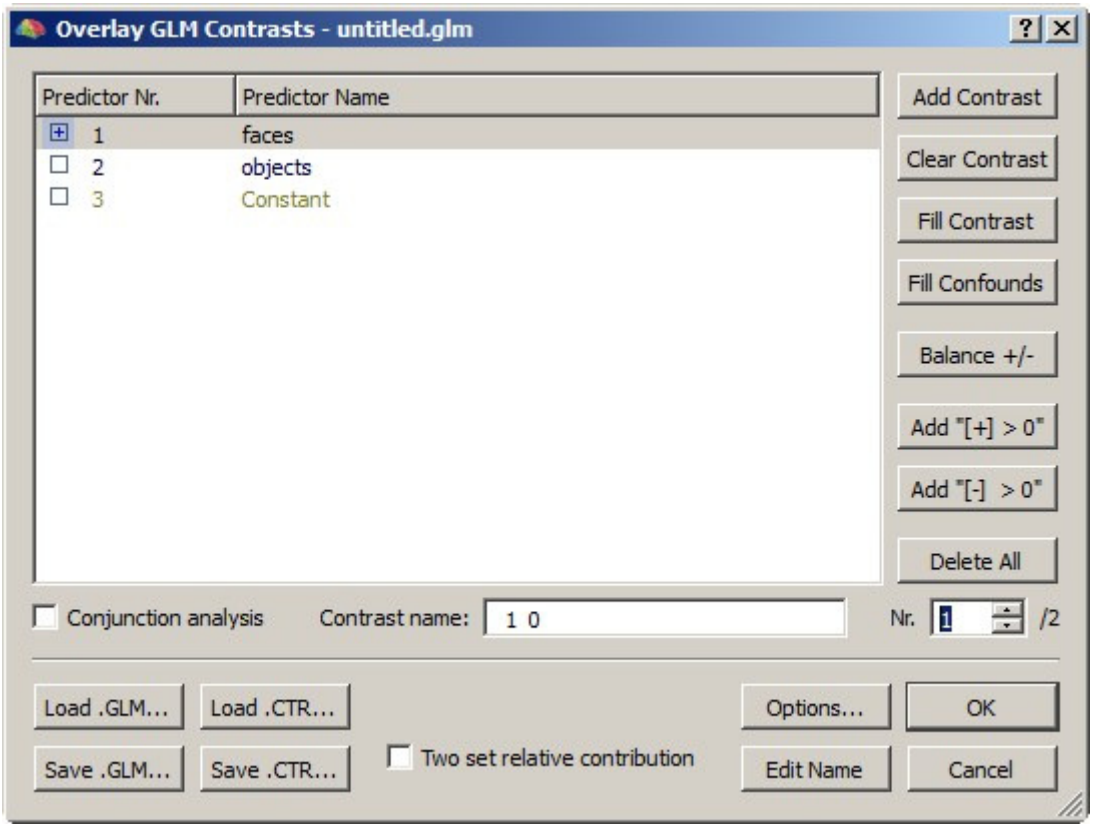
We open the Overlay GLM dialog

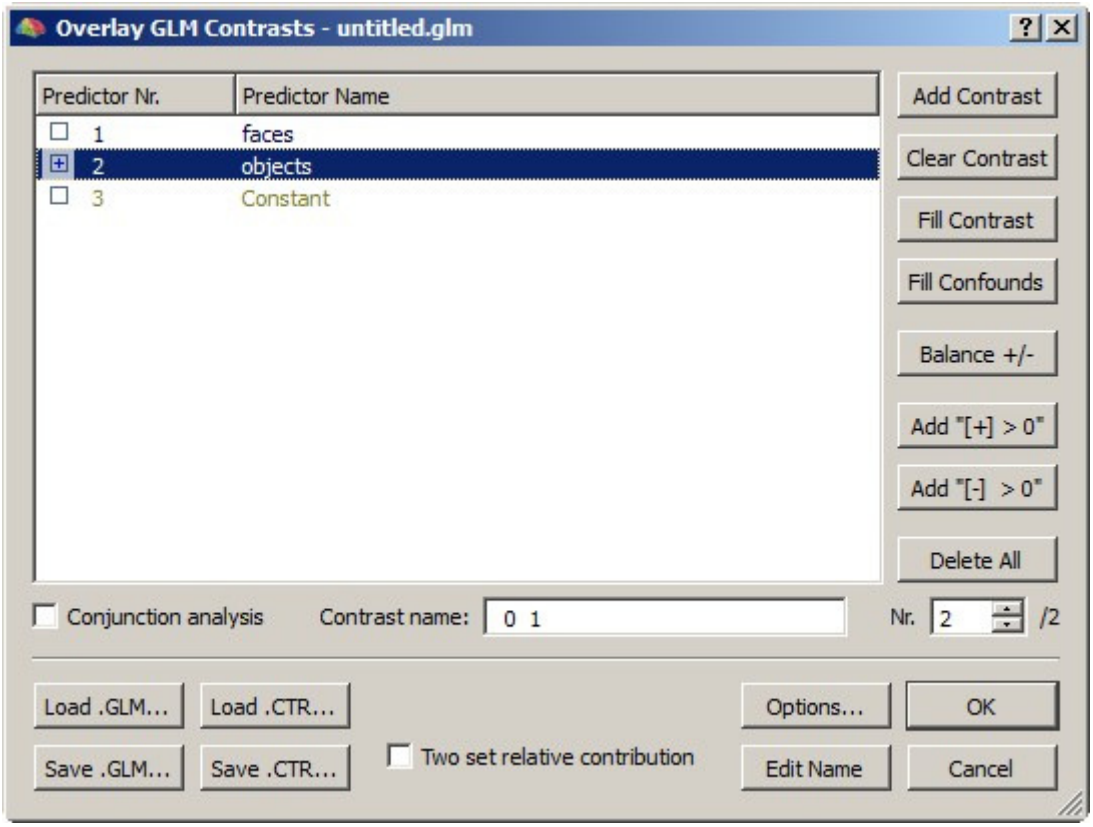


We define a new contrast



We click the "Add Contrast" button and define the contrast (+) "faces" on the first tab and the contrast (+) "objects" on the second tab.


Overlay GLM Contrasts - untitled.glm
Predictor Nr.
Predictor Name
1 faces
2 objects
3 Constant
Add Contrast
Clear Contrast
Fill Contrast
Fill Confounds
Balance +/-
Add "[+] > 0"
Add "[-] > 0"
Delete All
Conjunction analysis
Contrast name: 1 0
Nr. 1 /2
Load .GLM...
Load .CTR...
Save .GLM...
Save .CTR...
Two set relative contribution
Options...
Edit Name
OK
Cancel


Overlay GLM Contrasts - untitled.glm
Predictor Nr.
Predictor Name
1 faces
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Add Contrast
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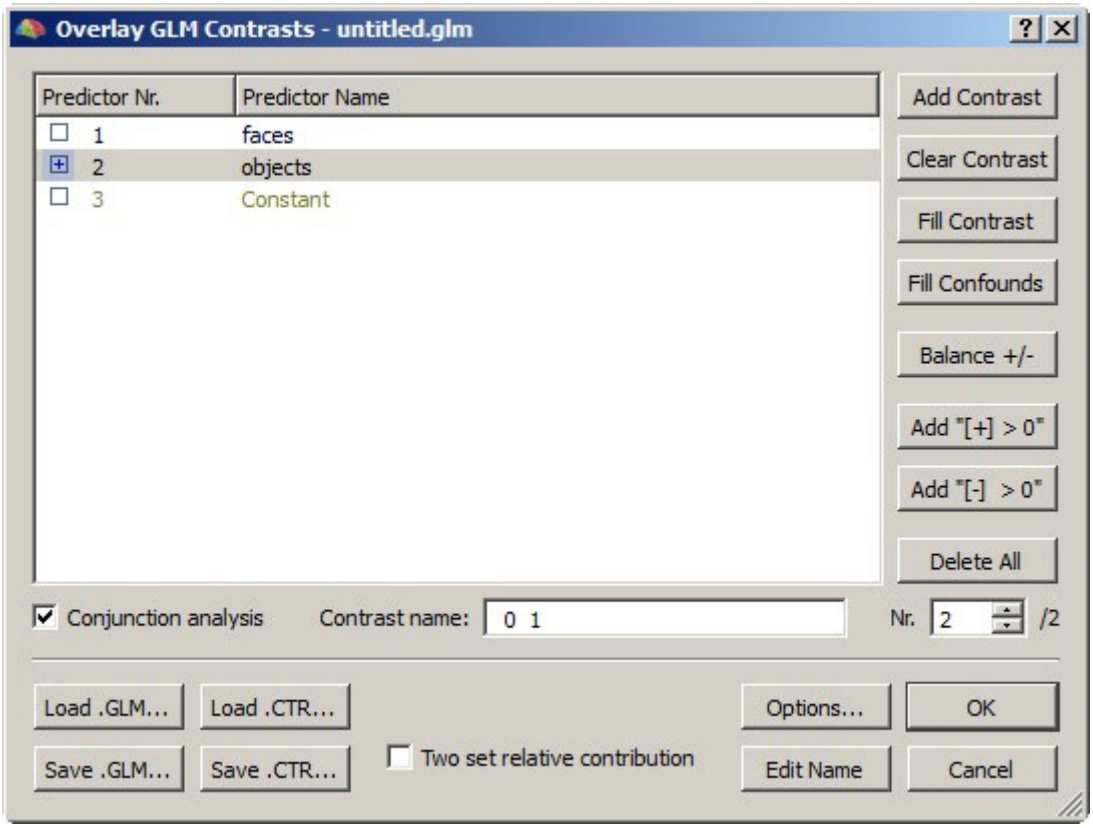
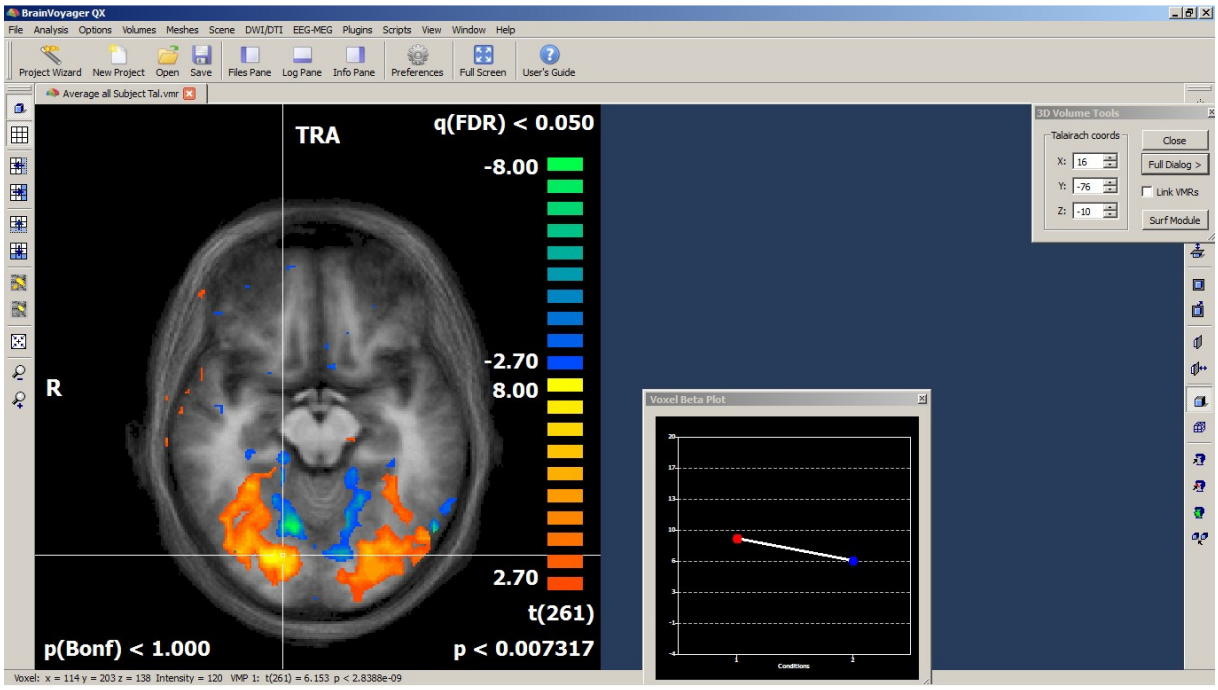
Fill Contrast
Fill Confounds
Balance +/-
Add "[+] > 0"
Add "[-] > 0"
Delete All
Conjunction analysis
Contrast name: 0 1
Nr. 2 /2
Load .GLM...
Load .CTR...
Save .GLM...
Save .CTR...
Two set relative contribution
Options...
Edit Name
OK
Cancel

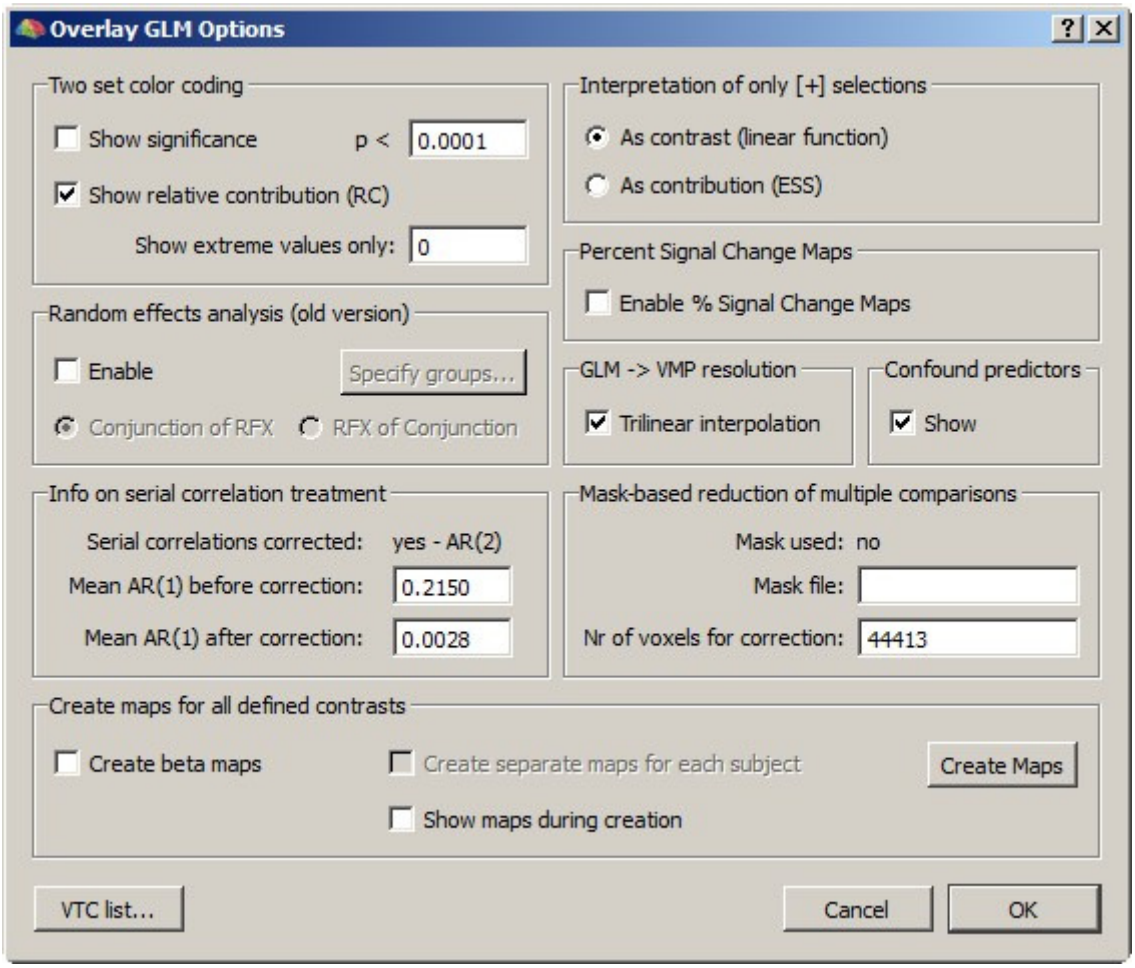


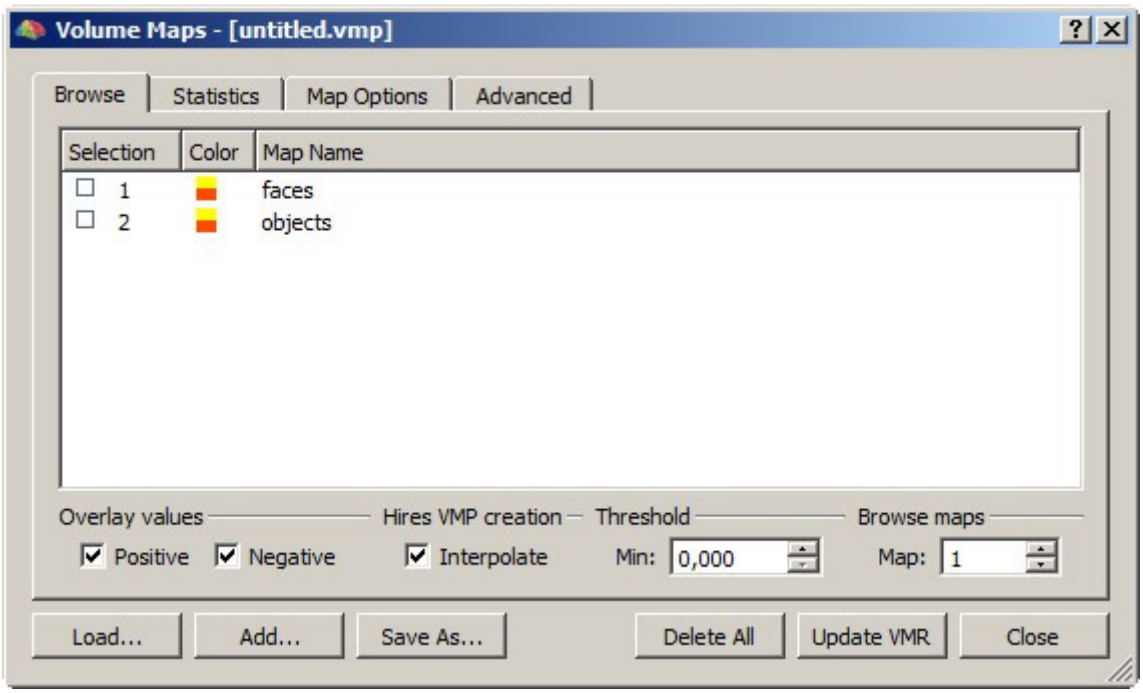
We choose the" Conjunction Analysis" checkmark and start the contrast calculation by clicking the "OK" button.



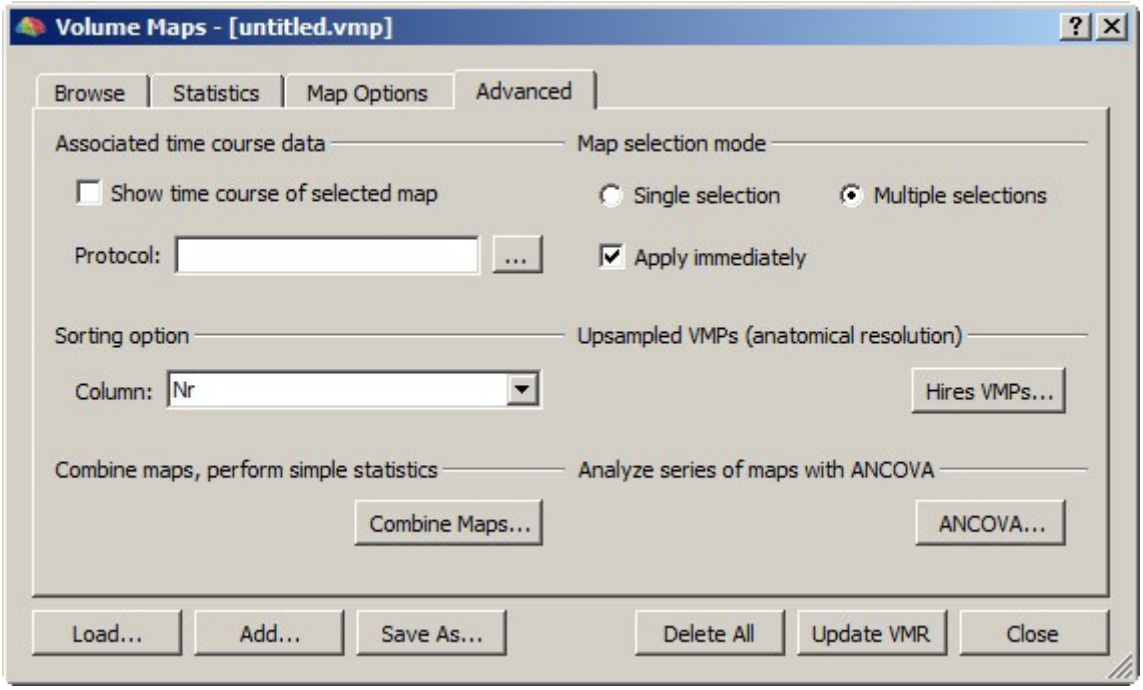
We open the "Overlay Volume Maps" dialog and save the conjunction map as a new volume map (to be used later)

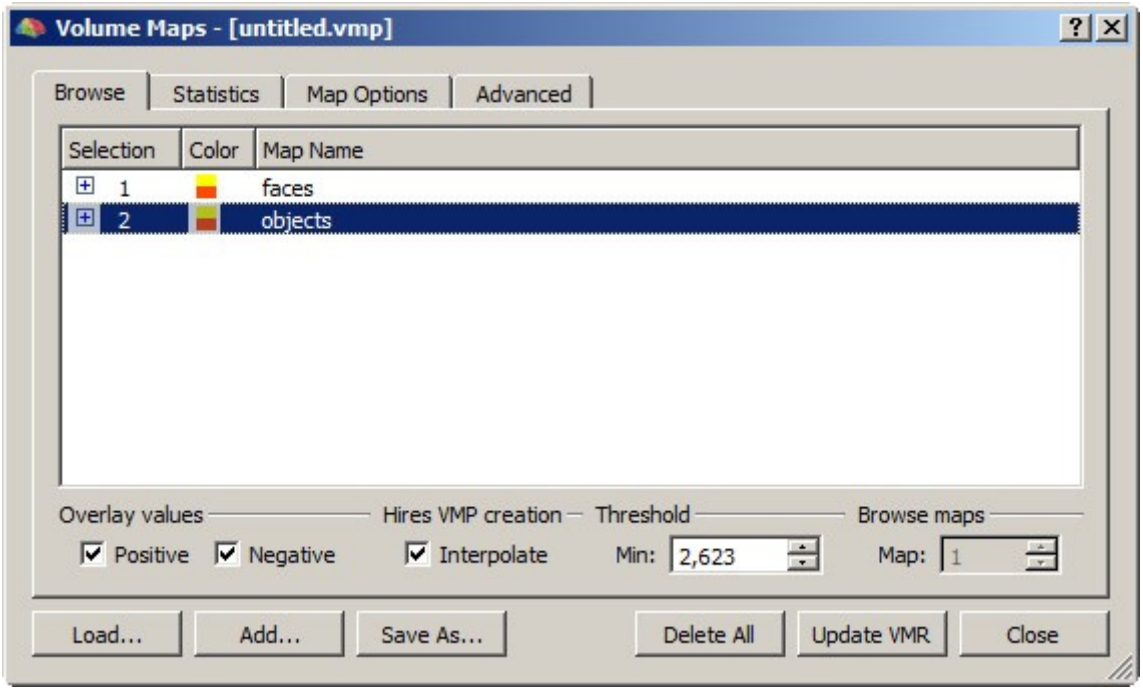
To observe the results further, we create the two separate contrasts maps. We open the Options of the Overlay GLM dialog and click the "Create Maps" button. This will create on contrast map for each of the contrasts defined.





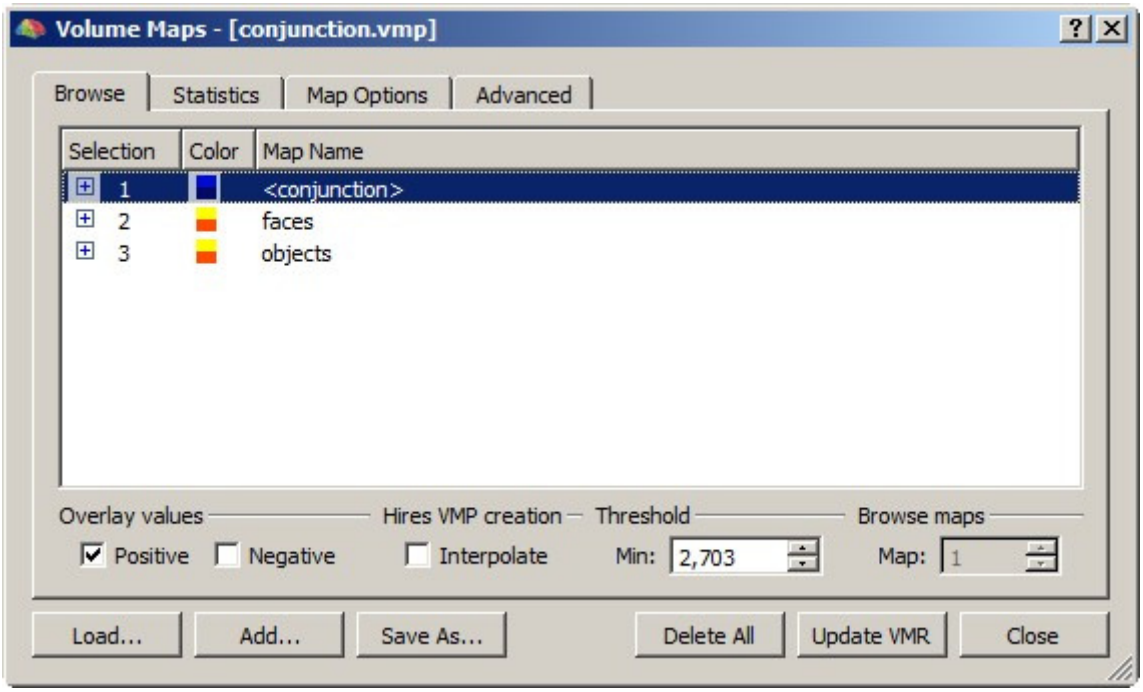
We choose the Multiple selections radio button on the Advanced tab.



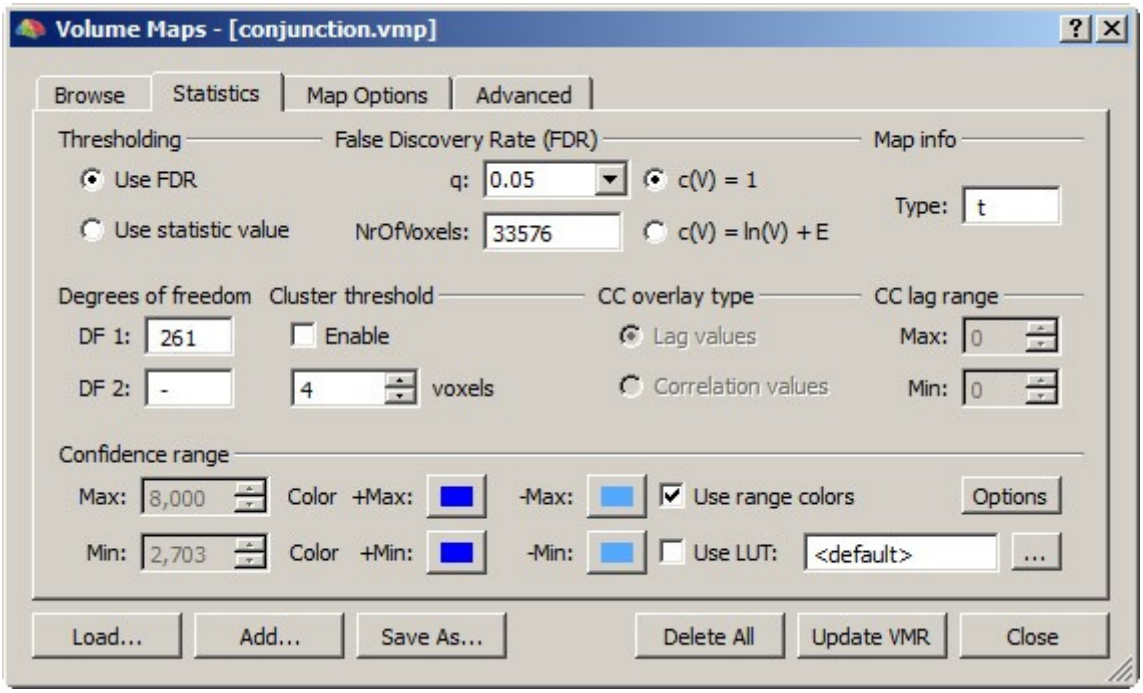


We add the "conjunction" map save before. This allows us to check the origin of negative and positive voxels in the conjunction map.

It is advised to switch off the "Interpolate" checkmark.

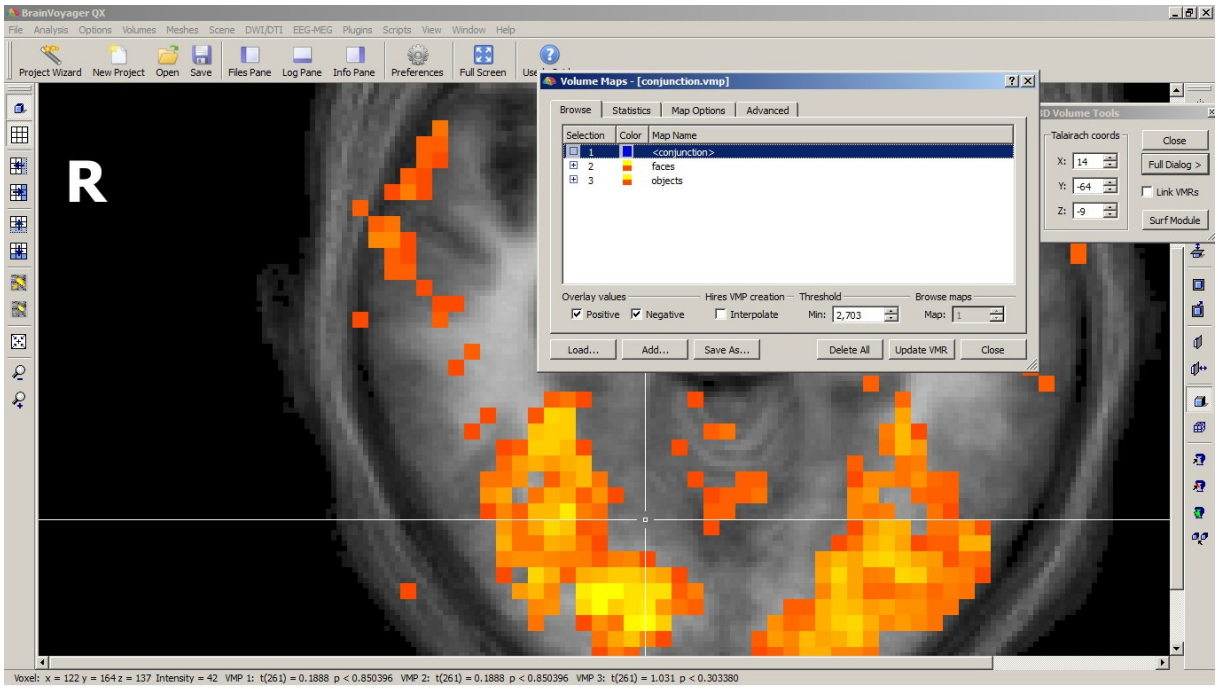


In this case, we first switched off the negative voxels within the single contrast maps to check the origin of positive and negative voxels in the conjunction map. In addition, we changed the color code of the conjunction map. This can be done on the "Statistics" tab. The new color allows an simpler evaluation of results.

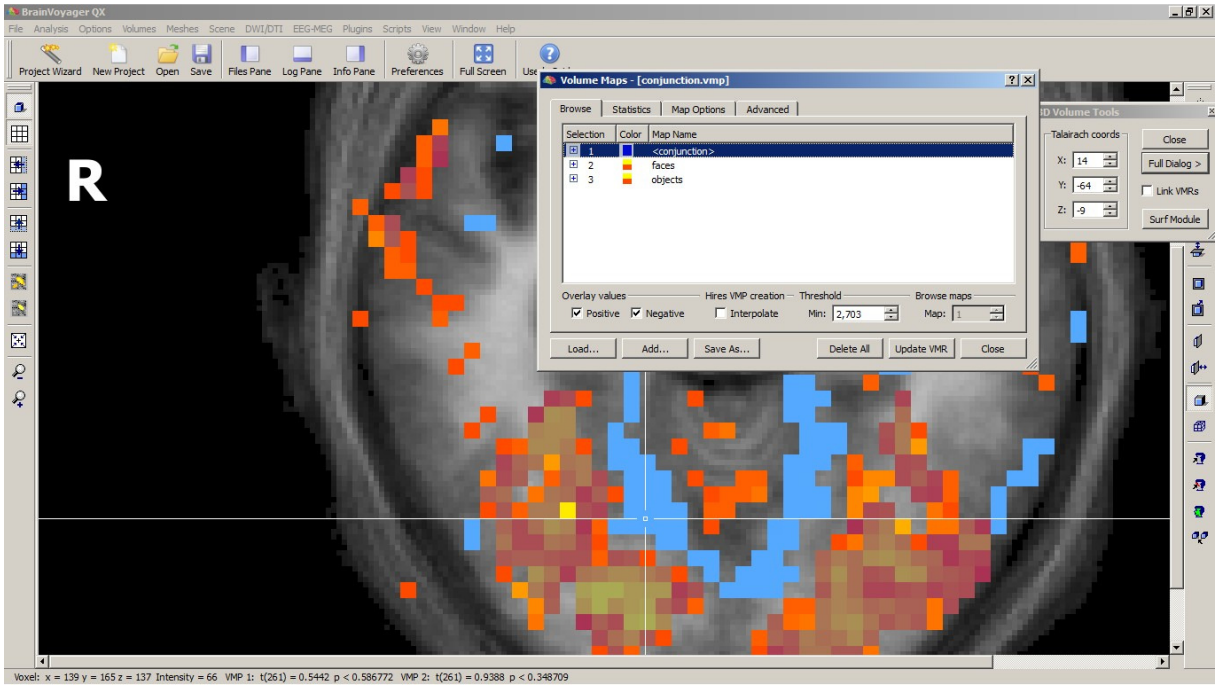


When switching off and on just the conjunction map, we can easily see the origin within the single t-maps. Of course we can do this same thing with only negative values in exactly the same way.

conjunction map switched off:



conjunction map switched on:



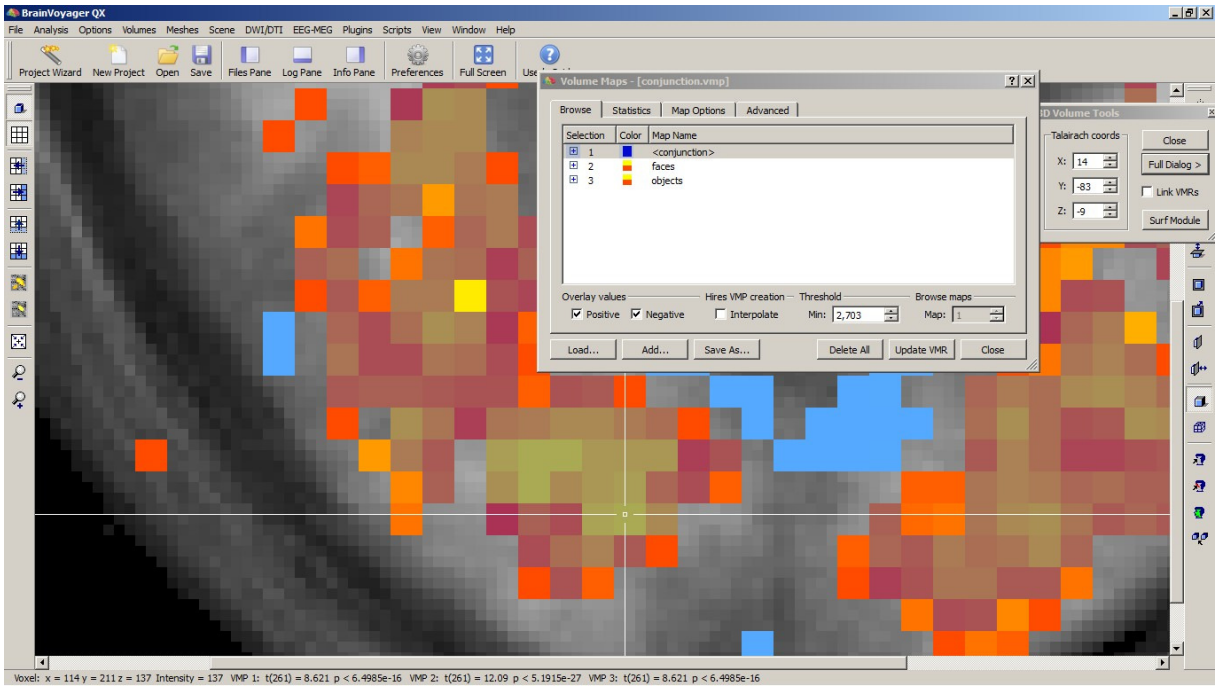
We can see a couple of details.

- no negative conjunction voxels seem to overlap positive original voxels

- there are some voxels in the original map(s) that are not in the (positive) conjunction map. In those voxels, the smallest t-value has not been significant and the voxel thus did not appear as significant in the conjunction map.

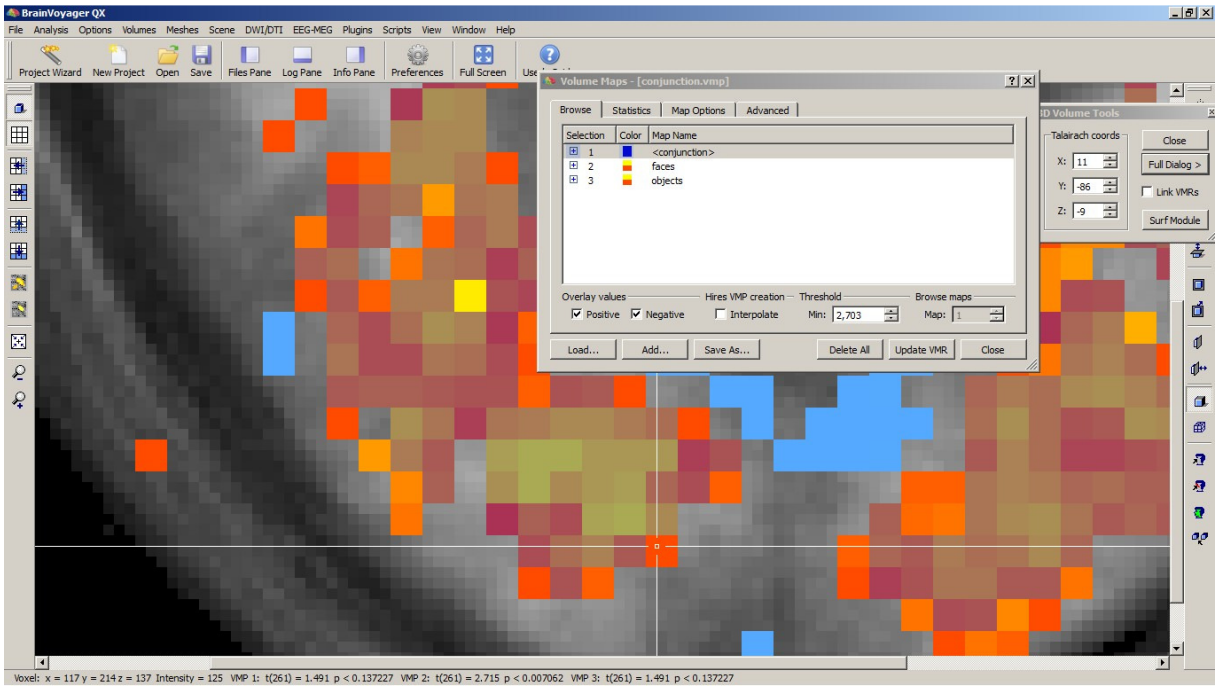
We check the t-values within a single voxel by moving the mouse over it.

Significant conjunction voxel:



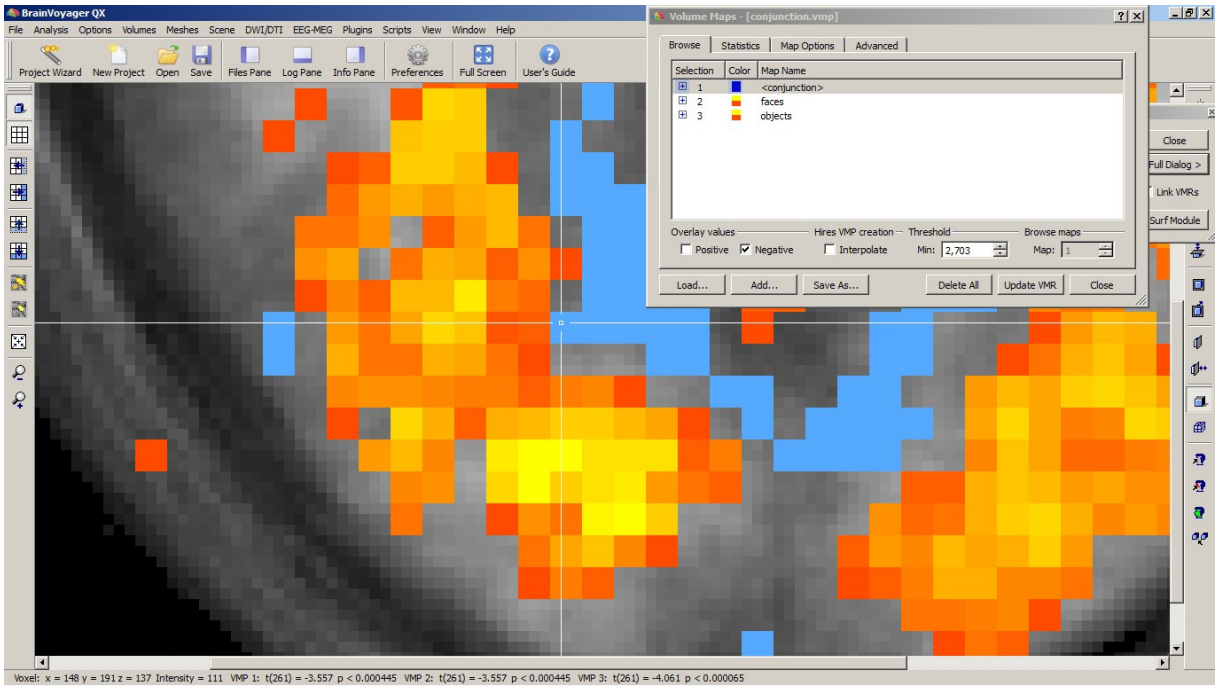
In this case, the first map has a t-value of 8.621, the second map has a t-value of 12.09 and thus the conjunction (following the mimimum t-logic) shows again the t-value of 8.621.

nonsignificant conjunction voxel:

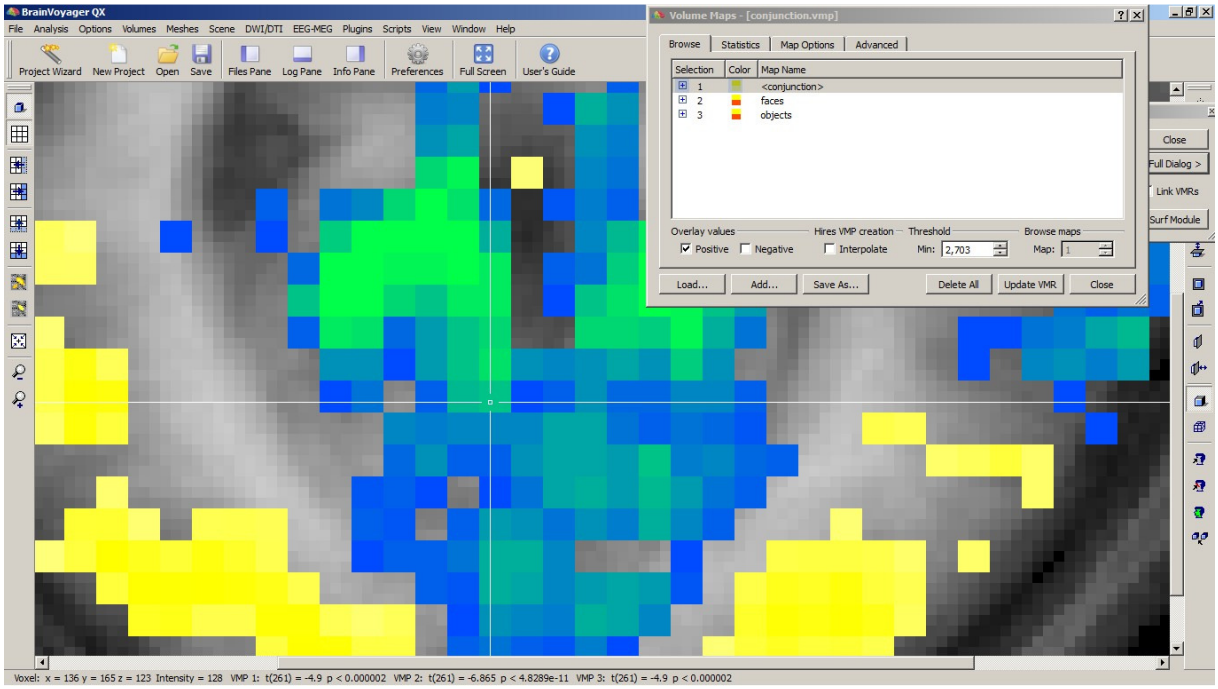


In this case, the first map has a t-value of 1.491, the second map has a t-value of 2.715 and thus the conjunction (following the mimimum t-logic) shows again the t-value of 1.491

In the next screenshot, we overlay negative conjunction map to the original positive map and can see that there is no apparent overlap.



The next screenshots shows the opposite depiction: positive conjunction voxels overlayed to negative original voxels. Again, there is no overlap.



To perform a more holistic numerical test and not just a visualisation of effects, we create VOIs on the basis of the four original maps:

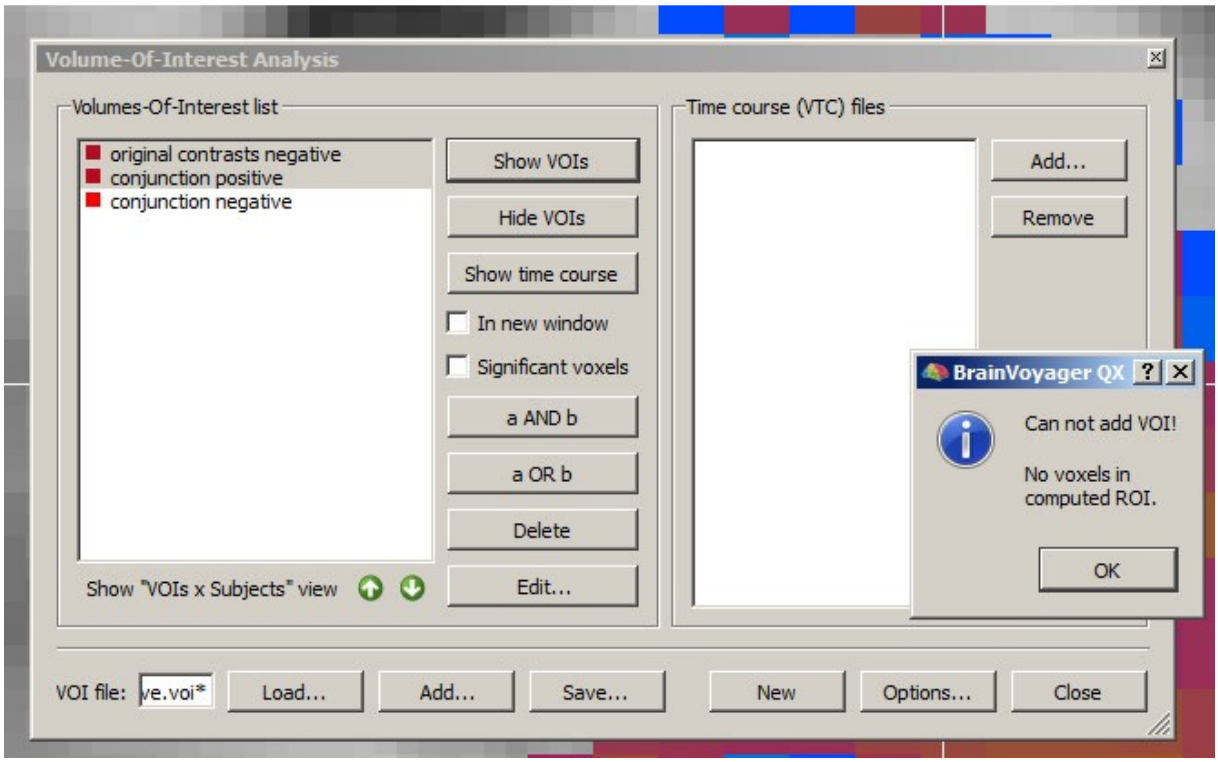
1. all positive voxels from the original contrast maps

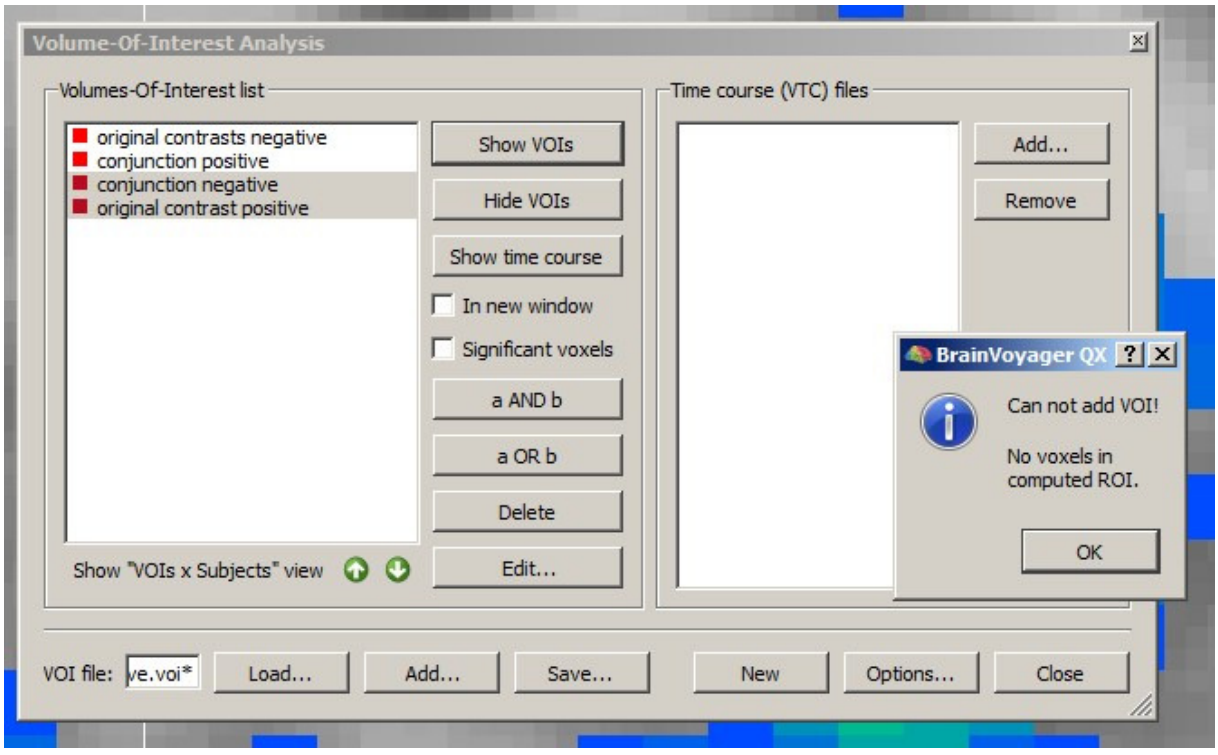
2. all negative voxels from the original contrast maps

3. positive voxels in the conjunction map

4. negative voxels in the conjunction map

In the VOI tool, we mark a) the "positive" voxels in the original maps and the "negative" conjunction voxels and b) the "negative" voxels in the original maps and the "positive" conjunction voxels and click the "A AND B" button to check for an overlap of voxels.





As expected, we find no overlapping voxels for maps with opposing signs in the original contrast and the conjunction map.