

# ***How is the baseline for event-related averaging calculated?***

*Baseline calculation options for the “Event Related Averaging plot” in BrainVoyager.*

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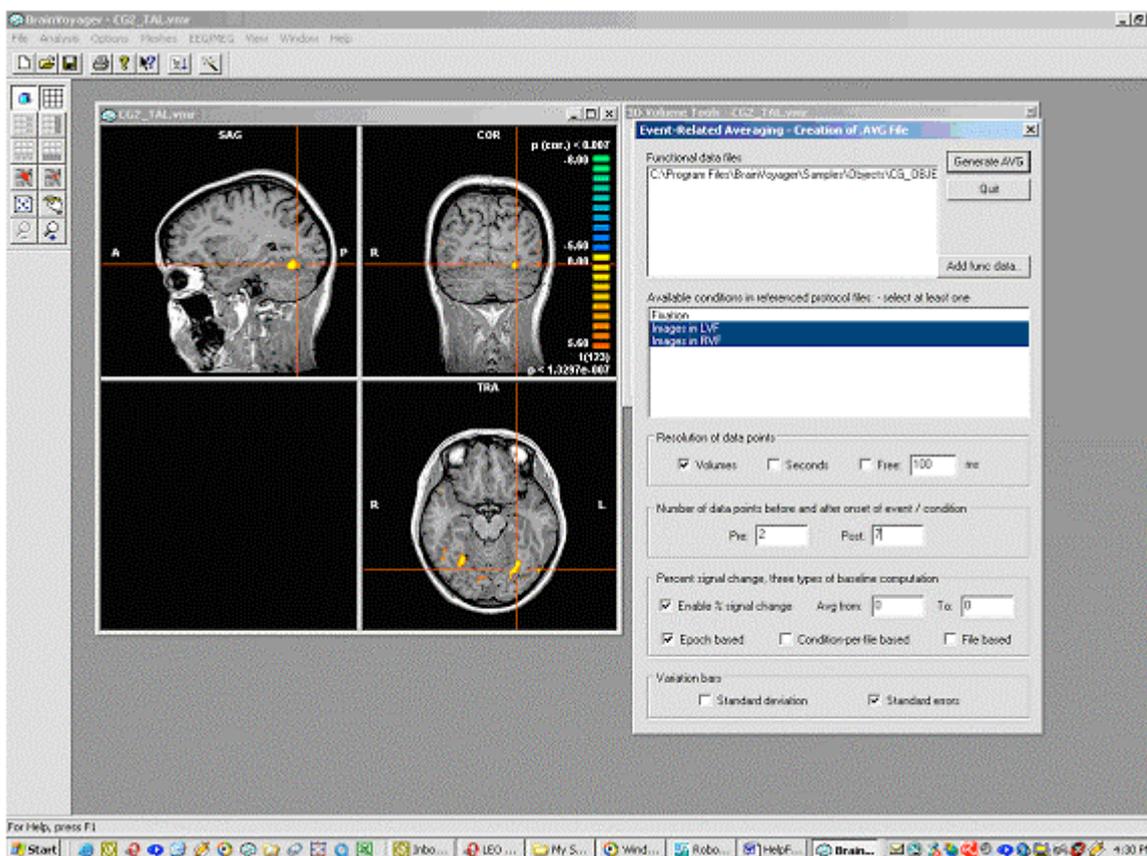
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## Introduction

In BrainVoyager's "Event-Related Averaging" dialog, three options to compute the baseline for the calculation of the percentual signal change can be found.

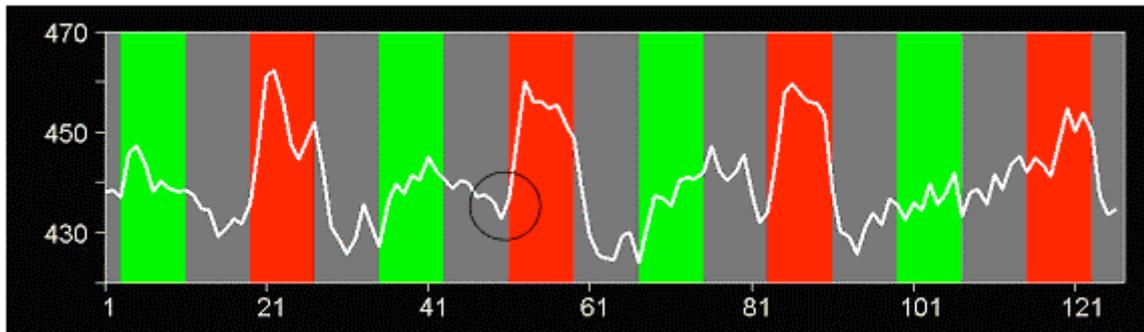
- Epoch based
- File based
- Condition-per-file based

Each of these three conditions uses a different method to calculate the baseline for the the percent signal change of activation within in the time window (pre - post period) defined by the user. In the following, I will use the "Objects" dataset of the standard BrainVoyager sample to show the differences between the conditions (simple block design, two conditions). First, a "Single Study GLM" is calculated and a "region of interest" is selected.



## 1. Epoch-based

This option is comparable to the averaging performed in Event Related Potential (ERP) analysis. The specific time point or points (depending if “pre-period” consists of one or several values) before each different epoch (event of the timecourse) is used for the calculation of the percentual signal change. In the picture below, only one epoch (second block of the “red” condition) is taken into account.

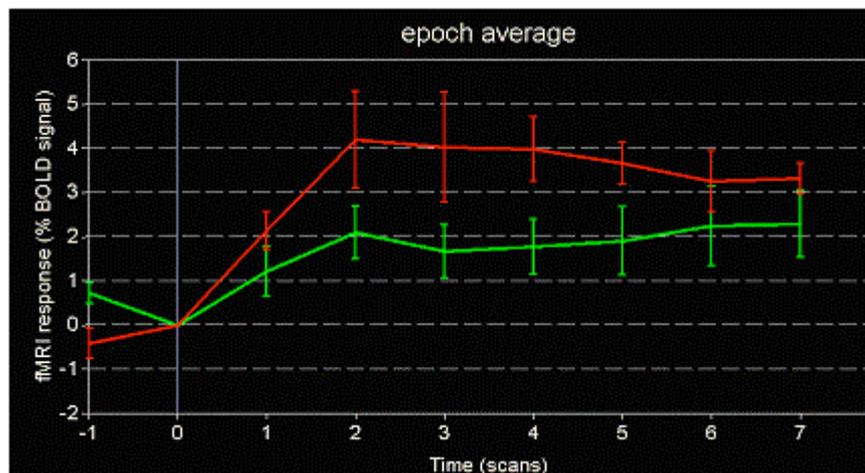


The percent signal change is calculated as:

$$\left( \frac{\text{value} - \text{spec\_baseline\_for\_epoch}}{\text{spec\_baseline\_for\_epoch}} \right)$$

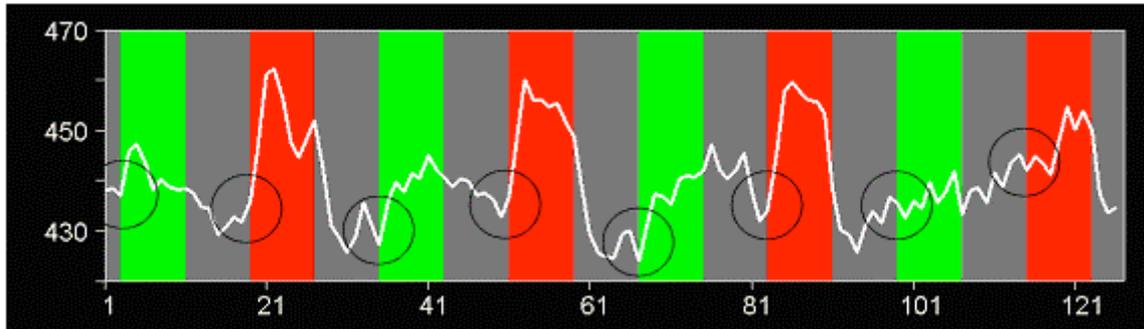
First, this formula is used for all specific epochs (here 8 blocks) within a run. After this, the percent signal change values for the same condition are averaged over the time course.

This is the resulting event related averaging plot:



## 2. File-based

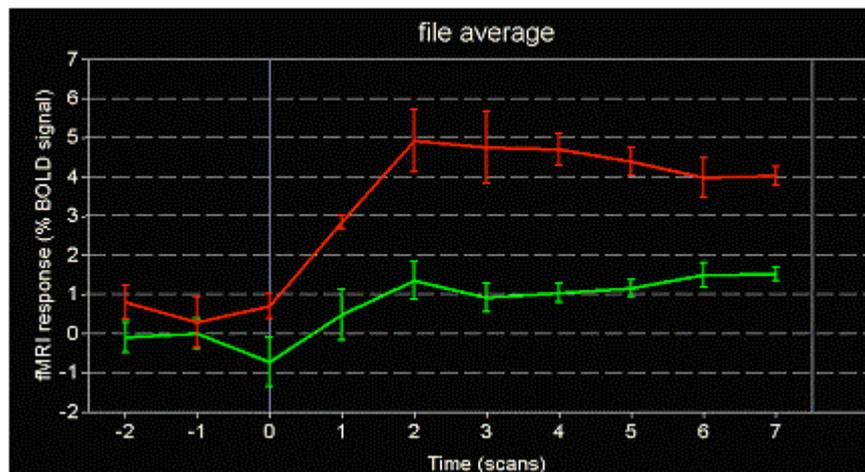
This method is the one most comparable to the calculation performed in the General linear model. If the condition “File based” is chosen, first every value of each pre-period over the whole time course defined is averaged. After doing so, the calculation of the signal change is performed with this average value.



The percent signal change is calculated as:

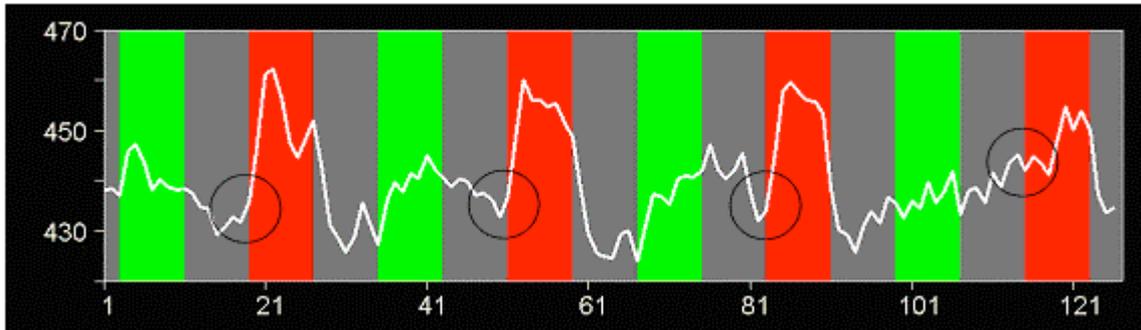
$$\left( \frac{\text{value} - \text{average\_baseline\_for\_run}}{\text{average\_baseline\_for\_run}} \right).$$

This is the resulting event related averaging plot:



### 3. Condition per file-based

Using this condition, the pre-period averages are computed specifically for each condition within the run. First, the average baseline of each condition is calculated (here, only the “red” condition is shown).



The percent signal change is calculated as

$$\left( \frac{\text{value} - \text{average\_baseline\_for\_cond}}{\text{average\_baseline\_for\_cond}} \right)$$

This is the resulting event related averaging plot:



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