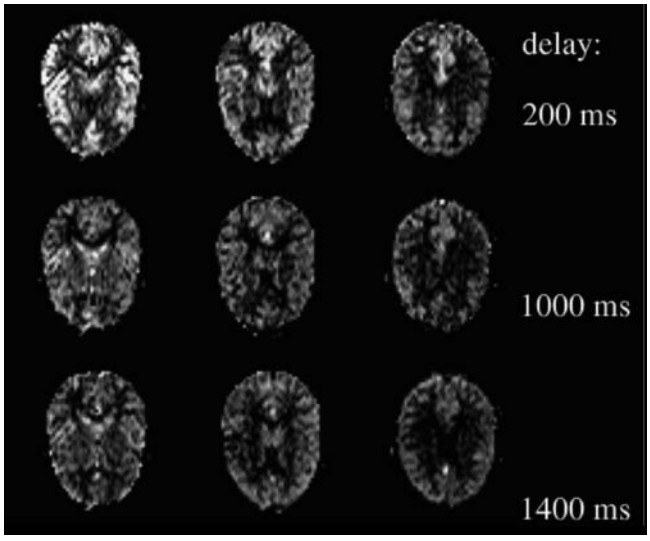

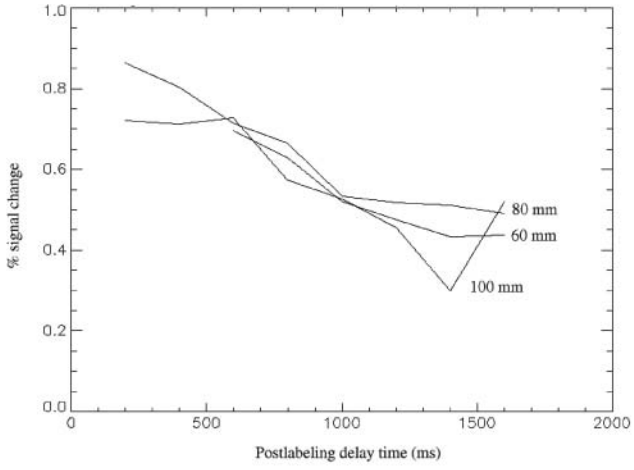

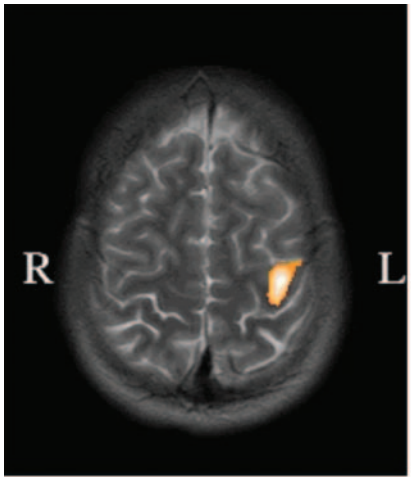

References:

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Optimal flip-angle choice in GRE-EPI fMRI

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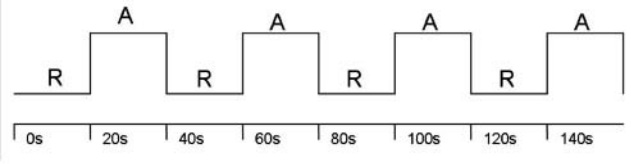
Introduction: SNR, an important limit in fMRI, is influenced by the flip-angle in GRE-EPI sequences. An optimization of the flip-angle is presented through signal strength and signal stability measurements.

Method: fMRI procedures were obtained in two Philips Intera 1.5T machines with different gradients. Each fMRI experiment consisted of 80 dynamic acquisitions covering the whole brain (24 slices) with a GRE-EPI (TR=2000 ms, TE=50 ms, slice thickness 5 mm, 96x96 acquisition matrix, FOV=220 mm).

The flip-angle was varied from 35º to 95º, on 15º intervals. The whole flip-angle test was performed three times in different days.

The motor activation paradigm was designed as hand apprehension (the subjects opened and closed the hand at 1 Hz in the activation block [A] being motionless in the rest block [R]).



fMRI images were analysed using SPM2 (Statistical Parametric Mapping, FIL, London, UK). The process consisted of realignment, coregistration to anatomical images and smoothing (6 mm full-width half-maximum kernel). Statistical images were finally obtained with a corrected (family-wise error) p=0.05 value and a minimum extent k=20. Five optimization parameters were selected, representing the amount of activation (BOLD extension: number of voxels activated; SNR) and signal stability (temporal fluctuation of signal; lateralisation variation to the first experiment; SNR variation).

Results: Unacceptable temporal fluctuation of the signal was observed in the 35º and 95º flip-angle images. Therefore, these sequences were disregarded. The number of activated voxels was smaller for 50º, being similar for 65º and 80º. SNR was similar in the 50º and 65º sequences, and higher than in the 80º flip-angle one. Relative lateralisation variation and SNR variation were smaller in the 65º flip-angle sequence than with the other two flip-angles.

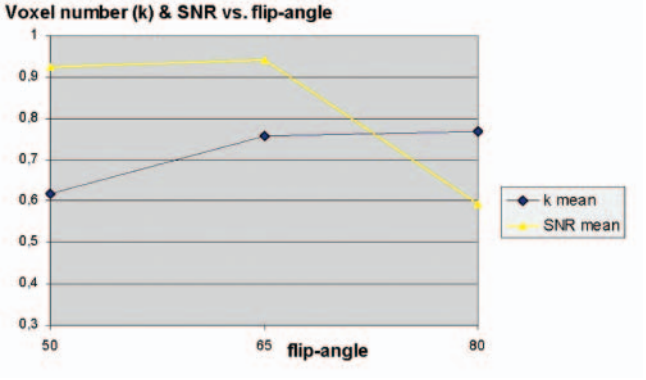


Figure 1: Signal strength. Number of activated voxels and SNR normalised to maximum value.

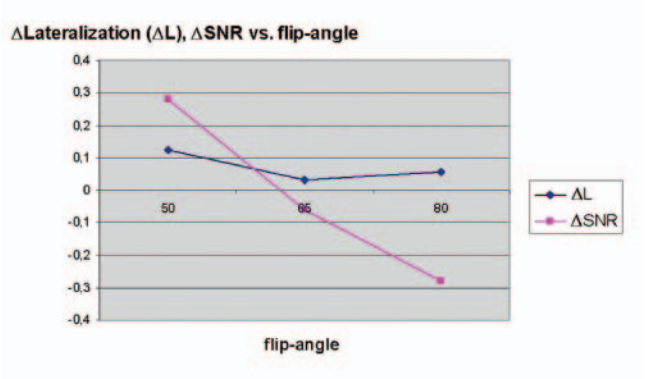


Figure 2: Signal stability.

Conclusion: Sequence optimization is very important in fMRI because a lower SNR and instability values give very poor results. We have shown a methodology to improve fMRI sequences with changes in the flip-angle related to signal strength and stability.

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The effect of evaluating lines length on perception and movement: an fMRI study

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Introduction: In behavioural studies, observers judge the parallel lines of the Mueller-Lyer illusion (MLI) to be of different lengths, but they are accurate when responding to these lengths by properly displacing their arms. According to a currently much-debated hypothesis, functional dissociations of this kind reflect a division of labour between two parts of the visual system: The ventral stream from primary visual cortex (V1) to infero-temporal cortex uses object-relative spatial coordinates for object constancy and recognition, whereas the dorsal stream from V1 to posterior parietal cortex uses observer-relative locations to guide movements. Here we report preliminary neuroimaging observations testing this two-visual-system hypothesis.

Subjects and Methods: An fMRI study was carried out using a 1.5 T Philips Gyroscan Intera imager and EPI technique. Ten informed healthy male volunteers were asked to view a milky screen, where versions of Muller-Lyer visual stimuli were projected. In the first condition (perceptual report), subjects had to lift their arms when they perceived the lines length as different. In the second condition (motor response), they had to respond to line length by reaching out and appropriately spacing their arms. Data pre-processing (image realignment, normalization and smoothing) and statistical analysis of significant relative regional BOLD response changes were performed using SPM2 software (Wellcome Department of Cognitive Neurology, London, Uk).

Results: Preliminary findings confirm behavioural observation and show different activation of occipito-temporal and occipito-parietal pathways in the two situations.

Discussion: It is speculated that this different activation is related to the performed task and that it further supports a role of the occipito-parietal pathway in coordinate transformation for visuomotor behaviour.

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Neural correlates of the number-size congruency effect

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Isoflurane as an alternative for alpha-chloralose anesthesia during fMRI studies in rats

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Introduction: Alpha-chloralose has been the drug of choice for fMRI studies in rats, because it provides a stage of deep sedation