

STIMULUS FREQUENCY DEPENDENCY OF POST STIMULUS UNDERSHOOT OF THE BOLD fMRI SIGNAL

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Introduction:

The aim of this study is to investigate the effects of different stimulation frequencies on post stimulus undershoot of the blood oxygen level dependent functional magnetic resonance imaging signal.

Study Design:

The fMRI experiment was performed on a Philips 1.5T MR system using an 8 channel head coil (Sense Head 8, Philips Medical Systems, Eindhoven, Netherlands) at the NPISTANBUL Neuropsychiatry Hospital, Istanbul. A fiber optic light delivery system connected to a black opaque sunglass is constructed to deliver visual stimuli to the subjects during fMRI scans (Figure 1). One static visual stimulus and eleven flashing stimuli with frequencies ranging from 4 to 14 Hz and 30 to 46 Hz are applied one subject in one fMRI scan session.

The acquired data is analyzed to obtain the BOLD fMRI parameters. Positive blood oxygen dependent and post stimulus undershoot signal changes in the primary visual cortex are determined for each frequency.

Results:

The results suggest that the post stimulus undershoot has a frequency dependency, independent of cerebral blood volume changes. Requirement of more data and additional measures for following possibility related phenomena such as cerebral blood flow are discussed which might be investigated in further studies.

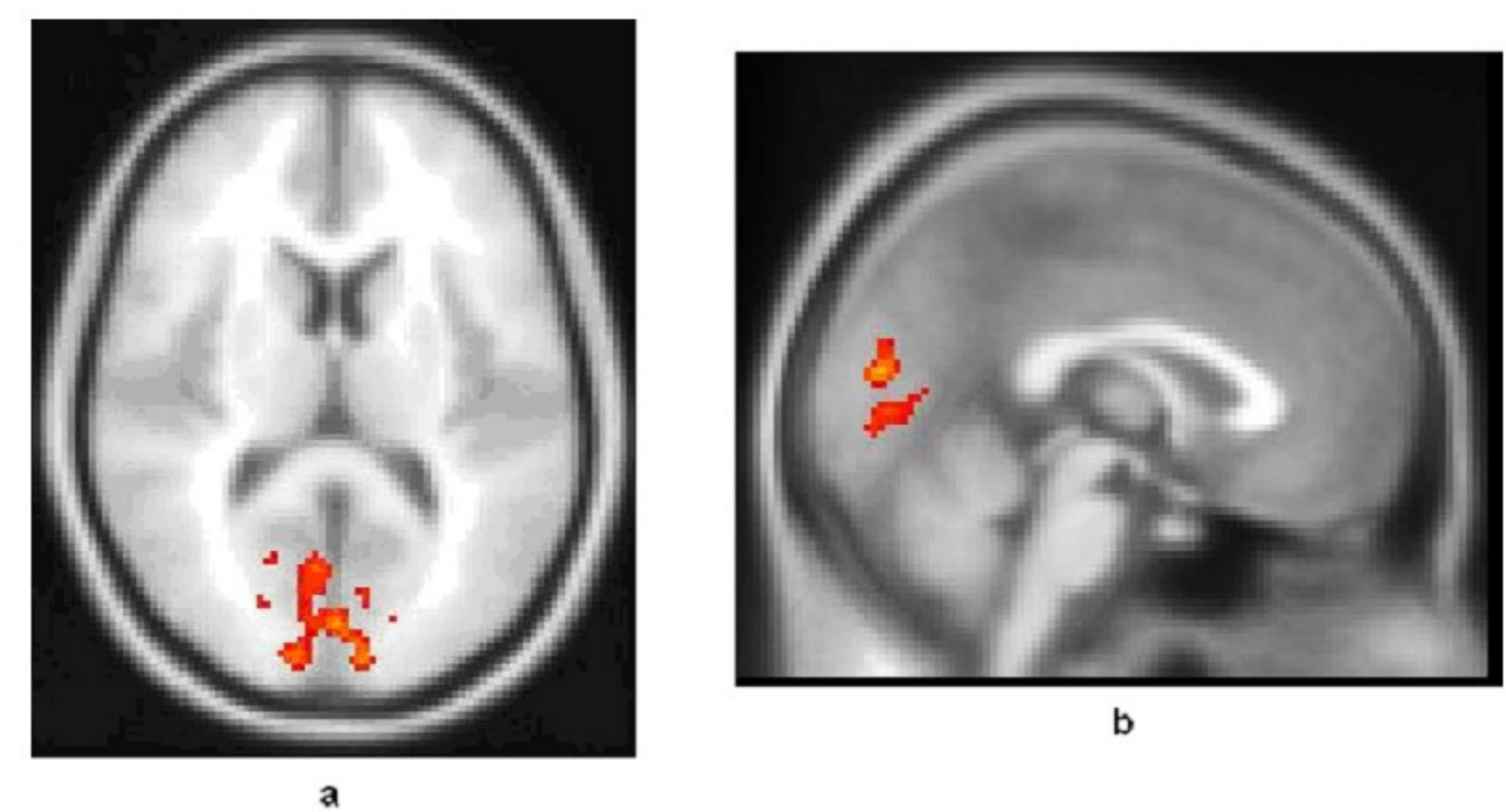


Figure 3. The most active voxels for the 6Hz stimulus data is superimposed on top of the subject's structural data.

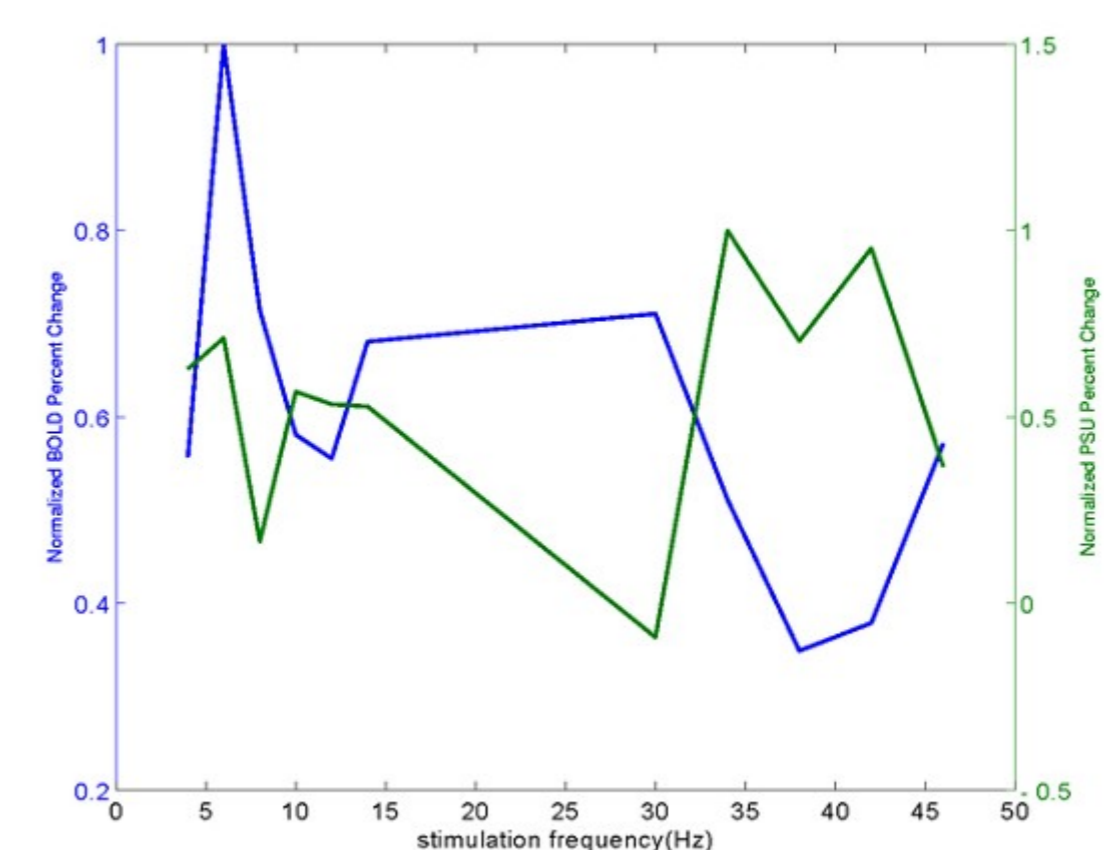


Figure 4. Normalized absolute PSU (Right y axis) and PBOLD (Left y axis) change across all frequencies. Maximum is set to 1.

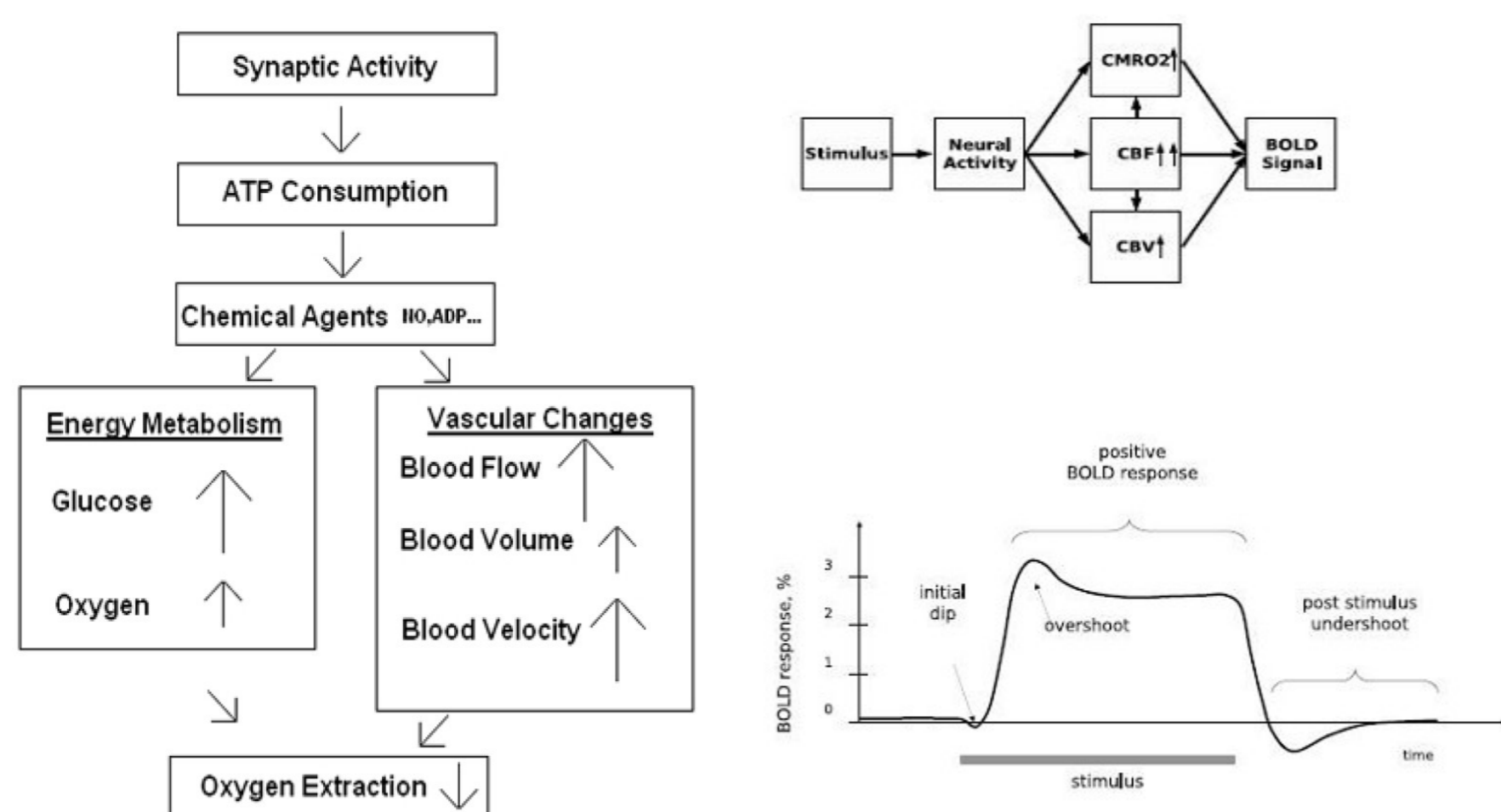


Figure 1. BOLD Signal generation and illustration of BOLD response

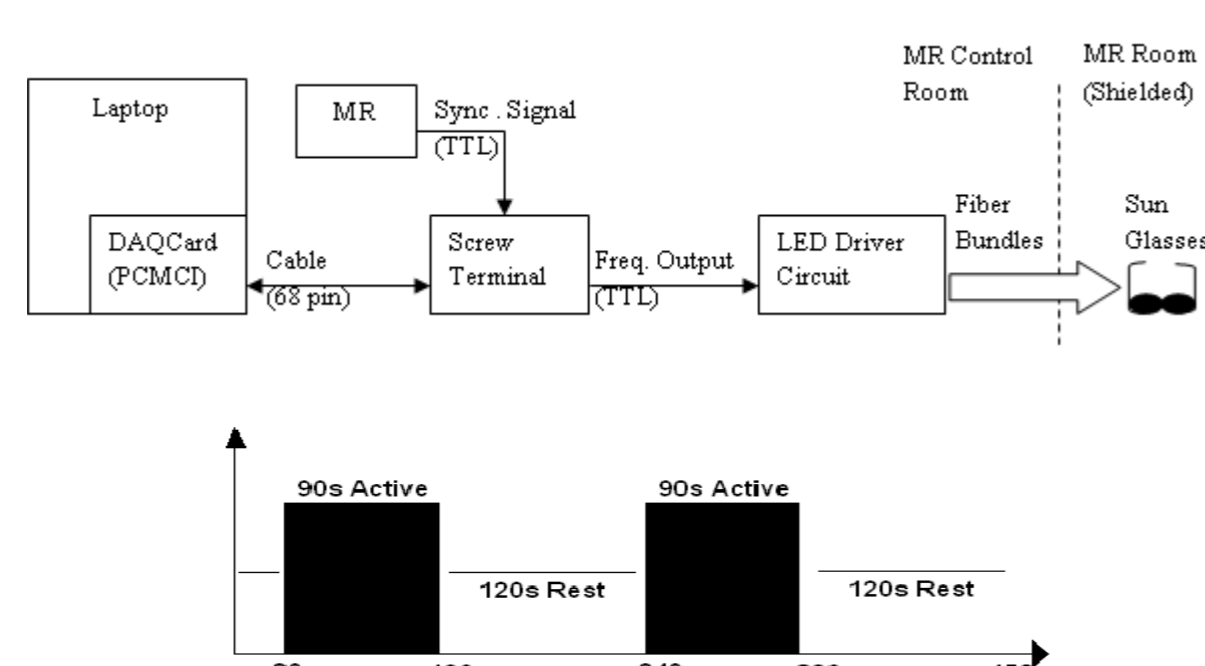


Figure 2. Visual Stimuli deliver system and Block design

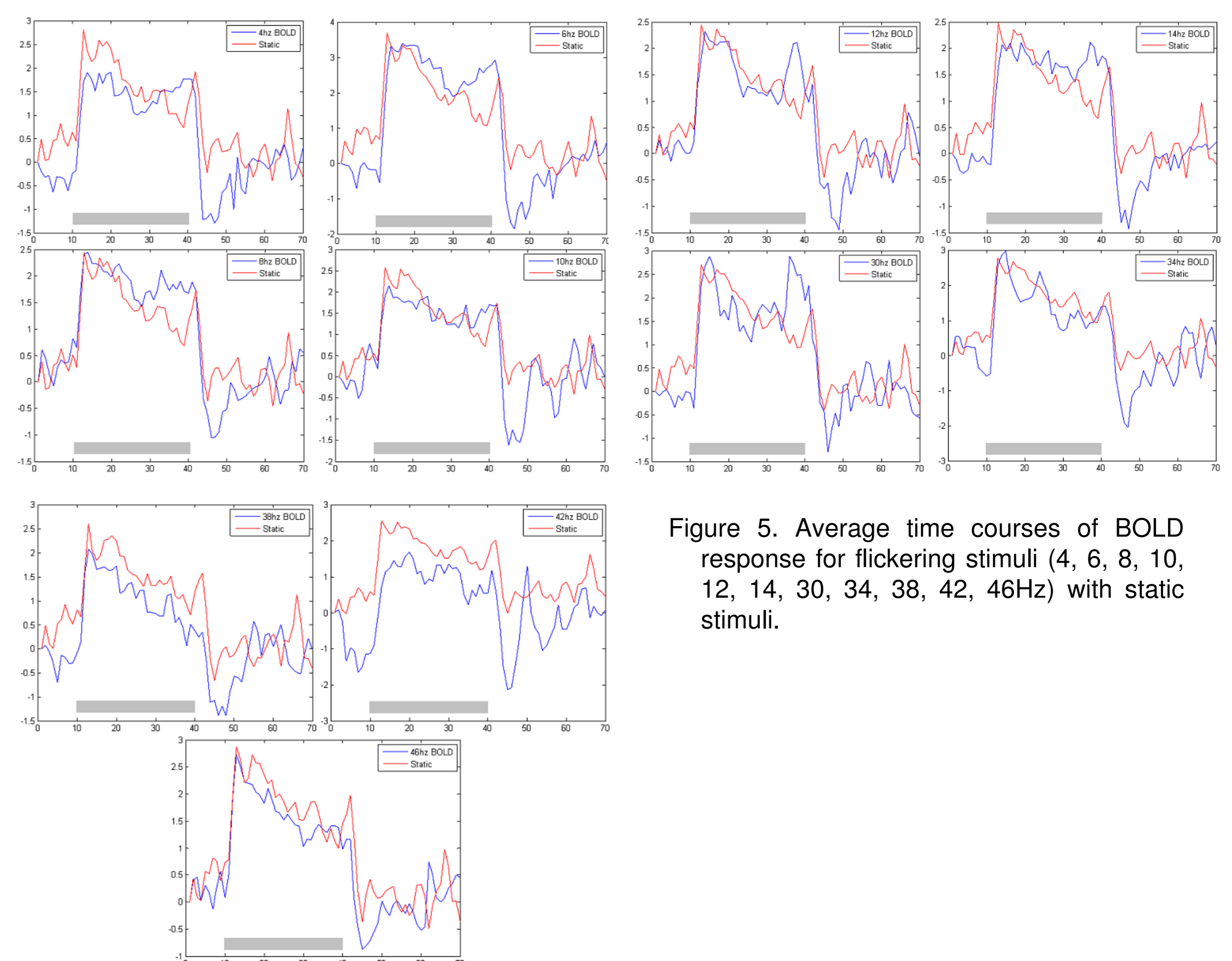


Figure 5. Average time courses of BOLD response for flickering stimuli (4, 6, 8, 10, 12, 14, 30, 34, 38, 42, 46Hz) with static stimuli.