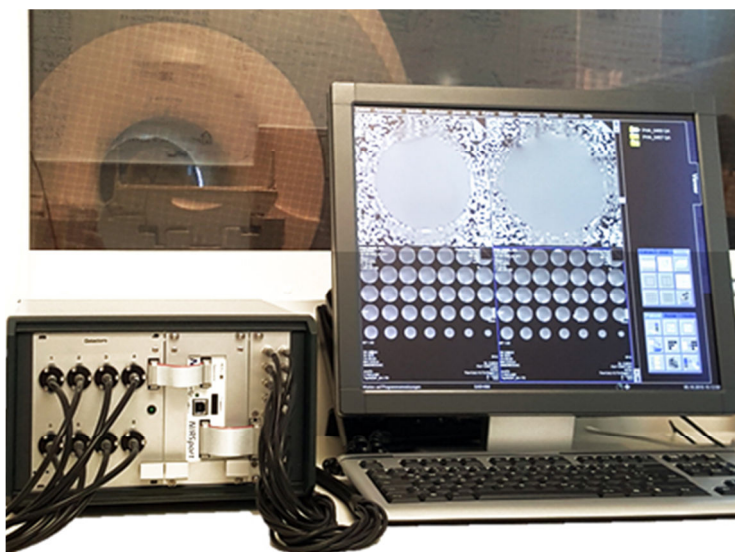
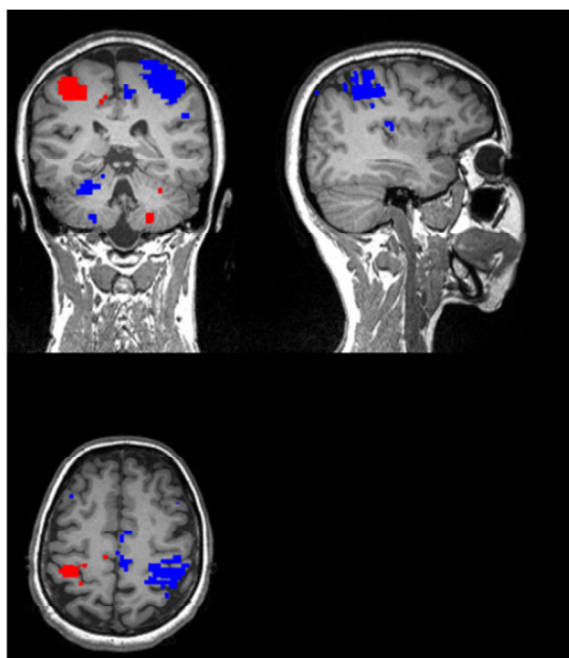


Concurrent fNIRS and fMRI

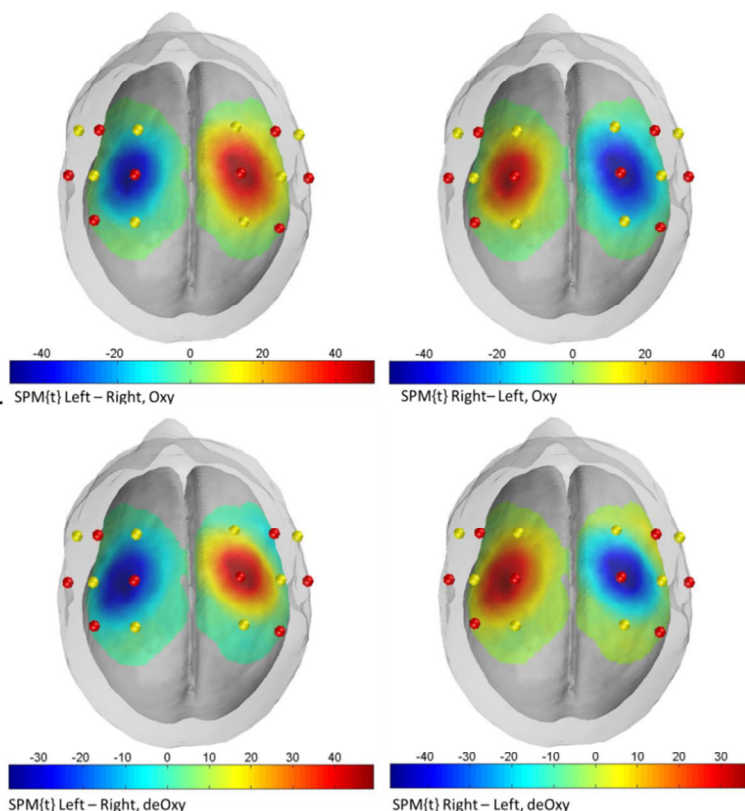


1. INTRODUCTION

Compared to fMRI, fNIRS has different advantages and disadvantages. While fMRI has become the gold standard for in vivo imaging of the human brain, fNIRS stands out for its portability and robustness to noise, bringing functional imaging into realistic environments. While limited by its inferior spatial resolution and penetration depth, fNIRS has a much higher temporal resolution than fMRI, allowing measurements of concentration changes in both oxygenated and deoxygenated hemoglobin.



Example of concurrent fMRI and fNIRS imaging during a left and right finger tapping experiment. fMRI data have been collected on a Siemens Magnetom 3T. fNIRS data have been collected on a NIRx NIRSport APD/LED module.
Above: FSL thresholded activation images. Left>Right (blue) and Right>Left (red) overlaid on anatomical scan. Right: SPM(t) activation images, contrasts defined in each image, overlaid on MNI template.



Concurrent fNIRS and fMRI

2. COMPARING FNIRS HEMODYNAMICS TO FMRI HEMODYNAMICS

It is therefore of interest to many researchers how NIRS compares to fMRI in studies of brain function. While concurrent fMRI and fNIRS measurements have been mostly aiming at validating fNIRS as newer technology and studying the spatial and temporal correlations between the fMRI BOLD signal and the concentration changes in oxygenated and deoxygenated hemoglobin, it is evident that combined fNIRS and fMRI can give new insights into brain function by overcoming some of their intrinsic limitations.

The optical nature of the NIRS signal and its robustness to motion, as well as the size and portability of fNIRS devices, makes fNIRS an ideal candidate for multimodality studies. fNIRS can effortlessly be combined with fMRI, EEG, TMS, tDSC and many other imaging modalities, without causing any measurement interferences.



3. FNIRS-FMRI WITH NIRX SYSTEMS

All NIRx NIRSport and NIRScout systems can be provided as MRI compatible modules, with sufficiently long optical fibers and MRI compatible optodes, for seamless installation in an MRI environment. Digital trigger inputs allow for fNIRS fMRI integration. Thanks to the modular design of NIRx devices, the number of NIRS sources and detectors can be customized based on the intended coverage.

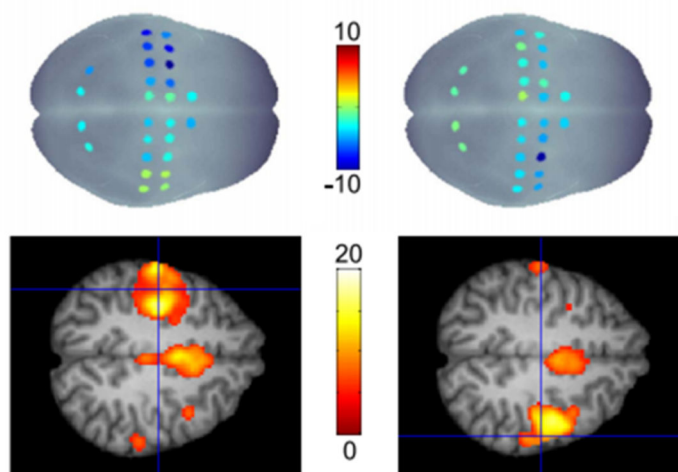


Figure 2. Statistical results of OT (top row) and fMRI (bottom row) using right and left finger tapping. Note that high activation is coded in blue (negative t-values) in the OT maps. The fMRI results show associated regions of the motor system ($p < 0.05$, corrected).

Mehnert, J., Schmitz, C., Möller, H. E., Obrig, H., & Mueller, K. (2010). *Simultaneous optical tomography (OT) and fMRI with and without task activation*. Poster presented at International Society for Magnetic Resonance in Medicine (ISMRM), 18th Scientific Meeting, Stockholm, Sweden.