Supplementary Methods for fMRI study:

MRI data acquisition

For each subject 100 T2*-weighted fast echo-planar images were acquired using a 3T Philips scanner with an 8-channel parallel head coil and SENSE factor of 2.0 (TE = 35 ms, flip angle = 85°, TR = 3.0 s). Forty-nine interleaved slices provided whole brain coverage (acquisition matrix 96 × 96, FOV = 240 × 240 × 147 mm) with each voxel subtending 2.5 × 2.5 × 3 mm. High-resolution T1-weighted images were also acquired with 1 × 1 × 1 mm voxel size, 175 slices in sagittal orientation.

fMRI analysis

All fMRI signal processing and analysis was performed using the FMRIB Software Library (www.fmrib.ox.ac.uk/fsl). At the first level (within-subjects), pre-processing involved several stages. Motion was corrected using MCFLIRT. Non-brain structures were removed using BET. The BOLD signal was then spatially smoothed using a 5 mm FWHM kernel and high-pass filtered with a 120s Gaussian weighted-filter.

The resulting de-noised time series data were analyzed using a general linear model (GLM) approach. Registration involved two stages. Initially the EPI data was registered to the subjects T1 images using 7 degrees-of-freedom. This was then registered to standard space using 12 degrees-of-freedom. Group analysis, was performed after this registration of each subjects brain to the MNI 305-brain average template. Statistical analysis was carried out in FEAT using FILM with local autocorrelation correction. The hemodynamic response function was modeled as a gamma function, a normalization of the probability density function of the gamma distribution with zero phase, standard deviation of 3s, and a mean lag of 6s.

There were 2 explanatory variables (EVs); *movement* and *rest.* FEAT was used to fit this model to the data, to generate parameter estimates for each of the EVs, and to contrast *movement* against *rest.* Voxels were initially thresholded at a Z-score value of 2.3, and then subjected to a cluster threshold with a significance level of $p<0.05$.

FEATQUERY extracted the time series data for a region of interest (6x6mm) which corresponded to the site of PMv TMS stimulation for each participant. An average was calculated using the contrast ***movement*** against ***rest.*** A paired t-test compared this value for PP+AO against PP.