ABSTRACT

Positive (PBR) and negative (NBR) haemodynamic responses (relative to baseline) are arising during stimulation. Functional magnetic resonance imaging (fMRI) signals only indirectly reflect the haemodynamic signatures of neural activity, and the relation between these fluctuations and fMRI responses remains poorly understood. Low-frequency activities are assumed to show inverse functional coupling with local PBR. Gamma frequency band is found as the major contributor to PBR development in visual cortex to grating stimulus. Two components of gamma frequency band (oscillatory narrowband (50-80Hz); non-oscillatory broadband gamma (50-120Hz) are reported, mainly from invasive animal studies. We investigated the relationship between unilateral motor movement and visuomotor task induced human magnetoencephalography (MEG) and fMRI responses in sensorimotor cortex and visual cortex. We hypothesised that alpha and beta event-related-desynchronisation (ERD) demonstrate inverse functional coupling with PBR in contra sensorimotor cortex and exhibit spatial overlap with NBR in ipsi sensorimotor cortex. Gamma event-related-synchronisation (ERS) were hypothesised to provide contribution to PBR in contra sensorimotor cortex. Our findings revealed spatial co-localisation between bilateral alpha and beta ERD peaks to motor tasks in contra and ipsi sensorimotor cortex. Contra alpha and beta ERD peaks exhibited good spatial agreement with contra sensorimotor cortex located PBR peak, while ipsi sensorimotor cortex identified NBR spatially overlapped with ipsi alpha and beta ERD. Furthermore, narrowband gamma activity was identified in ipsi visual cortex with observed broadband gamma in contra visual cortex to visual stimulus. Motor movements induced gamma ERS was identified in contra sensorimotor cortex with weak gamma ERD peak in ipsi visual cortex.