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INTRODUCTION

In order to react adequately to a stimulus in contact with our body, it is required to coordinate the perception of the location of that object in external space but also the perception of its contact on the body space. This highlights the ability of the brain to form a multisensory representation of space that integrates our body. The building of such a multisensory spatial representation is achieved by linking the inputs of the different sensory modalities, i.e. the somatosensory, visual and proprioceptive modalities. Neuroimaging studies have shown that cortical responses to a stimulus in primary sensory areas, thought to reflect unimodal processing, are influenced by the occurrence of a stimulus from another modality, provided that the two stimuli are presented in the same spatial location (e.g. Macaluso et al., 2002, 2005). We propose to further explore the neurophysiological mechanisms of such crossmodal interaction in primary sensory cortical areas using the frequency-tagging of steady-state evoked potentials (SS-EPs). More specifically, we tested the hypothesis according to which a tactile stimulus applied to one hand can enhance the cortical responses to a visual stimulus flashed near the stimulated hand, as compared to a visual stimulus flashed far from the hand.

METHODS

- > 15 healthy subjects
- > 4 blocks of 14 trials, each trial composed of 3 stimuli of 16 s
- > 4 of the 14 streams of stimuli contain interruptions

Stimuli:

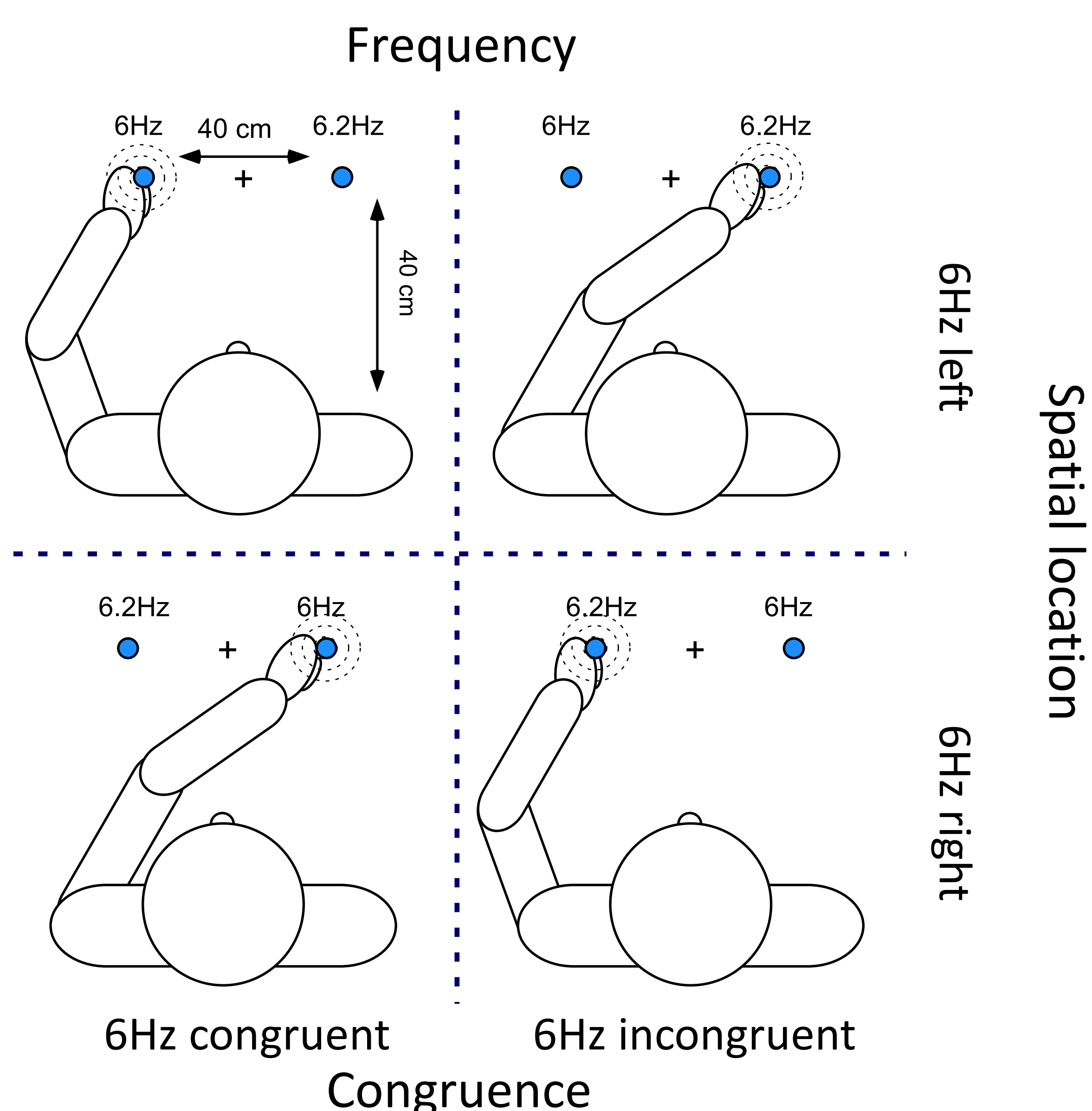
- > 2 sinusoidal visual stimuli (using LED), at 6Hz & 6.2Hz respectively
- > one vibrotactile sinusoidal stimulus at 21 Hz applied on one hand
- > the hand is placed near one of the two LEDs

Task: to detect the trials with interruptions and report whether the interruptions are simultaneous across the two sensory modalities

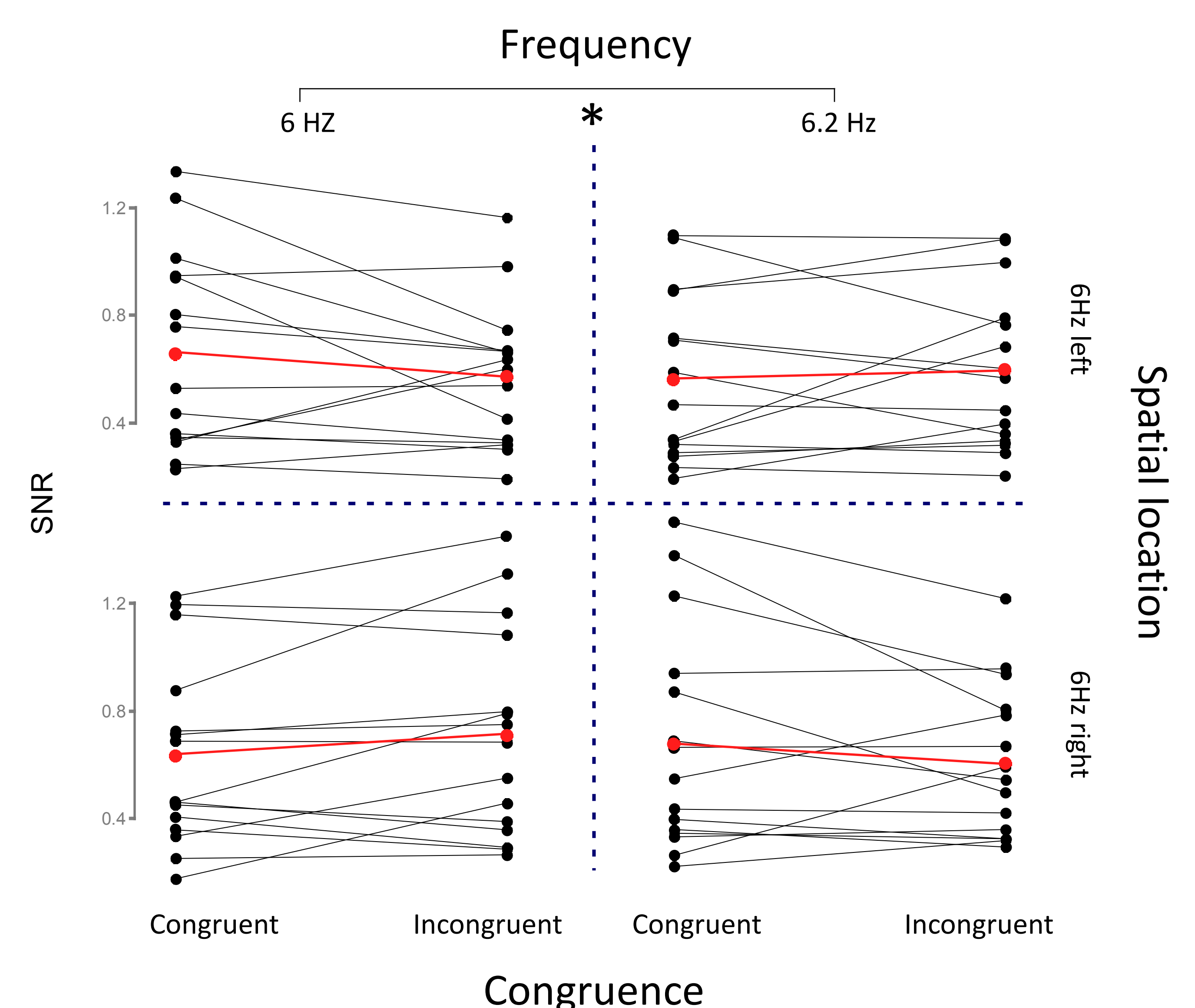
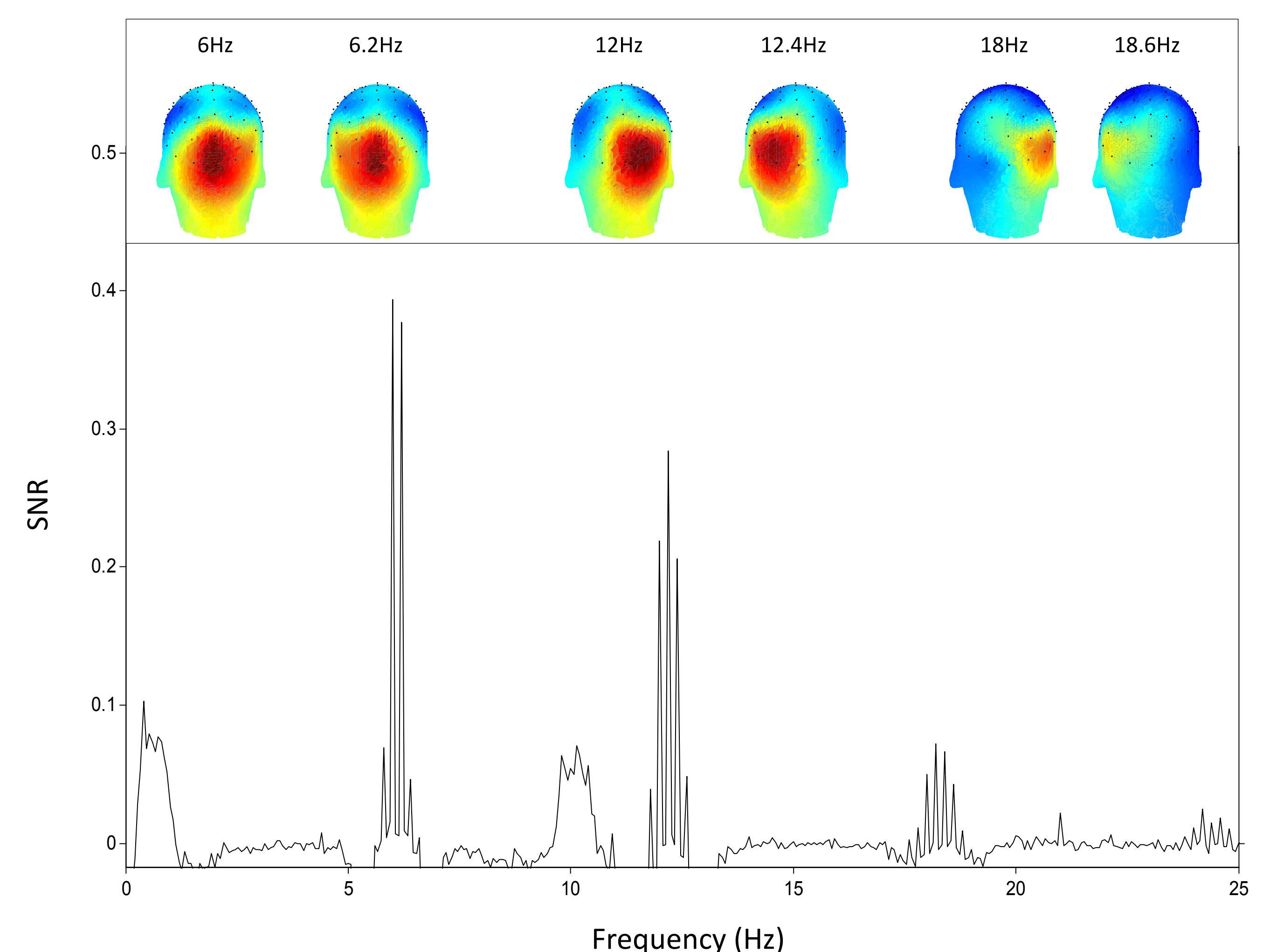
Independent variables:

- > Frequency: 6Hz vs. 6.2Hz
- > Spatial position of the visual stimuli: left vs. right
- > Congruence of the spatial location of the LEDs relative to the hand: congruent vs. incongruent

Dependent variable: magnitude of the visual SS-EPs (only on trials without interruption)



RESULTS



CONCLUSION

We showed that the amplitudes of SS-EPs induced by visual sustained stimuli are not modulated by the proximity of the participant's hand during the application of a tactile stimulus. Despite the enhancement of the metabolic response observed in primary visual areas to discrete visual stimuli during the occurrence of spatially-congruent tactile stimuli, we failed to replicate such an effect using sustained and simultaneous visual stimuli.