POSTER

On the influence of audio-visual interactions on working memory performance: a study with non-semantic stimuli

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Introduction

The visual meridian effect, as a consequence of programming the necessary ocular movements for visual object localization (Rizzolatti et al. 1987), was interpreted as an evidence of a supramodal network for visual attention to space, which may be critical for reorienting the focus of attention toward stimuli appearing at unattended locations. This hypothesis was confirmed in a behavioural study also for auditory and for bimodal audio–visual stimulation (Ferlazzo et al. 2001). The present study is aimed at observing: the cerebral circuit underling the auditory meridian effect; whether this circuit is related with the network involved in reorienting the focus of attention toward stimuli appearing at an unattended location; whether a functional temporal dynamics can be defined in these areas.

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Methods

The same protocol was used in both fMRI and MEG sessions for ten healthy volunteers with normal auditory capability. We used four experimental conditions. Three were characterized by sequences of sounds alternatively oscillating between two locations separated by an angle of 40° : on the right, on the left, and at the frontal location. A fourth condition was characterized by a complex sequence of sounds incoming randomly different locations (±90°, ±45°, 0°).

Results

Our results reveal an inferior parietal lobule and inferior frontal cortex activation, together with the activation in the planum temporale activation pattern was observed when sound position changes in the same or in different hemifields when expected, whereas a significantly stronger activation was observed when sound positions changed across the two hemifields at unexpected locations. Finally, MEG results show a temporal dynamic of the activation of the regions comprised in this network: activation of Heschl's gyrus was observed 95 ms after stimulus, the peak latency of the caudal superior temporal gyrus was at 182 ms, the inferior parietal lobule peaked at 245 ms, and the frontal regions peaked at 343 ms.

Conclusions

The present study allowed to identify a network involved in reorienting the focus of attention toward auditory stimuli appearing at an unattended location, and also to identify the functional temporal dynamics in the brain regions constituting this network.

References

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