BOTH SPATIAL AND PITCH SOUND VARIATIONS ACTIVATE THE PARIETAL CORTEX: AN ERP AND SCALP CURRENT DENSITY STUDY

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Animal and human studies have suggested that posterior temporo-parietal regions are specifically involved in auditory spatial (location and motion) processing, forming a putative dorsal 'Where' pathway, similar to visual system. We used scalp EEG and current density mapping to investigate the dynamics of this network in human subjects processing a varying acoustic stream in a two-factor paradigm: focused vs diverted attention, spatial vs pitch variations. We contrasted spatial and pitch variations of long-lasting sounds, in two attention-controlled situations: in the stream-focused attention condition, the task required the subject to actively and continuously follow acoustic variations, while in the control condition, the subject's attention was diverted towards additional sounds superimposed to the end of the stream.

We found a sustained bilateral temporal activity during stream presentation, which was more pronounced for pitch variations over the left hemisphere. When focusing attention on the stream variation, a superior parietal and two bilateral temporo-parieto-occipital components were activated, showing no difference between spatial and pitch processing.

Thus, the left superior temporal cortex was the only region showing different activations for pitch and spatial variations. The parietal cortex seems to be less specialized in spatial hearing than originally believed. The present results are consistent with a contribution of the auditory dorsal pathway in task-related processes regardless of the acoustic feature to be integrated.

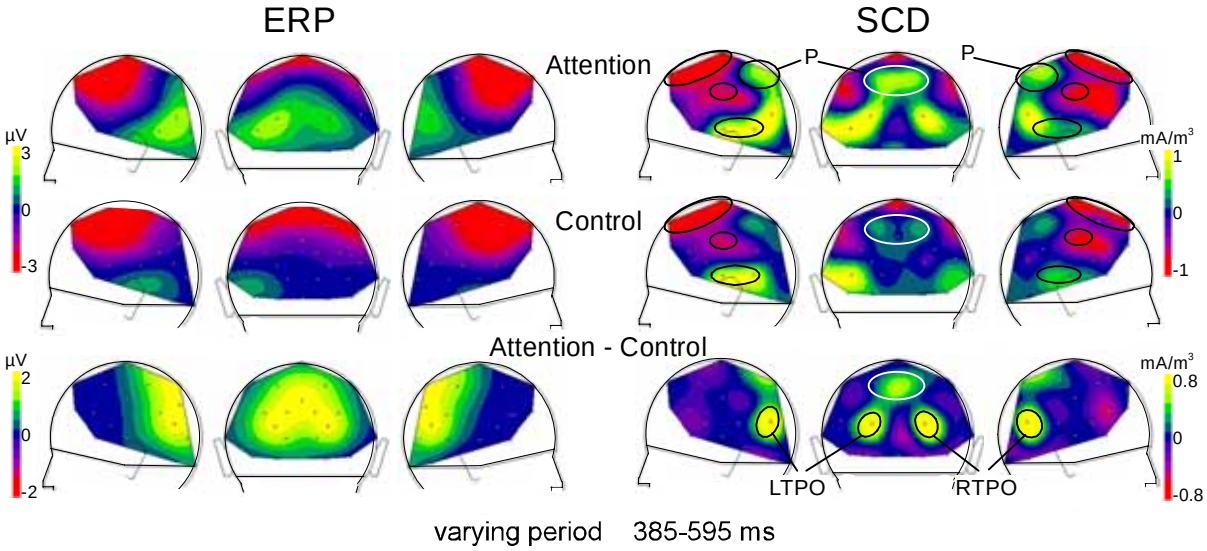

Figure. Topographies during the varying period.
ERP and SCD maps (left, back and right views, mean value between 385 and 595 ms after variation onset, 14 subjects) in attention and control conditions, and difference maps between conditions. In ERP maps, a positive component is present in the attention condition and is topographically distributed over parietal and occipital areas. SCD maps allow to disclose distinct and focal current sources over superior parietal cortex for both tasks and over temporo-parieto-occipital junctions in the attention condition only, clearly visible on the attention-minus-control maps. Ovals indicate the electrode groups chosen for the analysis: superior parietal current source (P), right and left temporo-parieto-occipital current sources (RTPO and LTPO, respectively), in addition to the frontal and temporal components previously defined in the N1 topography.