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Functional magnetic resonance imaging evidence for a representation of the ear in human primary somatosensory cortex: comparison with magnetoencephalography study.

Nihashi T¹, Kakigi R, Okada T, Sadato N, Kashikura K, Kajita Y, Yoshida J.

Author information

Abstract

Our previous study (T. Nihashi et al., 2001, Neuro- Image 13: 295-304), using magnetoencephalography (MEG), revealed somatotopy of the **ear** in the human primary somatosensory cortex (SI); that is, the signals following **stimulation** of the **ear** reach both the neck and face areas of the SI. However, since this was the first report on somatotopy of the **ear** in humans, we performed an fMRI activation study to confirm the somatotopic representation, and compared the electrical activity by MEG and the cerebral blood flow change by fMRI. We studied eight healthy subjects using 3-T MRI. We stimulated three parts of the left **ear**: the helix, the lobulus, and the tragus. First, we identified the location of the **ear** area in the SI based on our previous MEG study, in which equivalent current dipoles (ECDs) were located in the neck and/or face areas of the SI. Then, we determined the search volume as a sphere with a 15-mm radius, which was placed in the neck and/or face area. We analyzed whether or not fMRI activation occurred inside such spheres. **Stimulation** of the helix activated the neck area of the SI in four of eight subjects, and both the neck and face areas in two. No activation was observed in two subjects. **Stimulation** of the lobulus activated the neck area in one subject, the face area in two, both in four, and neither in one. **Stimulation** of the tragus activated the face in four, both in three, and neither in one. These fMRI findings confirm the result of MEG that the representation of the **ear** in the SI is separated into neck and face areas.

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