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Titel des Beitrags: Cortical distribution of speech and language errors investigated by visual object naming and navigated transcranial magnetic stimulation.

Abstract: Navigated transcranial magnetic stimulation (nTMS) gains increasing importance in presurgical language mapping. Although bipolar direct cortical stimulation (DCS) is regarded as the gold standard for intraoperative mapping of language-related areas, it cannot be used to map the healthy human brain due to its invasive character. Therefore, the present study employed a non-invasive virtual-lesion modality to provide a causality-confirmed cortical language map of the healthy human brain by repetitive nTMS (rTMS) with functional specifications beyond language-positive/language-negative distinction. Fifty right-handed healthy volunteers underwent rTMS language mapping of the left hemisphere combined with an object-naming task. The induced errors were categorized and frequency maps were calculated. Moreover, a principal component analysis (PCA) was performed on the basis of language-positive cortical regions for each error category. The left hemisphere was stimulated at 258–789 sites (median: 361.5 sites), and 12–241 naming errors (median: 72.5 errors) were observed. In male subjects, a total number of 2091 language errors were elicited by 9579 stimulation trains, which is equal to an error rate of 21.8 %. Within females, 10,238 stimulation trains elicited 2032 language errors (19.8 %). PCA revealed that the inferior parietal lobe
(IPL) and middle frontal gyrus (MFG) were causally involved in object naming as a semantic center and an executive control center. For the first time, this study provides causality-based data and a model that approximates the distribution of language-related cortical areas grouped for different functional aspects of single-word production processes by PCA.