Joint independent component analysis of structural and functional images reveals complex patterns of functional reorganisation in stroke aphasia.

Abstract:
Previous functional activation studies in patients with aphasia have mostly relied on standard group comparisons of aphasic patients with healthy controls, which are biased towards regions showing the most consistent effects and disregard variability within groups. Groups of aphasic patients, however, show considerable variability with respect to lesion localisation and extent. Here, we use a novel method, joint independent component analysis (jICA), which allowed us to investigate abnormal patterns of functional activation with O(15)-PET during lexical decision in aphasic patients after middle cerebral artery stroke and to directly relate them to lesion information from structural MRI. Our results demonstrate that with jICA we could detect a network of compensatory increases in activity within bilateral anterior inferior temporal areas (BA20), which was not revealed by standard group comparisons. In addition, both types of analyses, jICA and group comparison, showed increased activity in the right posterior superior temporal gyrus in aphasic patients. Further, whereas standard analyses revealed no decreases in activation, jICA identified that left perisylvian lesions were associated with decreased activation of left posterior inferior frontal cortex, damaged in most patients, and extralesional remote decreases of activity within polar parts of the inferior temporal gyrus (BA38/20) and the...
occipital cortex (BA19). Taken together, our results demonstrate that jICA may be superior in revealing complex patterns of functional reorganisation in aphasia.