

Review

Meta-analyzing left hemisphere language areas: Phonology,
semantics Department of Neurosurgery, Hôpital de Salpêtrière, France

Received 28 July 2005; revised 8 November 2005; accepted 9 November 2005
Available online 18 January 2006

community: the Talairach stereotactic atlas ([Talairach and Tournoux, 1988](#)) and the MNI (Montreal Neurological Institute) atlas. To benefit from the MNI single-subject parcellation we developed ([Tzourio-Mazoyer et al., 2002](#)), we choose this last

and the last three were found at the level of the anterior fusiform gyrus (Fusa), the posterior part of the superior temporal gyrus (T1p), and the lateral and middle part of T2 (T2ml).

Finally, we identified three frontal and five temporal clusters devoted to sentence processing (Table 4, Fig. 4). In the frontal lobe, F3opd and F3tv were close to or overlapped with semantic clusters (Table 5), whereas the third cluster was at distance from both phonological and semantic clusters, its center of mass being located in the dorsal part of the middle frontal

identification of functional fields, it is the first that provides whole-brain results that are under the gyral level.

The present meta-analysis reveals that all frontal phonological areas except one (F3td) were located in the posterior part of the frontal lobe distributed along the precentral gyrus. In the temporal

precentral gyrus and the frontal operculum in the frontal lobe. The perception–action cycle that is supported by these fronto-temporal areas connected through the arcuate fasciculus fibers

versus word reading ([Paulesu et al., 2000](#)), reading consonant strings versus reading words ([Jessen et al., 1999](#)), and phonetic discrimina-

seen as the transmodal gateway that coordinates reciprocal interactions between the sensory representation of words or objects and the symbolic association that gives them meaning, a definition proposed by Mesulam for Wernicke's area (Mesulam, 2000). Pre-surgical cortical mapping confirmed the integrative semantic role of this region: electrical interference at the level of the posterior part of the left superior and middle temporal gyri resulted in the transient emergence of a transcortical sensory aphasia. Notably, these symptoms resembled those of Wernicke's aphasia, in that there was no impairment in the phonological decoding of syllables (

The F3opd semantic cluster aggregated peaks issued from tasks calling for semantic retrieval and selection. This includes categorization tasks ([Noesselt et al., 2003](#)); lexical decision tasks (

activity is larger for word than for image categorization. Second, its activity is correlated with the number of words that are heard and retrieved from memory (Wise et al., 2001); such a correlation between activity and the frequency of word presentation, but not with that of noise, was lost in two patients with Wernicke's aphasia (

- Braver, T.S., Bongiolatti, S.R., 2002. The role of frontopolar cortex in subgoal processing during working memory. *NeuroImage* 15, 523–536.
- Brett, M., Johnsrude, I.S., Owen, A.M., 2002. The problem of functional localization in the human brain. *Nat. Rev., Neurosci.* 3, 243–249.

of human primary motor–sensory cortex: model and validation.

modulated by the comprehension of normal and pseudo-word sentences of different processing demands: a functional magnetic resonance imaging study. *NeuroImage* 15, 1003–1014.

Ronnberg, J., Rudner, M., Ingvar, M., 2004. Neural correlates of working memory for sign language. *Brain Res. Cogn. Brain Res.* 20, 165–182.

Roskies, A.L., Fiez, J.A., Balota, D.A., Raichle, M.E., Petersen, S.E., 2001.