

CORELEX (ANR 2006)

BIOLOGIE & SANTÉ 2011



Becoming a fluent reader: Brain mechanisms and development of word reading

Reading in the brain

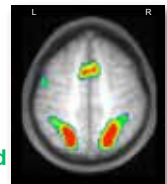
By adulthood, most of us have been exposed to over one hundred million printed words and have become fluent readers.

The invariant visual representation of printed words is thought to be subtended by a sector of the left ventral occipitotemporal cortex (**the Visual Word Form Area or VWFA**). Understanding the anatomy, function, and development of this system is a basic question for cognitive neuroscience, as it provides an accessible entry point into the interaction between cultural learning and brain structure. It is also of fundamental importance if one is to understand the pathologies of reading, both in adults with acquired lesions (alexia) and in children (dyslexia).

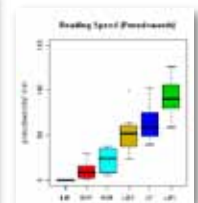
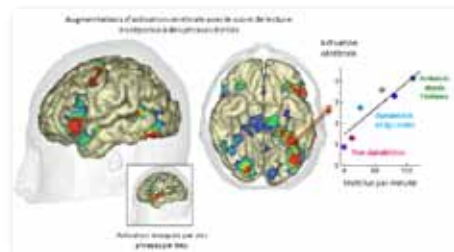
The goals of the CORELEX program were to study the *functioning*, the *development*, and the *anatomy* of visual word recognition, with a special emphasis on the role of the VWFA. To this aim, we used a variety of behavioral and brain imaging methods, in healthy and brain-damaged, literate and illiterate subjects.

■ We showed how parietal cortex kicks in in the reading process when words are displayed in unusual conditions

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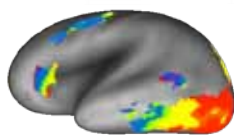


■ We directly visualized the *brain changes due to literacy* by scanning literates, ex-illiterates, and illiterate adults during visual and language-related tasks.



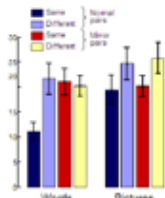
Illustrative results

■ The *functional properties of the VWFA* are attuned to a specific orthographic system through the acquisition of reading. We showed that it incorporates the equivalence between printed and handwritten characters...



... that it becomes sensitive to the conformity of strings of letters to the regularities of French orthography...

... that when perceiving words, it loses the default invariance for mirror-reversal which it shows for common objects.



Original articles in peer-reviewed international

- F. Vinckier, E. Qiao, C. Pallier, S. Dehaene, L. Cohen, *J Vis* 11, 1 (2011).
- M. Szwed et al., *Neuroimage* (Feb 4, 2011).
- F. Pegado, K. Nakamura, L. Cohen, S. Dehaene, *Neuroimage* 55, 742 (Mar 15, 2011).
- E. Qiao et al., *Neuroimage* 49, 1786 (Jan 15, 2010).
- S. Dehaene et al., *Science* 330, 1359 (Dec 3, 2010).
- S. Dehaene et al., *Neuroimage* 49, 1837 (Jan 15, 2010).
- M. Szwed, L. Cohen, E. Qiao, S. Dehaene, *Vision Res* 49, 718 (Mar, 2009).
- S. Epelbaum et al., *Cortex* 44, 962 (Sep, 2008).
- L. Cohen, S. Dehaene, F. Vinckier, A. Jobert, A. Montavont, *Neuroimage* 40, 353 (Mar 1, 2008).
- F. Vinckier et al., *Neuron* 55, 143 (Jul 5, 2007).

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