Figure 2.10. Three-dimensional reconstruction of the left hemisphere of the human brain showing increased activity in ventrolateral area 45 during verbal episodic active retrieval. Note that activity in the middle part of the superior temporal gyrus and adjacent superior temporal sulcus has decreased. Based upon a positron emission tomography study by Petrides et al. (1995). AS: ascending sulcus; HS: horizontal sulcus; IFS: inferior frontal sulcus; SF: Sylvian fissure; STS: superior temporal sulcus.
Figure 2.11. Three-dimensional reconstruction of the left hemisphere of the human brain showing increased activity in the supramarginal gyrus, the central sensorimotor cortex, and the supplementary motor cortex during writing. Based upon a positron emission tomography study by Petrides et al. (1995). CS: central sulcus; IPS: intraparietal sulcus; SMA: supplementary motor area; SF: Sylvian fissure.
Figure 3.1. The subtraction method in functional neuroimaging experiments. The figure displays the pattern of brain activity when generating words in a second language in two different groups of subjects. The conditions were a second language to which subjects of the study were less exposed (on the left) and a second language to which a different group of subjects were highly exposed (in the middle). As may be observed, more extensive brain activation in the left dorsolateral frontal cortex is found when generating words in a less exposed second language. These findings suggest that a second language associated with lower environmental exposure is in need of additional neural resources.

In order to know where these additional neural resources are located, the subtraction method can be used: the brain activity pattern of the well-exposed group is subtracted from the pattern found in the group of low-exposed subjects’ brain activity. The result is illustrated on the right, and the pattern of brain activity shows those areas necessary for supporting a second language to which subjects are relatively less exposed (modified from Perani et al., 2003). Note that the subtraction method may be used either between different groups or between different conditions in the same group (that is, word generation in L1 versus L2). In our example, subtraction is used between groups.
Figure 3.2. This figure shows the results for grammatical processing of the study of Wartenburger et al. (2003) (see text for details). Results for three groups of bilinguals are displayed: early-acquisition bilinguals (left), late-acquisition and high-proficient bilinguals (middle), and late-acquisition and low-proficient bilinguals (right). The images refer to direct comparisons between L2 and L1 (subtracting L1 from L2 within each group in order to show whether L2 activates a more extended neural system for grammatical processing).

As demonstrated, the degree of L2 proficiency does not seem to have strong influences on the pattern of brain activity. The late-acquisition and high-proficient group used the same additional brain activity as the low-proficiency group. Only when L2 was acquired early in life, was the same pattern of brain activity found (left) (modified from Wartenburger et al., 2003).
Figure 8.1. The pattern of brain activity is measured by functional magnetic resonance imaging, associated with anomia (left column, pre-speech therapy) and with successful naming performance (right column, post-speech therapy) in two anomic patients (S.A., top rows; G.R. bottom rows) (see text for further details). As may be observed, a hemispheric shift of brain activity associated with a better performance in naming occurred in both patients. However, in G.R., also the right homolog of Broca’s area was activated, probably because his original brain lesion extended into the left Broca’s area proper. Areas involved in phonological processing are circled (red circles = Broca’s area; green circles = supramarginal gyrus), emphasizing that both patients used the trained phonological strategies for successful naming (modified from Vitali et al., 2007).
Figure 17.1. Cortical lesion sites associated with neglect. Most anatomoclinical correlation studies show that the lesion responsible for unilateral spatial neglect involves the right inferior parietal lobule (BA 39 and BA 40: red area), particularly the supramarginal gyrus at the temporoparietal junction (black-grey area). Neglect after right frontal damage is less frequent and usually associated with lesions to the frontal premotor cortex, particularly to its more ventral parts (BA 44 and ventral BA 6: blue area). Damage to white-matter fibre bundles that provide connections between the posterior parietal region and the temporoparietal junction, and the frontal premotor cortex, are also relevant (arrow). Neglect may be also associated with damage to the more dorsal and medial regions of the frontal premotor cortex, and to the superior temporal gyrus (azure areas) (modified from Halligan et al., 2003). BA: Brodmann area.
Figure 20.2. Major regions of the frontal lobe including the primary motor, premotor, and prefrontal cortex. The prefrontal cortex is further divided into lateral, mesial, and ventral regions with distinctive anatomic and functional characteristics.
Figure 20.10. fMRI illustration of prefrontal activation patterns occurring during a fluid IQ task in a typical subject.
Figure 20.12. Summary of activation regions in the frontal and temporal lobes associated with social emotions from functional brain-imaging studies of typical adults (from Moll et al., 2003).