8.8 Evaluation of neurophysiological findings

**THE LIMITATIONS OF NEUROPHYSIOLOGICAL FINDINGS**

- Neurophysiology often explains the hardware and function of different parts of the brain but often ignores the effect of environmental experience upon it. Some studies have looked at this issue, however, such as Blakemore & Cooper's (1970) exposure of animals to environments of vertical lines, and the effect of this on the striate visual cortex.
- Physiological explanations have not dealt with the 'mind body' problem — they do not say how the physical structure and activity of the brain gives rise to the apparently non-physical conscious sensations and experience of mental life.
- There are many limitations of some of the methods used to identify brain activity, e.g. electrical stimulation of the brain may have a spreading activation effect to other areas (see methods of investigating brain function).
- The idea that neurophysiological explanations are sufficient to explain psychological functioning is dubious. In the case of visual perception, for example, Marr (1982) pointed out that the aims and cognitive processes of vision had to be considered rather than just the hardware. Indeed, once the processes by which perception occurs have been identified, the psychologist could change the hardware from the brain to a computer's circuits. There is, however, the possibility that vision could only be achieved by the complex biological hardware of the brain, but on the other hand, this biological complexity may also make a clear and useful explanation of perception impossible if the functions are spread in a parallel way over millions of neurones.
- Focusing just on the physiology of the brain may lead researchers to ignore the important implications that psychological research and theory has for the functions of brain areas. Hubel and Wiesel's 'bottom-up' description of feature detection in the cells of the visual cortex only focused on the 'input' from the retina, and thus ignored the 'top-down' influences of past experience and expectation that many psychologists such as Gregory (1970) have long pointed out. Recent investigations of the neural activity of cells that respond to the input of visual stimuli are now stressing the importance of the brain's background state of activity. 'It seems that the output of an individual neurone also depends on what the brain happens to be thinking about at the time' (McCronie, cited from New Scientist, December 1997).
- Maunsell and Treue (1996), for example, found the visual movement detection cells of monkeys would show increased activity to moving dots that they had been trained to pay attention to, compared to dots they could see but were not 'interested' in.

**ARGUMENTS AGAINST LOCALISATION OF FUNCTION**

- **Localization is not always clear cut.** In the case of brain asymmetry, for example, there are many variations in the location of function in the two cerebral hemispheres between male and female subjects and left and right-handed subjects. The findings usually reported on the location of cerebral functioning are most representative of right-handed, male subjects.
- **The brain shows 'plasticity.'** According to some researchers, the brain is very flexible and can physically adjust the location of function if brain damage occurs (e.g. the recovery of language in children with left cerebral hemisphere damage), or specialisation to environmental conditions is required (e.g. blind Braille readers show an increase in the sensory cortex surface area devoted to the right forefinger, compared to non-Braille readers and their own left forefinger).
- **The brain is hugely integrated.** There are many different brain areas involved in abilities such as vision (Maunsell and Newcombe, 1987, proposed there were at least 19 visual areas in macaque monkeys) and research needs to focus on how these areas interact together to produce function. The diagram above shows how just some of the areas involved in language interact in a simple task. Researchers such as Lashey believe in holism — that many functions are distributed across the whole brain. Lashey (1929) destroyed virtually all parts of rat brains in varying amounts to find the location of memory, and concluded that the 'law of mass action' applied memory loss is related to the amount of damage inflicted upon a rat brain, not the location of it. Neuroscientists are currently accepting the view that the brain is a very dynamic system and that activity in one area of the brain is influenced by the background activity of the rest of the brain. We must stop thinking of neurones as if they are exchanging messages, most of the 50,000 input lines to the average brain cell are actually parts of feedback loops returning via neighbouring neurones, or those higher up the hierarchy. Barely a tenth of the connections come from sense organs or mapping levels lower in the hierarchy. Every neurone is plumbed into a sea of feedback (McCronie, cited in New Scientist, December, 1997).