

Summary of Historical Approaches to the Study of the Brain

Fold, Read, Answer: ___/18... (see also your text, pp. 124-41)



The ancient Egyptians

...thought that the heart was the seat of thought and emotion. During the mummification process, they threw the brain out rather than saving it for eternity. Only in about 500 BCE did some thinkers in Greece begin to hypothesise that the brain was responsible for mental processes. Hippocrates, a famous ancient Greek doctor, argued after carrying out numerous dissections of bodies that the brain was responsible for cognitive processes.

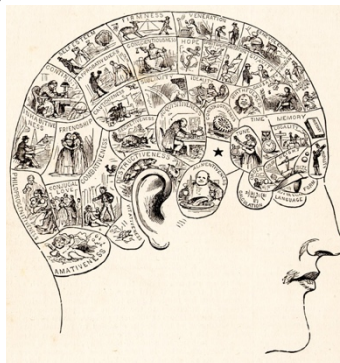
Descartes (1596-1650)



...argued that the human mind (a spiritual, non-physical entity) and the human body (a physical structure) are separate but interconnected. Each can influence the other. This interaction, he believed, is the basis of perception and conscious experience.

The phrenologists,

...led by Franz Gall (1758-1828), believed that different parts of the brain have specialised functions. After studying a large number of skulls, they asserted that there was a relationship between the shape of the skull and a person's personality and behavioural characteristics. By the 1850s, these ideas had been rejected as a fake science (what we now call pseudoscience). Gall and his followers had looked for evidence to support what they already thought, rather than using evidence to gain knowledge and reject hypotheses in an objective fashion. Ultimately, the concept of **localisation of brain function** is the only idea that has not been debunked (proven false) in the phrenologists' assumptions about the brain. Modern knowledge about the localisation of brain function, however, is far more complex and nuanced than Gall ever assumed.



a According to the Egyptians, [mark two]

- ☐ the brain was essential to thought and emotion.
- ☐ the heart was essential to thought and emotion.
- ☐ the brain was not an important organ.

b Hippocrates [mark one]

- ☐ had the same view as the Egyptians.
- ☐ argued that mental operations take place in the brain.

c Descartes was a philosopher who [mark two]

- ☐ believed that the mind and body influence each other.
- ☐ saw the mind as a physical entity like the body.
- ☐ viewed the mind as a spiritual, non-physical entity.

d The ideas of the phrenologists [mark one]

- ☐ have been debunked (shown to be false) by scientists and medical researchers.
- ☐ have been validated (shown to be supported by the evidence) by scientists and medical researchers.

e The phrenologists believed that [mark two]

- ☐ there is a relationship between the shape of the skull and a person's characteristics and personality.
- ☐ there is no relationship between shape of the skull and a person's characteristics and personality.
- ☐ different parts of the brain have specialized functions.

f The current status of phrenology is that [mark two]

- ☐ it has been dismissed as a pseudoscience.
- ☐ it is considered to be a valuable contribution to our understanding of the brain.
- ☐ only the belief in localisation of brain function remains from the phrenologists' ideas.

Brain Ablation (late 19th to early 20th century):

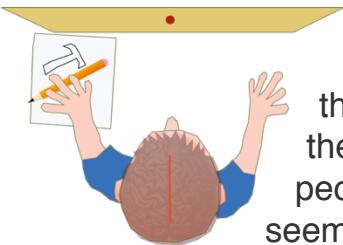


Ablation means that a brain structure is usually damaged irreversibly or lesioned by researchers in order to discover what purpose it serves. Early researchers intentionally damaged the brains of animals in order to find out which parts of the brain were required for certain tasks.

Electrical Stimulation of the Brain:

A small electrified wire (an electrode) can be placed onto a part of the brain either to stimulate it or to inhibit a response. If this stimulation leads to a response, one can establish which part of the brain is responsible. By the 1940s, a Canadian surgeon called Penfield began mapping the cerebral cortex with his patients as his research participants. While his patients (often sufferers of debilitating epilepsy) were awake and alert, he stimulated specific regions of their brains, partially to find the area that needed to be treated in order to reduce uncontrolled seizures. In the process, he was able to create precise maps with tiny numbers to show what each part of the sensory and motor cortices did.

Split-Brain Experiments



In extremely debilitating cases of epilepsy, surgery that severs the corpus callosum and splits the hemispheres can save people's lives and yet have seemingly no impact on their

functioning in everyday life. Sperry and Gazzaniga's experiments, however, revealed clear differences between the functions of each hemisphere.

Modern Neuroimaging:

In the late 20th century, it became possible to gain a picture of **brain structure**. From the 1970s, **CAT scans** have permitted researchers to use X-ray technology to create scans of **brain structure**. **MRI scans**, more recently, have provided more precise colour pictures of the brain. Once again, this type of imaging reveals **structural** abnormalities such as tumours. In contrast, **PET scans** also show **brain activity and function**. A person can therefore be asked to read, laugh or listen to music and the activity and function of the brain can be examined at that moment. **fMRI** is another advancement that allows moment to moment scanning of **brain activity**.

g Ablation: Which statement is true? [mark one]

- ☐ Brain ablation for research could be practised ethically on humans.
- ☐ The damage caused by brain ablation can be healed afterwards.
- ☐ Brain ablation procedures lead to lasting, irreversible damage.

h Studies in which electrical stimulation of the brain occurred (1)

- ☐ showed that no specific part of the brain is responsible for specific functions.
- ☐ indicated that certain parts of the brain are crucial to specific functions.

i The split-brain experiments (1)

- ☐ showed that the left and right hemispheres work in exactly the same way.
- ☐ showed that the left and right hemispheres have varying functions.

j The two main types of neuroimaging are structural and functional neuroimaging. [mark one]

- ☐ Both provide information about the brain's moment to moment activity.
- ☐ Only functional neuroimaging provides information about the brain's activity at a given moment.

k PET scans [mark two]

- ☐ allow researchers to compare brain activity when a person is listening to music or speech.
- ☐ provide only structural information about the brain, such as the location of a tumour.
- ☐ provide information about brain function.

l A CAT scan could [mark two]

- ☐ show that a person has a brain tumour.
- ☐ reveal which part of the brain is active at any given moment.
- ☐ show how the brain looks after significant surgery, such as a hemispherectomy.
- ☐ indicate which part of the brain "lights up" during a specific activity.

