

SL IB Psychology

The Brain & Behaviour

Contents

- * Overview: Techniques to Study the Brain

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Overview: Techniques to Study the Brain

Overview: Techniques used to Study the Brain

What are some examples of techniques used to study the brain?

- **Post-mortem analysis** of the brain involves examining the brain (usually in slices) to determine the cause of behaviour(s) or dysfunction experienced when the patient was alive
- **Magnetic Resonance Imaging (MRI)** uses a large magnet and radio waves to scan the brain, producing images of brain structures
- **Functional Magnetic Resonance Imaging (fMRI)** measures oxygenated blood flow in the brain i.e. brain activity
- **Positron Emission Tomography (PET)** scans use a radioactive tracer to measure glucose metabolism of specific regions in the brain

Which studies use these techniques?

- **Post-mortem analysis** of the brain was used to investigate the damage done to **HM's** brain and helped to determine the link between the hippocampus and formation of new memories
- **Magnetic Resonance Imaging (MRI)** was also applied to the case of HM (**Corkin 1997**); its use was also instrumental in Maguire (2000)
- **Functional Magnetic Resonance Imaging (fMRI)** was used by **Fisher et al. (2005)** in her study of the link between romantic love and dopaminergic activity in the brain
- **Positron Emission Tomography (PET)** was used by **Raine et al. (1997)** to investigate the role of the **prefrontal cortex** in the brains of impulsive murderers

What are the strengths and limitations of each technique?

Post-mortem analysis

- Strength: It enables researchers to study a brain without any harm to the living person
- Limitation: It is not possible to compare what is measured post-mortem, to a living brain

Magnetic Resonance Imaging (MRI)

- Strength: It enables researchers to pinpoint specific brain structures which may be damaged or have increased grey matter to identify the link between brain and behaviour
- Limitation: MRI scanners are prone to disturbance caused by noise, temperature and human error in calibration, which means that they are not always reliable

Functional Magnetic Resonance Imaging (fMRI)

- Strength: It enables researchers to measure oxygenated blood in specific brain regions which can inform them of brain activity linked to cognitive processes such as emotion
- Limitation: fMRI is slow, having a 5-second delay between brain activity and measurement and so it may miss some important information

Positron Emission Tomography (PET)

- Strength: It is more sensitive than other scanning techniques and can highlight abnormalities and illness more successfully
- Limitation: Using a radioactive tracer involves some risk to the patient

Worked example

Describe one technique for studying the brain, using relevant research to support your answer. [9]

'Describe' means you need more detail than 'Outline' but a bit less than 'Explain'.

Your first paragraph should clearly identify the technique and it should be relevant e.g. not a lab experiment, correlation, self-report etc.

Note the lack of evaluation/critical thinking in the answer: this is not required for an SAQ and you will receive no marks if you do evaluate.

Let's assume you use MRI as the technique. You should describe what each is, e.g:

MRI is a non-invasive test used to diagnose medical conditions. MRI uses a powerful magnetic field, radio frequency pulses and a computer to produce detailed pictures of the brain. The researcher compares the size and distributions of the bright and dark areas on the scan detect brain structure anomalies e.g. injury, stroke, dementia.

'Relevant research': The next section of the answer should be on the use of the technique as the focal point of the answer. Simply giving a straightforward description without referencing the question won't gain you marks. For example:

Maguire (2000) used MRI to compare the brains of taxi (16) and non-taxi drivers (50 pre-existing matched scans). The resulting scans were analysed by a blind expert using voxel-based morphometry (VBM) to measure grey matter volume in brain structures. Pixel-counting was also used to calculate hippocampal volume: pixels were counted on photographic 'slices' made through the brain using an MRI scan. Pixels were counted for the anterior, posterior and body of the hippocampus.

The next section of your answer will comment on how the technique enabled the researchers to form meaningful conclusions about the brain and its associated behaviour. For example:

Maguire's (2000) results suggest that spatial navigation is localised to the left posterior hippocampal region, as this is where the volume of grey matter was greatest in the taxi drivers compared to the controls. The use of MRI scanning was an appropriate technique for this research as it scans the structure of the brain, allowing researchers to form conclusions as to possible biological correlates of brain and behaviour.