

### Describe/Explain how an MRI is conducted:

MRI: Magnetic Resonance Imaging

A MRI measures which parts of the brain are using energy most quickly, it measures the blood flow using radio waves and a magnetic field.

The person lies in the machine (MRI) and a magnet inside the magnetic field is rotated around their head. The radio waves excite the atoms and molecules which produces magnetic changes. Then the magnetic changes are detected by the magnet and a computer turns them into high resolution three dimensional (3D) pictures and provides an image of the structure of the brain.

MRIs are used to study the brain **because** they can be used to examine the brains anatomy and determine which of the brains parts are handling critical functions.

### Supporting study: Maguire (1999)

**Aim:** To determine whether changes in the brain of London Taxi drivers could be detected to further investigate the Hippocampus's functions in spatial memory.

**Procedure:**

- Was a correlational (means that the IV was not manipulated)
- STRUCTURAL MRI - 16 RH male London taxi drivers who have been driving for at least 1.5 years. They were compared with 50 RH male non-London taxi drivers.
- The means age did not differ between the two groups.

**Findings (in relation to MRI):**

- There was increased grey matter in the left and right posterior hippocampi of taxi drivers.
- Anterior hippocampi was larger in the control subjects.
- A positive correlation was found between the time the drivers spent as a London taxi driver and the volume of their right posterior hippocampi.

**Conclusions:** MRIs are extremely useful as they provide high resolution images of the structure and this gives us an insight into the critical functions of the brain.

### Conclusions (in relation to the study)

- 1) Because images were taken before, during and after researchers were able to view the changes that were made in the hippocampi in relation to the environmental changes.
- 2) The posterior hippocampi may be more involved when previously learned spatial memory is used.
- 3) The anterior hippocampi may be more involved in the encoding of new environmental layouts.

### fMRI: Sharot (2007)

**Aim:** To determine the potential biological factors of Flashbulb memories (FBMs).



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### fMRI: Sharot (2007) (cont)

**Research method:** Quasi-experiment = Quasi experimental simply means that it is almost similar to true experiment. Like a true experiment, a quasi-experimental design aims to establish a cause-and-effect relationship between an independent and dependent variable. However, unlike a true experiment, a quasi-experiment does not rely on random assignment.

**Procedure:** Was 3 years after 9/11

- 1) 24 participants who were in New York that day and were recruited by advertisement. There was informed consent and were compensated after the experiment.
- 2) Put in an fMRI and were presented with word cues on a screen while brain activity was observed while they recalled the event.
- 3) The memories of personal event that summer served as a baseline of brain activity for evaluating the 9/11 memories.
- 4) Afterwards they were asked to rate their memories for vividness, detail, confidence, accuracy and arousal.
- 5) They also had to write down a description of their personal memories.

### Findings

- 83% activation of the amygdala

- Demonstrates biological support for the existence of FBMs - a unique form of memory that is needed for survival

- As the activation of the amygdala was only true for the "downtown" group, researchers can narrow down the definition of FBMs.

### Describe/Explain the term technique.

A technique is a way of carrying out a particular task.

Some examples in relation to Psychology are MRIs, fMRIs, Animal studies and Post-mortems.

Techniques are used to study the brain **because** in order to investigate the correlations between brain and behaviour we must see inside the brain and study the structure and processes.

### Strengths and Weaknesses of MRIs

### Strengths of Maguire

- 1) Was non-invasive
- 2) Correlation between the role of the hippocampus and spatial tasks.
- 3) Learning a new skill increased the dendritic branching
- 4) Brain scans were coded so analysis could be done blindly - this avoids researcher bias

### Weaknesses of Maguire

- 1) Correlation - could be a third unmeasured variable causing the change in the hippocampus.
- 2) MRIs only indicate structure - they don't map out the brain.
- 3) Change in the structure of the brain does not imply function

**So is there a better technique to study the brain?**

### fMRIs - A better technique?

### Strengths and Weaknesses of fMRIs

#### Strengths

- 1) Non-invasive
- 2) Does not involve radiation
- 3) Excellent high-resolution images
- 4) Provides a clear picture of how brain activity is localised.
- 5) It helps physicians to evaluate both the structure and functions of the brain

#### Weaknesses

- 1) May not truly represent moment-to-moment brain activity.
- 2) fMRI is expensive compared to other techniques and can only capture a clear image if the person stays still.

fMRIs detect changes in blood oxygenation and flow that occur due to neural activity in specific brain areas. When a brain area is more active it consumes more oxygen and blood flow is directed to the active area. Produces a 3D image showing which parts of the brain are active.

### Weaknesses of Sharot (2007)

- 1) Expensive - was a small sample size
- 2) Does not provide immediate evidence of brain function
- 3) The brain activates for a variety of reasons.

### Strengths

- 1) Extremely fine spatial resolution, providing detailed neuroanatomical images.
- 2) Possible to obtain images from any angle and 3D images can be generated
- 3) *Advanced* MRI method have recently permitted the imaging of brain function as well as structure, blood flow and oxidative metabolism

### Weaknesses

- 1) The patient has to stay still for long period of time. This can be difficult for someone who is claustrophobic, a young child or someone with a mental illness/disorder.

fMRIs (Functional Magnetic Resonance Imaging) can be considered a better technique as not only does it provide a high resolution image, but it can also detect what the brain is doing while active.

When doing an ERQ (Extended Response Question) such as "*Evaluate one or more technique used to study the brain in relation to behaviour (22)*" you can use fMRIs and MRIs and compare.

### Strengths of Sharot (2007)

- 1) Enables the brains functions to be captured - without this the role of the amygdala in FBMs may be unknown.



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