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| **Ways of Investigating the Brain AO1 and AO3** |
| **AO1** | **AO3** |
| **Functional Magnetic Resonance Imaging (fMRI)*** Detects changes in blood oxygenation and flow that occur as a result of neural activity in specific parts of the brain
* Active areas consume more oxygen, and so blood flow to this area also increases to meet this demand (known as the *haemodynamic response)*
* Produces 3D images (activation maps) showing which parts of the brain are involved in particular mental processes helping us to understand localisation and function
 | **Strengths*** Does not rely on use of radiation
* Risk-free, non-invasive and straightforward
* Images have very high spatial resolution, clear picture of brain localisation

**Weaknesses*** Expensive, and person must remain incredibly still so picture is not distorted
* Poor temporal resolution due to 5 second time lag
* Can only measure blood flow in brain, not individual neuron activity so can be difficult to decipher
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| **Electroencephalogram (EEG)*** Measures electrical activity using electrodes fixed to the scalp using a skull cap
* Scan recording represents brain wave patterns generated by activity from neurons
* EEG used by clinicians as a diagnostic tool for unusual *arrhythmic* patterns of activity; could indicate neurological abnormalities such as epilepsy, tumours or sleep disorders
 | **Strengths*** Invaluable diagnosis of disorders e.g. epilepsy as activity is easily detected on screen
* Contributed to our understanding of sleep
* Has very high temporal resolution – can detect activity at a res. of 1 msec

**Weaknesses*** Very generalised nature of information (thousands of neurons) - signal is not useful for pinpointing exact source of neural activity
* Does not allow researchers to distinguish between activities originating in different but adjacent locations
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| **Event-related Potentials (ERPs)*** Data contains all neural responses associated with specific sensory, cognitive and motor events that may be of interest
* Using a statistical averaging technique, all extraneous brain activity from the original EEG is filtered out, leaving just responses that relate to the presentation of a specific stimulus or task for example
* These are called the event-related potentials: types of brainwave that are triggered by particular events
* Research has revealed many forms of ERP and how they are, for example, linked to cognitive processes such as attention and perception
 | **Strengths*** Much more specificity to measurement of neural processes
* Excellent temporal resolution – widespread use in measurement of cognitive functions and deficits
* Researchers able to identify many different types of ERP and describe the precise role of these in cognitive functioning e.g. *P300 component* thought to be involved in allocation of attentional resources and maintenance of working memory

**Weaknesses*** Lack of standardisation in methodology between research studies, making findings difficult to confirm
* Background noise and extraneous variables must be completely eliminated in order to establish pure data
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| **Post-mortem Examinations*** Brains subject to a post-mortem are likely to be those who have a rare disorder and have experienced unusual deficits in mental processes/behaviour during their lifetime
* Areas of damage are examined to establish the likely cause of affliction the person suffered
* Could also involve a comparison with a *neurotypical* brain to ascertain the level of difference
 | **Strengths*** Was vital in providing the foundation of understanding key processes before technological advancement
* Improves medical knowledge and helps generate hypotheses for further study

**Weaknesses*** Causation is an issue – observed damage may not be linked to deficits under review, but to some other trauma or decay
* Ethical issues of consent
* Informed consent also difficult in some cases when patient is still alive *because* of their condition e.g. HM
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