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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 |
| **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 |
| **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 |
| **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 |