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| **Localisation and Function of the brain AO1** | **Localisation and function of the brain AO3** |
| **Localisation Vs Holistic Theory**  During the 19th century, scientists such as Broca and Wenicke discovered that certain parts of the brain are associated with particular physical and psychological functions.  Before then scientists supported the holistic theory of the brain – all parts were always involved.  Localisation is referred to as *cortical specialisation.* Different parts perform different tasks and are involved with different parts of the body.  If a certain area became damaged, the function associated with that area will also become damaged. Just ask Phineas Gage… | **Brain Scan Evidence**  P: On strength of the theory of localisation as a theory of brain function is that there is a wealth of supportive evidence:  E: For example, Ptersen eta l (1988) used brain scans to demonstrate how Wernicke’s area was active during a listening task and Broca’s area was active during a reading task.  E: This is a strength because these findings suggest that these particular areas of the brain have different functions, specifically relating to language. Therefore we can assume there are other localities within the brain responsible for different physical and psychological functions.  L: as a result, the theory of localisation gains further credibility. |
| **Hemispheres and the Cerebral Cortex**   * Two symmetrical halves of the brain = left and right hemisphere * Each hemisphere will have control over particular functions – this is called lateralisation * Right hand side of body = left hemisphere * Left hand side of body = right hemisphere * The outer layer of both hemispheres = cerebral cortex (think of a tea cosy) * This cortex is 3mm thick and ours is much more developed than any other animal * It appears grey due to the location of cell bodies (hence ‘grey matter’) | **Neurological Evidence**  P: One strength of the theory of localisation as theory of brain function is that there is real-life application serving as supportive evidence for theory.  E: For example, lobotomy-type procedures are still used today within neurosurgery. Dougherty et al (2002) reported on 44 patients with OCD who underwent a cingulotomy (removal of the cingulate gyrus). During post-op, 1/3 had met the criteria for successful response and 14% for partial response. The success suggests that the symptoms and behaviours associated with serious mental disorders are localised.  L: As a result, the credibility of the theory of localisation is increased. |
| **The Motor, Somatosensory, Visual and Auditory Centres**   * The cortex is divided into 4 lobes: frontal, parietal, occipital and temporal * Frontal lobe = ***motor area*** which controls voluntary movement in the opposite side of the body. Damage could result in loss of control over fine movements * Parietal lobe = ***somatosensory area*** separated by a ‘valley’ called the central sulcus. Sensory information from the skin is represented here e.g. touch, pressure, heat etc. the area devoted to a part of the body suggests it’s sensitivity level, receptors for our face and hands occupy over half of the somatosensory area * Occipital lobe = ***visual area*** where each eye sends information to the opposite visual cortex. Damage to left hemisphere can cause blindness in part of the right visual field of both eyes. * Temporal lobe = ***auditory area*** which analyses speech-based information. Damage could produce hearing loss. In addition, damage to a specific area of the temporal lobe (Wernicke’s area) could affect the ability to comprehend language. | **Case Study Evidence**  P: One strength of localisation theory is that there are unique cases of neurological damage which support the theory.  E: For example, Phineas Gage suffered severe head trauma with a trans-cranial wound that penetrated through the frontal lobe. He survived, however it was not without its mark. This injury altered Gage’s personality, turning him from a calm and reserved individual into someone who was quick-tempered, rude and ‘no longer Gage’.  E: This is a strength because it shows that when one specific, localised area of the brain is damaged, there is a direct, specific impact on one function. In this instance it was only Gage’s personality that was altered, whilst the rest of his functioning recovered as normal.  L: As a result the explanatory power of the localisation theory is increased. |
| **The Language Area of the Brain**  Language is restricted to the left side of the brain in most people  In the 1880s, Broca (a surgeon) identified a small area in the left frontal lobe responsible for speech production – damage to this are causes Broca’s aphasia which is characterised by slow, laborious speech that lacks fluency  Around the same time as this, Wernicke was describing patients who had no problem producing language, but they had severe difficulties understanding it – the speed they produced was fluent but meaningless. The Wernicke area was identified to be in the left temporal lobe, and when damaged would result in Wernicke’s aphasia. Patients often produce nonsense words when this happens. | **Contradictory Evidence**  P: One weakness of the localisation theory is that there is contradictory evidence.  E: For example, Lashley (1950) removed 10% to 50% of the cortex in rats that were learning a maze. They were still able to perform the task after this procedure, with no inhibition to their actions.  E: This is a weakness as the findings of Lashley’s study suggest that higher cognitive functions, such as the processes involved in learning are not localised but are instead distributed holistically within the brain. The process of learning appeared to require every part of the cortex, rather than being confined to one particular area.  L: As a result, the credibility of the localisation theory is reduced.  NB: Is it OK to generalise to humans if rats are used? Specifically, why not? Cerebral cortex… |