

WEEK 1 – INTRODUCTION TO NEUROSCIENCE

Biological explanations of behaviour

1. Define and compare physiological, ontogenetic, evolutionary and functional explanations of behaviour

Physiological: behavioural or mental function related to activity of the brain/organs. It deals with the machinery of the body – ie, the chemical reactions that enable hormones to influence brain activity and the routes by which brain activity controls muscle contractions.

Ontogenetic: function or structure related to its genetic and environmental experiences – ie, we are predisposed to acquire and develop language, but we must also be exposed to it in order to do so.

Functional: the focus is on understanding the relevance of and the sub components of particular behaviours/abilities.

Evolutionary/Biological: focus on understanding of why behaviours arose on the basis of evolutionary principles – ie, if we live somewhere there are lots of tigers, we would develop the ability to run fast and this will be passed on through genes.

2. Contrast these with commonsense explanations.

The philosophy of the mind

1. Discuss (and define) the issues underlying the “mind-brain problem”.

It is an attempt to reconcile two dimensions of reality which are completely incompatible. 1, we have overt, objective and measureable brain events which take the form of patterns of firing of neurons within the nervous system. They are not completely understood but clearly follow physiological/biological laws of cause and effect – they are deterministic events. Two, we have covert, subjective and illusive mental events and experiences which include consciousness, a sense of self and free will, feelings, values and qualities of experience and qualia (we experience pain and love in different ways we would physiologically).

Mind and brain are separate things

2. What is the debate between free will versus determinism, and how is this debate relevant to our understanding of consciousness

3. Be able to define these terms:

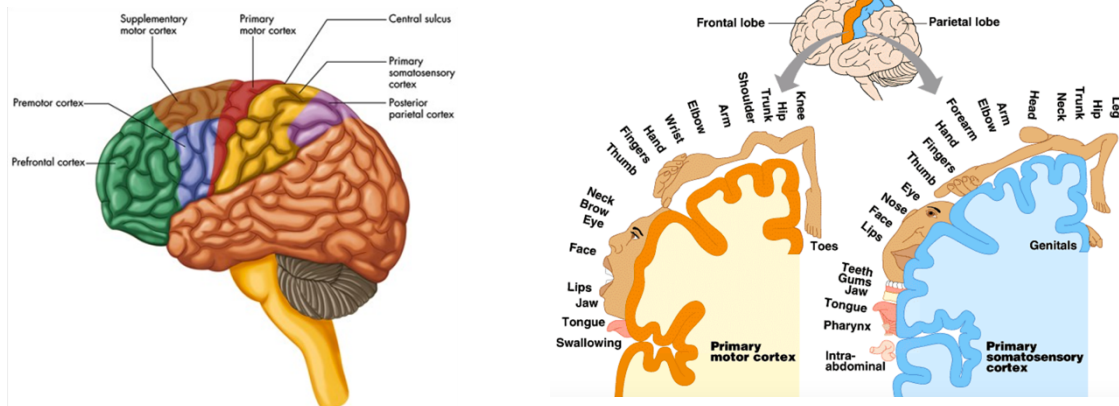
Dualism – the mind and brain are separate but interact. It cannot explain events such as consciousness and free will. One type of dualism is *interactionism*, this is where they mind and brain interact although they are still separate from each other. This explains why our sense of self follows our brain around. In *parallelism*, the mind and brain do not interact, but they do co-exist. *Epiphenomenalism* is where the mind and thoughts are a byproduct of the brain. **NOT SCIENTIFIC**

Monism – proposed mind and brain are the same thing. The most popular version is **materialism** (realism). That is, the mind can be explained entirely on the basis of the physical laws that govern the brains **5. What is a central pattern generator?**

It is a neural mechanism in the spinal cord that generate rhythmic patterns of motor output. The stimulus that activates a central pattern generator does not control the frequency of the altering movements. Eg, wing flapping in bird.

Brain Mechanisms of Movement and Disorders of Movement

1. Locate the primary motor area and premotor area on the lateral surface of a sketch of the human cerebral hemisphere. Note the relationship between cortical representation and precision of motor activity.



2. Know the role of each of the following areas near the primary motor cortex (it is no accident that each of these movement- and body-relevant areas is nearby). Note that in addressing these objectives it is important to remember (where the information has been given to you) some of the motor symptoms that are associated with damage to each of these regions.

Premotor cortex – most active immediately before a movement

- receives info about target which body is directing movement
- receives info about body's current position and posture

Prefrontal cortex – active during a delay before movement

- stores sensory info relevant to movement
- considers probable outcome of possible movement
- DAMAGE to this area would cause disorganised movement (showing with clothes on)

Supplementary motor cortex – important for planning and organising rapid sequence movements

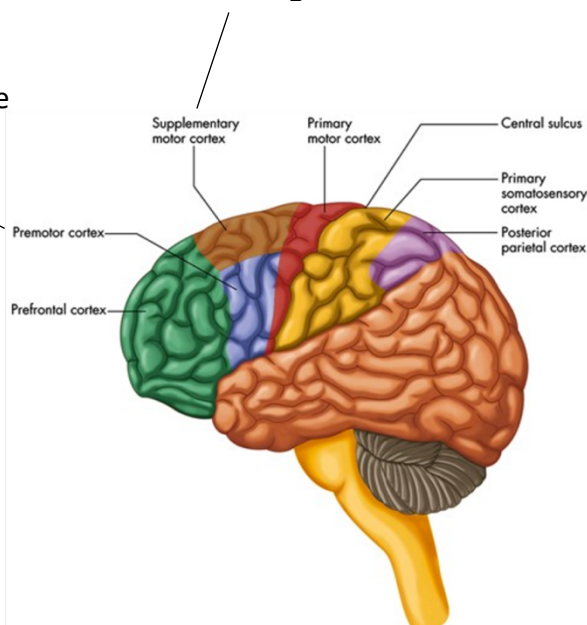
- essential for inhabiting a habit when you need to do something else

Primary somatosensory cortex – receives all sensory input from the body for processing

- contains a detailed map of the body
- DAMAGE can result in decreases sensory thresholds

Posterior parietal cortex – active in planning movement

- monitors position of body relative to the world
- DAMAGE causes people to have trouble finding objects and bump into things when walking



WEEK 7 – VISION AND HEARING

SOME GENERAL PRINCIPLES

1. What is a receptor cell?

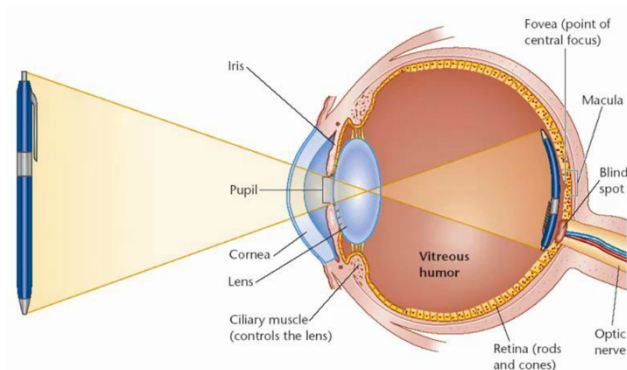
A cell that is able to respond to light, heat or other external stimulus and transmit a signal to a sensory nerve.

2. What is meant by the notion that a particular neuron codes for (or represents) a particular type of physical information? How does this notion differ from Descarte's notion that the brain needs to store present objects literally within its structure?

Impulses in certain neurons will indicate light, whereas impulses in other neurons will indicate touch, sound, or other sensations. Descarte believes that nerves from the eye would send the brain a pattern of impulses that resembles the objects up right. But the brain encodes information in a way that does not resemble the object being seen.

THE STRUCTURE OF THE EYE AND THE RETINA

1. Sketch and label a schematic representation of the eye and retina. Identify on this representation the following structures (and include a describe of their functions):



The iris and pupil – the whole job of the iris and pupil is to control the amount of light that reaches the retina. The pupil will be bigger in dim light and smaller in bright light. Iris is the colour part of the eye.

The cornea - shares protective task. Acts as the eye's outermost lens. It functions like a window that controls and focusses the entry of light into the eye.

The lens – by changing shape, it alters the focal distance of the eye so it can focus on objects at various distances, thus allowing a sharp real image of the object of interest to be formed on the retina.

The retina – the rear surface of the eye which is lined with visual receptors.

The fovea – is responsible for sharp central vision which is necessary in humans for activities where visual detail is of primary importance such as reading and driving.