

Glossary

Amygdala: Group of nuclei (accumulations of neurons) located in front of the hippocampus. Amongst its main functions is the learning of emotional responses.

Amygdalotomy: Removal of the amygdala on one side (unilateral) or both (bilateral).

Amyotrophic lateral sclerosis (ALS): A neurodegenerative disorder that leads to progressive loss of motor neurons in the brain and spinal cord. American baseball legend Lou Gehrig was a prominent sufferer, and ALS is also known as “Lou Gehrig’s disease”, particularly in the USA.

Angiogram: A way of imaging blood vessels with x-ray by injecting a contrast medium into the blood.

Anorexia nervosa: Eating disorder, characterised by low body mass index, food restriction and/or over-exercising.

Atrial fibrillation: A heart condition with irregular and often abnormally fast heart rate.

Bed nucleus of the stria terminalis (BNST): A part of the extended amygdala region, implicated in fear responses and addiction. Its central division is sexually dimorphic: it is larger in men than women.

Body mass index (BMI): Quotient of weight (in kg) over height (squared, in m²). Values between 18.5 and 25 are considered to be in the normal range.

Brain computer interface (BCI): A circuit that enables signals from the brain to control an output device, for example a computer cursor or a robot.

Capsulotomy (internal): Lesioning of the anterior limb of the internal capsule, normally by stereotactic means (local application of heat through an electrode). The anterior limb of the internal capsule carries

thalamo-frontal fibres, including the medial forebrain bundle. The posterior limb carries the cortico-spinal (pyramidal) motor tract, and thus lesions to it would result in loss of motor function.

Caudate nucleus: Part of the basal ganglia adjacent to the lateral ventricles. Forms their main input station.

Cingulate gyrus: The part of the medial frontal lobe above the corpus callosum. Liaison station between “higher” cortical areas and the limbic system.

Cingulotomy: Lesion of the cingulate gyrus/cingulum.

Cingulum: White matter bundle between corpus callosum and cingulate gyrus. Its posterior part connects with the hippocampus.

Computed tomography (CT): An extension of the x-ray technique that uses computer processing to obtain tomographic images (virtual slices through the body).

Continuous performance task (CPT): A psychological test that probes the integrity of attention and response control.

Cortex, cortical: The cerebral cortex is the sheet of gray matter covering the hemispheres of the brain. It contains most of the neurons of the hemispheres (the others are in the basal ganglia). In adults it is about 2mm–4mm thick and has three to six layers, characterised by different cell composition. Most human cortex is neocortex (thus new in evolutionary terms), which has six layers.

Deep Brain Stimulation (DBS): Application of current to an area of the brain through a (normally stereotactically inserted) electrode. “Deep” refers to areas that are not on the cortical surface.

Depression: A mood disorder, characterised through (often recurrent) episodes of abnormal sadness, lack of motivation, inability to experience joy and somatic symptoms, such as sleep disturbance, fatigue, loss of appetite or loss of libido.

Diencephalon: The part of the brain below the hemispheres, mainly contains the thalamus and hypothalamus.

Dorsolateral prefrontal cortex (DLPFC): Part of the frontal lobe, involved in working memory and executive functions.

Electrical stimulation of the brain (ESB): A summary term for DBS and stimulation of areas at the surface of the brain.

Electroconvulsive therapy (ECT): A treatment for depression that induces seizures through high-intensity transcranial electrical stimulation. It is also used for rare complications of schizophrenia.

Electroencephalography (EEG): Recording of electrical activity from the brain through the intact skull by means of electrodes. Developed by Hans Berger in the 1920s.

Electronarcosis: A historical treatment of schizophrenia that entailed the induction of coma of several minutes duration through high-intensity transcranial electrical stimulation.

Encephalitis: Inflammation of the brain. It can be caused by infectious agents or by autoimmune processes occurring when the patient's own immune system attacks cells in the brain.

Essential tremor (ET): A common movement disorder characterised by prominent tremor during voluntary movements.

Frontal lobe: Most anterior part of a brain hemisphere. It is supposed to have developed most in evolutionary terms (e.g. it is proportionally much larger in humans compared to the rest of the brain, than even in great apes). Contains areas of motor control, memory, decision making, cognitive control and emotion regulation.

Functional magnetic resonance imaging (fMRI): Technique to record vascular signals from the brain, which allows for drawing inferences on the underlying neural activity.

Functional near infrared spectroscopy (fNIRS): Technique to record changes in blood oxygenation from superficial areas in the brain by shining light of specific wave length through the skull.

Globus pallidus (internal) (GPi): A part of the basal ganglia, involved in motor control, and one of the target areas of DBS for movement disorders.

Grey matter: Accumulation of neurons in sheets (cortex) or lumps (nuclei).

Hamilton Depression Rating Scale (HDRS): The HDRS assesses depressive symptoms with 17 items. Higher scores correspond to more severe depression. A score of seven or less generally denotes remission from depression. The HDRS is often used to assess the effects of treatments for depression.

Hippocampus: Area of evolutionarily old, three-layered cortex in the medial temporal lobe. Crucial for memory encoding and retrieval.

Humanitarian device exemption (HDE): An exemption granted by the U.S. Food and Drug Administration that allows manufacturers to market medical devices for specific rare conditions although its effectiveness has not been demonstrated.

Hypothalamotomy: Lesion of the hypothalamus, most commonly its ventromedial nucleus (in German operations on sexual offenders) or posterior medial part (Sano's operations for aggressive behaviour).

Hypothalamus: Part of the diencephalon. Central control station for the hormone system and bodily homeostasis (balance of metabolic processes).

Impulse control disorders: A group of behavioural disorders defined by the inability to resist relatively specific and isolated impulses, including kleptomania (impulse to steal), pyromania (impulse to set fire), pathological gambling (impulse to gamble) and trichotillomania (impulse to pull out one's hair).

Insulin coma therapy: A historical treatment for schizophrenia that involved injecting the patient with insulin to induce coma through depriving the brain of glucose, often on several days in succession.

Klüver Bucy syndrome: A symptom complex comprising problems with memory and visual recognition of objects, increased libido, overeating and the compulsory tendency to put things in the mouth ("hyperorality"). It arises after bilateral destructions of the amygdala and was first described by psychologist Heinrich Klüver and neurosurgeon Paul Bucy in monkeys, although it can also occur in humans.

Limbic system: Group of cortical areas and nuclei around the lateral ventricles of the brain that are involved in the formation of emotions and memories.

Lobotomy/leucotomy: Cut through the white matter of the frontal cortex.

Magnetic resonance imaging (MRI): Technique to pick up signals that show contrasts between different tissue types (e.g. gray and white matter) by means of their characteristic resonance of protons from water.

Medial forebrain bundle (MFB): A tract of nerve fibres connecting the mesencephalon (ventral tegmental area) with the basal ganglia, the limbic system, the hypothalamus and the frontal lobe.

Mesencephalon: Midbrain. Contains the passage of the long fibre tracts from the hemispheres to the periphery and back (motor and sensory), areas for eye movement control and dopamine-releasing cells.

Minimally conscious state (MCS): Disorder of consciousness with severely impaired awareness. Patients with MCS show some directed movements, but their communication is limited to simple gestures or verbal responses. They depend on 24-hour care.

Motor cortex: Part of the frontal lobe that gives rise to the motor fibres that travel through the pyramidal or cortico-spinal tract to the anterior horn of the spinal cord.

Motor neuron disease (MND): See Amyotrophic lateral sclerosis.

Neuron: Nerve cell.

Neuroplasticity: Changes in the connectivity between neurons. These can happen at the level of an individual synapse (e.g. by changes in receptor expression or sensitivity) or by the formation or pruning of synapses.

Neurotransmitter: A chemical that mediates the communication between neurons or between neurons and muscle cells.

Obsessive compulsive disorder (OCD): Mental disorder, characterised by obsessive thoughts and compulsive actions (e.g. checking, washing, hoarding).

Opioids: A group of neurotransmitters. They are particularly important for experiences of pain and pleasure.

Organic personality disorder: A profound change in personality after a traumatic brain injury or another brain lesion. It is characterised by emotional lability, irritability, apathy, disinhibition, suspiciousness and problems with concentration and pursuit of specific goals.

Paraphilia: A group of sexual disorders characterised by “recurrent, intense sexual urges, fantasies, or behaviours that involve unusual objects, activities, or situations”.¹⁸⁵ For a more detailed introduction to sexual disorders and their biological models see Linden, *The Biology of Psychological Disorders*.⁵

Parkinson’s disease: Movement disorder characterised by the symptom triad of tremor, rigidity and slow movement initiation (hypokinesia) and by typical changes in neurons (Lewy bodies) with a loss of dopamine-producing neurons.

Periaqueductal grey matter: A collection of neurons in the brainstem. It contains opioid-sensitive neurons that are involved in the central modulation of pain.

Persistent vegetative state (PVS): Disorder of consciousness with lack of awareness. Patients do not communicate and depend on 24-hour care.

Phantom pain: Pain that develops after loss or amputation of a limb, which is located in that limb.

Positron emission tomography (PET): Imaging technique that utilises radioactive isotopes to mark specific molecules in the body.

Psychopathy: A personality disorder characterised by antisocial behaviour, lack of empathy and callousness.

Randomised controlled trial (RCT): A method to investigate the efficacy of a therapeutic intervention by comparison with appropriate control groups/ control interventions. Patients are randomly assigned to the intervention or one or several control groups. Ideally, patients and raters are “blind” to group allocation.

- Schizophrenia:** Mental disorder characterised by “positive” (e.g. hallucinations, delusions), “negative” (e.g. loss of enjoyment, poverty of speech) and cognitive symptoms. “Positive” does not mean that the symptoms have a positive effect but that they constitute an addition to normal perceptual and cognitive processes.
- Selective serotonin reuptake inhibitors (SSRI):** A group of widely prescribed antidepressants that block the uptake of the neurotransmitter serotonin into neurons and thus prolong its action.
- Sexually violent predators (SVP):** A term used in the law of several U.S. states. The California Welfare and Institutions Code provides the following typical definition: “Sexually violent predator” means a person who has been convicted of a sexually violent offense against one or more victims and who has a diagnosed mental disorder that makes the person a danger to the health and safety of others in that it is likely that he or she will engage in sexually violent criminal behavior’ (www.leginfo.ca.gov/cgi-bin/displaycode?section=wic&group=06001-07000&file=6600-6609.3, accessed on 13 July 2014).
- Single photon emission computed tomography (SPECT):** Imaging technique that utilises radioactive isotopes to mark specific molecules in the body.
- Skinner box:** Setup used for animal training. The standard equipment includes a lever and a source of food or drink.
- Somatosensory cortex:** Most anterior part of the parietal cortex that contains the neurons receiving the projections carrying tactile information from the thalamus.
- Stereotactic/stereotaxic:** Minimally invasive neurosurgical operation technique using insertion of instruments or electrodes with guidance by a coordinate system and a frame fixed to the skull (although frameless systems are now also available).
- Subcortical:** Areas below the cerebral cortex, including white matter and basal ganglia.
- Substantia nigra:** Part of the mesencephalon, containing dopamine-releasing neurons, which are destroyed in Parkinson’s disease.
- Subthalamic nucleus (STN):** Part of the basal ganglia, relay station of motor signals travelling to the thalamus. Also has an associative (cognitive) and a limbic (affective) component.
- Temporal lobe epilepsy (TLE):** A common form of epilepsy with a focus in the temporal lobe of the brain. It is characterised by complex partial seizures, during which patients experience altered states of consciousness and engage in odd, automatic behaviours.

Thalamus: Main relay station between periphery and cortex. The main sensory input (auditory, visual and tactile modalities) travels from here to the specialised cortical areas. Also projects fibres that modulate cognitive, affective and motor processes.

Tourette's syndrome: Neuropsychiatric disorder, characterised by compulsive and often obscene utterings, tics and important comorbidities (for example with OCD).

Transcranial electrical stimulation (TES): Induction of currents in the brain through application of currents to the scalp.

Transcranial magnetic stimulation (TMS): Induction of currents in the brain through a brief application of strong magnetic fields over the skull.

Unified Parkinson's Disease Rating Scale (UPDRS): A clinical rating scale for different aspects of the severity of Parkinson's disease. It is commonly used to assess treatment effects in clinical trials.

Ventrointermedius nucleus (VIM): A structure in the thalamus and target for DBS in patients suffering from tremor.

Ventrolateral prefrontal cortex (VLPFC): Part of the frontal lobe, involved in emotion control.

Ventroposterolateral nucleus (VPL): A sensory relay nucleus of the thalamus and target for DBS in pain syndromes.

Visual cortex: Part of the cortex that receives the visual fibres from the thalamus. Located in the occipital cortex at the posterior end of the brain.

Waiting list design: A method for clinical trials in which a group receiving the intervention is compared with a group of patients on a waiting list who later to on to receive the same intervention.

White matter: Brain tissue containing mainly fibres (axon bundles).

Wolff Parkinson White (WPW) syndrome: A heart condition leading to episodes of abnormally fast heart beat.

Yale Brown Obsessive Compulsive Scale (YBOCS): A clinical rating scale for the severity of OCD symptoms that is often used to evaluate treatment outcomes.

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