

Handout 1. Understanding Neurologists' & Neuropsychologists' Jargon

Speaking a Foreign Language: Jargon → Plain English Dictionary

It's understandable that professionals rely on specialized terminology when they talk to each other. Lawyers have their own jargon; neurologists have theirs; neuropsychologists have theirs. The difficulty comes when people from different professions try to talk to each other. We can get so used to our own "language" that we forget to translate when we're talking to other groups. Below is an incomplete glossary of jargon terms and common acronyms used in talking about TBI (traumatic brain injury).

ACRONYM ALERT! (Includes acronyms and explanations for types of brain scans you may run across)

Here's an alphabetical list of what some common acronyms stand for, along with definitions of the full terms and some background information.

AACN = American Academy of Clinical Neuropsychology: An organization to promote best practice in neuropsychology through journals, books, conferences, and continuing education, with membership made up of psychologists who have achieved board certification in the specialty of Clinical Neuropsychology from the American Board of Clinical Neuropsychology (ABCN). Not every psychologist or neuropsychologist is a member, nor do they need to be, but good neuropsychologists will be aware of this organization.

APA = American Psychological Association: A professional society to which most psychologists belong, both research and clinical. APA members are bound by the APA's code of ethics, including, for example, that it is unethical to do a neuropsychological evaluation "on contingency", for which one only gets paid if a clients' claim is settled in the clients' favor, and that it is unethical to have a third party observer present during a neuropsychological evaluation, except in a few, restricted circumstances (e.g., having a parent present during the evaluation of a child with behavior problems). It would be very unusual for a licensed psychologist not to be a member of APA.

CHI = Closed head injury: An injury to the head caused by a blow or shock wave to the head, that does not penetrate the skull.

CNS = Central nervous system: The brain and the spinal cord. (Here in Colorado, it could also stand for Colorado Neuropsychological Society.)

CSF = Cerebrospinal fluid: A protective fluid that surrounds and supports the brain and spinal cord. The fluid circulates slowly through different cavities in the brain, as part of brain cells' waste disposal system.

CT scan = Computed transaxial tomography scan: An imaging process that gives an image of the density of brain tissue based on multiple x-ray images of the brain added together. Each image on a CT scan gives a particular "slice" through the brain. The patient is exposed to x-ray radiation during the scan. CT scans do not give a lot of detail at a small scale – very small areas of damage or very small structures in the brain cannot be seen on a CT scan. These scans are often performed when someone is first brought in to the

CT scan, continued: hospital following a traumatic brain injury, to make sure that there is no area within the brain that is bleeding or needs immediate surgical intervention.

DAI = Diffuse axonal injury: Damage to the axons of the brain that is widespread (“diffuse”) over many parts of the brain, common after traumatic brain injury. Axons are the long connecting fibers that

DAI, continued: carry signals between brain cells, so DAI can cause many kinds of cognitive problems. Axons are also called “white matter” because they are coated with a white protein coating and so appear white. See diagrams of grey and white matter with the definitions in the next section.

DTI = Diffusion tensor imaging: An imaging process using special processing of MRI scans (see below) that gives a detailed view of the “white matter”, or axons, in the brain, the connecting fibers that carry signals between brain cells. DTI is not yet used regularly as part of evaluating a patient.

EEG = electroencephalography. An imaging process that allows one to see general patterns of activity of neurons (brain cells) in the brain by using electrodes to record electrical signals from the scalp, or, in rare cases before neurosurgery, directly from the surface of the brain. EEG is a good technique for studying brain activity on the outer surface of the brain, where the brain cells are close to the electrodes, but not a good technique for telling what is going on in the interior portions of the brain, where the brain cells are farther from the electrodes. These patterns of activity are mostly not under conscious control (though stress-reduction techniques, such as meditation, can sometimes change the frequency of brain waves).

EF = Executive functioning: A collection of cognitive abilities that includes the ability to control attention flexibly (whether that means focusing when you need to, or shifting focus when you need to), the ability to hold many things in mind at once (also called “working memory”, kind of like RAM in your computer), the ability to encode and remember the proper sequence of events, the ability to plan sequences of events or actions, and the ability to use all of these abilities together to solve complex problems. Sometimes EF is incorrectly called “executive function”, singular, although there is no such thing as a unitary ability that is a single “executive function”. If a psychologist says, e.g., “The client’s executive function is intact,” fair questions back to them would be, “Could you specify which function you mean specifically, since there are many ‘executive functions’? How did you test for it? How do you know that other executive functions are also intact?” More often these abilities are called “executive functions” or “executive functioning” to indicate correctly that the term refers to multiple abilities.

ERP = event-related potential; also sometimes called EP = evoked potential: A kind of EEG imaging that allows one to see how certain areas of the brain respond to stimuli (e.g., sounds or visual images) in the first few hundredths of a second after the stimulus has been seen or heard. The difference between ERP and EEG is that EEG looks at patterns generally, not necessarily in response to anything specific, whereas ERP looks at the time-course of the brain’s electrical activity in response to something that occurs at a specific point in time. The patterns of response over time to certain kinds of stimuli are well-documented scientifically, so that an abnormal pattern of response could be defined objectively. These responses are not under conscious control. Like EEG, ERP is a good technique for studying brain activity on the outer surface of the brain, where the

ERP, continued: brain cells are close to the electrodes, but not a good technique for telling what is going on in the interior portions of the brain, where the brain cells are farther from the electrodes. Although it can tell you about responses within milliseconds, ERP can only tell you about responses over time – it is a very poor tool for localizing anything to a specific part of the brain.

fMRI = functional magnetic resonance imaging: An imaging process that uses a series of MRI images of the brain over time to measure activity of the brain during particular kinds of activities or tasks. Researchers talk about brain areas “lighting up” when someone does a task, but that term is mis-leading. In fact, what they do is compare how active the brain is while doing one task to how active the brain is when it’s doing something different, a kind of baseline condition, and look at the difference. E.g., they might look at what parts of the brain are active when someone listens to

fMRI, continued: meaningful, grammatical sentences, and compare it to what parts of the brain are active when someone listens to unconnected words. In that case, the difference in activity is thought to reflect the areas involved when someone uses grammar to understand language.

GCS = Glasgow Coma Scale: A scale that physicians use to rate how severe someone’s change of consciousness and functioning is after brain injury. See your handout with the Glasgow Coma Scale on it for a detailed explanation of what is on the scale. Used as one way to predict outcome following TBI, although it is not really predictive of outcomes in mild TBI.

INS = International Neuropsychological Society: a scholarly society where research and clinical neuropsychologists interested in the brain get together and share clinical knowledge and research through journals, conferences, and continuing education. Good neuropsychologists will be aware of what goes on in this society, even if they don’t keep track of all the latest findings in perfect detail.

LOC = loss of consciousness: the length of time that someone is unconscious following a head injury, used as one way to predict outcome following TBI, although it is not really predictive of outcomes in mild TBI.

MRI scan = Magnetic resonance imaging scan: An imaging process that uses the magnetic properties of water in tissues to get a detailed structural image of the brain. The patient is not exposed to any radiation to get the image; instead, they are placed in a very strong magnetic field. (Thus patients with any metal in their bodies – pacemakers or shunts or pins – cannot be scanned using MRI.) Very small lesions and very small brain structures that cannot be seen in CT scans are visible in MRI scans. MRI scanning is more expensive than CT scanning; thus, insurance companies are more reluctant to approve them. MRI scans show “grey matter” (areas with more cell bodies of brain cells) better than they show “white matter” (the long fibers connecting the cell bodies of brain cells). See diagrams of grey and white matter with the definitions in the next section.

PET scan = positron emission tomography scan: An imaging process that uses technology similar to CT scans to show ongoing activity in the brain during certain activities or tasks. The patient is injected with or inhales a radioactive solution, which then shows up in areas that are most active during the activity or task; exposing the patient to more radiation than just during a CT scan. PET scans are not very detailed – small areas of

PET scan, continued: activity do not show up well on PET scans, compared to fMRI. As with fMRI, researchers compare how active the brain is while doing one thing to how active the brain is when it's doing something different, a kind of baseline condition, and look at the difference.

PTA = post-traumatic amnesia: loss of memory that occurs after the traumatic brain injury, often a period of disorientation after the injury occurs. The duration of PTA is often used as one indicator to predict outcomes following TBI, although it is not really predictive of outcomes in mild TBI. More detail on amnesia at the end of this handout.

SPECT scan = single photon emission computed tomography: An imaging process using technology similar to PET scans to show overall patterns of activity in the brain. PET scans can show activity during specific tasks over a few seconds, whereas SPECT shows patterns of activity over many hours. It is a good technology for showing overall where there might be lower-than-normal activity in a patient's brain. Like PET, it involves exposing the patient to a radioactive substance as well as x-rays, and it takes 2 days for all the radioactive substance to be eliminated from the patients' body. Thus, there is some risk to the patient's health from the procedure.

TBI = Traumatic brain injury, almost always used to mean "non-penetrating traumatic brain injury", an injury to the brain caused by a blow or shock wave to the head, that does not penetrate the skull. When a brain injury results from, for example, a mistake during brain surgery, or a bullet wound through the brain, even though these are traumas to the brain, such injuries are usually just referred to as "brain injury."

WCST = Wisconsin Card Sorting Test, also sometimes called "the Wisconsin": One of many tests of executive functions that should probably not be used with TBI patients. Patients look at cards with different numbers of colored shapes on them, and have to guess the rule being used to sort the cards, whether it is by color, number, or shape. There is little evidence that the WCST is sensitive to TBI. Although it was originally designed as a measure of "frontal lobe function", there is also little evidence to support the idea that it is sensitive and specific only to frontal lobe damage.

TERMS TO DESCRIBE THE BUILDING BLOCKS OF THE BRAIN:

Several terms get bandied about to talk about the basic parts of the brain. How is a neuron different from a brain cell? (It's not, it is a brain cell.) What are white matter and grey matter? What are axons? Definitions below:

Neuron: A brain cell that sends and receives electrical signals from other neurons and may combine input from several other neurons. It has a cell body that is roughly round, long fibers called axons for sending signals, and short fibers called dendrites for receiving signals.

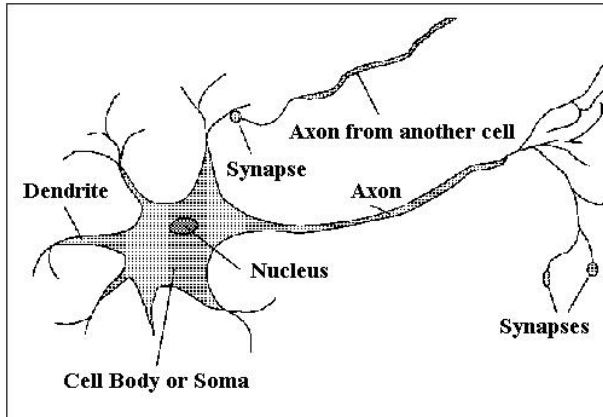


FIG. 1. DIAGRAM OF NEURON WITH

PARTS LABELED

Axon: Part of a neuron, specifically, the long fiber extending out from the cell body that sends electrical signals to other neurons. It is covered with a white protein coating, which is why bundles of axons are called “white matter”.

Dendrite: Part of a neuron, specifically, the short fibers extending out from the cell body that receive electrical signals from other cells’ axons.

Synapse: A connection between the axon from one cell and the dendrite from another cell. Signals travel from one cell to another across the synapse.

Neurotransmitter: A chemical that allows signals to travel across the synapse; e.g., serotonin, dopamine, glutamate, and acetylcholine are all neurotransmitters.

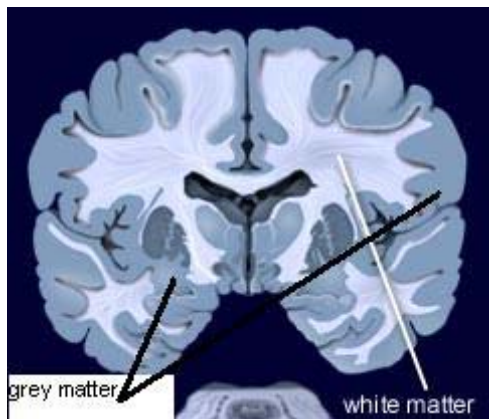


FIG. 2. DIAGRAM OF GREY & WHITE MATTER IN

THE BRAIN

Grey matter: parts of the brain, especially the surface of the brain, that have a higher density of neuron cell bodies than of axons.

White matter: parts of the brain that have a higher density of axons than of neuron cell bodies. The *corpus callosum* is one of the most visible parts of white matter, the thick

White matter, continued: bundle of fibers connecting the right and left hemispheres of the brain. Each fiber is the axon of an individual brain cell.

TERMS FOR DAMAGE TO THE BRAIN:

Contusion: Bruising of tissue

Lesion: An area of damaged brain tissue.

Focal lesion or focal damage: Damage to brain tissue that is localized to a specific part of the brain.

Diffuse damage: Damage to brain tissue that is widespread rather than in just a specific area.

Coup/ Contrecoup injury: “coup” is French for a blow or hit, so a coup injury occurs right under where the impact to the head occurs. Contrecoup is French(ish) for on the other side of the head from the blow to the head. A contrecoup injury occurs because the brain bounces around inside the skull – damage can occur in other areas than under the site of the impact. You will often see these terms misspelled, as contracoup, or cous or contracous, but I don’t want to find anyone who has seen this handout misspelling these terms ever again. “Contre-coup” is acceptable. Contrecoup injuries are most common in the bottom part of the frontal lobes and the front part of the temporal lobes, because the skull has many bony ridges in those areas that can tear or bruise brain tissue, whereas the inside of the skull is smoother elsewhere.

PARTS OF THE BRAIN:

The cortex is made up of the right and left frontal, parietal, temporal, and occipital lobes, shown in Figure 3 below on the right side of the person’s brain.

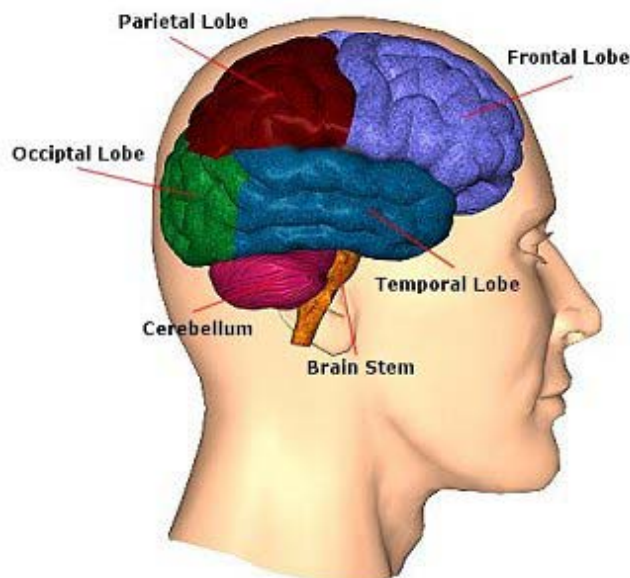


FIGURE 3. THE LOBES OF THE BRAIN

Confusing pairs of terms neurologists use in combination with the above terms for parts of the brain:

Ventral: towards the bottom of the brain, towards the feet. *E.g.*, “ventral frontal cortex” means the part of the frontal lobes on the bottom surface of the frontal lobes, kind of over the eyes.

Dorsal: towards the top of the brain

Medial: towards the center of the brain

Lateral: towards the outer surface of the brain

Anterior: towards the front of the brain. “Anterior temporal lobes” means the front-most part of the temporal lobes.

Posterior: towards the back of the brain

Rostral: towards the front of the brain

Caudal: towards the back of the brain

Contralateral: on the opposite side of the brain or body, right or left, as where a lesion is. *E.g.*, his stroke was in the left hemisphere of the brain, so he had trouble moving his contralateral hand, aka his right hand.

Ipsilateral: on the same side of the brain or body, right or left, as where a lesion is.

KINDS OF DEFICITS THAT PEOPLE SUFFER AFTER TRAUMATIC BRAIN INJURY:

Amnesia: Loss of memory or inability to form new memories

Post-traumatic amnesia: loss of memory that occurs after the traumatic brain injury, often a

period of disorientation after the injury occurs.

Anterograde amnesia: inability to form new memories from the moment of the TBI onwards in time

Retrograde amnesia: loss of memory for events before the TBI, typically worst for recent events

while memory is better for events further in the past.

Types of amnesia

