

Chapter 1

What is behavioral neuroscience?

–Branch of psychology that studies the relationship between the brain and behavior

View of ancient Egyptians and Greeks on the brain? Hippocrates? Galen?

-Nervous system is a network of fluid-filled, interconnected tubes and chambers. Fluid in ventricles plays important role in transmitting messages to and from the brain.

-Hippocrates (460-379 BC): First to suggest that the brain was the source of intelligence

-Galen (130-200 AD): Introduced notion that fluid filled ventricles animate the body

What does localization of function mean? How does Phineas Gage relate?

Different areas of the brain are specialized for different functions. Phineas Gage took a spike through his brain. Before the accident he was fully competent, after the accident he had intelligence, speech, learning and movement problems. No sense of responsibility, no respect for social conventions, profane, irreverent.

What are the differences between a theory and a hypothesis?

Theory: integrates and interprets many observations to explain a phenomenon

Hypothesis: Testable (yes/no) prediction that is used to guide further research

How is a correlational design different from an experiment?

Correlation: Systematic research design that does not manipulate but rather observes whether two variables are connected

Experiment: Research Design characterized by: Random Assignment, Control of extraneous/confounding variables, Manipulation of a condition, Measurement of changes from the manipulation

What are common histological techniques used in neuroscience research? When would you use each approach? What type of information would you expect to find?

CT scan: Uses multiple x-rays to construct a 3D image; X-ray penetrates body and absorbed by various “radiopaque” tissues; Digital reconstruction within plane of slice

PET: Injection of a radioactive substance; (2-deoxyglucose) into the bloodstream, which is taken up by parts of the brain according to how active they are

MRI: Magnetic field and radio waves used to produce high-resolution structural images of the brain

fMRI: Measures brain activation by detecting increases in oxygenated blood directed at active neural structures. Changes in blood flow and blood oxygenation in the brain (i.e., hemodynamics) are closely linked to neural activity; Ratio of oxyhemoglobin to deoxyhemoglobin determines areas of brain activation

Brain recording methods:

EEG: Scalp electrodes provide information about the activity of large populations of neurons; Used to study sleep and diagnose seizures

ERP: Series of EEG responses to environmental stimuli; Useful in studies of perception, cognitive processes

MEG: Brain's magnetic output is assessed; Skull is transparent to magnetism, not electricity, making MEG less distorted than EEG; Localization of activity is possible

What technique is used to stimulate the human brain?

Brain stimulation: Delineate functional properties of neural tissue 

TMS: Applies strong and quickly changing magnetic fields to surface of skull that can interrupt brain function

What is histology? What are the most common stains and what do they stain?

Histology: Study of microscopic structure and tissue

Nissl stain: Cell bodies of neurons, Example: Cresyl Violet

Golgi stain: Single cells, Darkly stains full neuron, Randomly stains ~5% of neurons

Myelin stain: Stains myelin that wraps and insulates axons, Identifies neural pathways

What is tract tracing? What is the difference between anterograde and retrograde tracers?

Tracing the projections from one part of the nervous system to another part.

Anterograde: "moving forward". Where a pathway ends.

Retrograde: "moving backward". Where a pathway begins.

What techniques are used to study neurophysiology?

Neurophysiology: Intracellular Recording; Brain slice ~0.5 mm wide, inject current, depolarizing neuron, causing Action Potential

What are the neurochemical methods? When would you use each approach? What type of information would you expect to find?

Neuropharmacology: Drugs- chemical substances that alter biochemical functioning.

•Receptor *antagonists*: Inhibitors of neurotransmitter receptors

•Receptor *agonists*: Mimic actions of naturally occurring neurotransmitters

Microdialysis: Procedure for analyzing chemicals present in the extracellular fluid

Immunocytochemistry: Uses antibodies attached to a dye to identify the presence of particular proteins

What are lesions? What are the different ways of producing lesions? What type of information does this method provide?

Lesions: a region in the brain that has suffered damage

Humans: Trauma, Strokes, Tumors, Infection, Toxins, Neurological disease
Animals: Ablation, Heat / Electrolytic, Neurotoxic, Cooling (reversible inactivation)

What is stereotaxic surgery? How is it done? What is it used for?

A three-dimensional surgical technique that enables lesions deep within tissues to be located and treated using cold, heat, or chemicals.

What are the genetic methodologies? Concordance rate?

Twin studies: Compare variable of interest between identical (monozygotic) and fraternal (dizygotic) twins. Contribution of heredity is stated as concordance rate- Statistical analysis on twin studies which determines the extent to which twins are similar, low rates = not similar (or environmentally influenced), high rates = similar (genetically influenced).

Genetically Modified Animals: Knockout or knockin genes. Protein production blocked or added

Chapter 2

What are the basic anatomical directions?

Rostral/anterior → head/front
Caudal/posterior → tail/back
Dorsal/superior → top/back
Ventral/inferior → bottom/belly
Medial → middle
Lateral ← outside
Proximal → near core
Distal → extremities
Ipsilateral – same side
Contralateral – opposite side

What are the three planes of section?

Coronal sections divide brain crosswise from front to back.
Sagittal sections are parallel to the midline and give us a side-view
Horizontal sections section brain from top to bottom.
*medial towards the middle of brain, lateral towards outside

What are the meninges? The three layers?

System of membranes which envelops the central nervous system.
3 layers in the CNS:
–Dura mater (Hard mother)
–Arachnoid membrane
–Pia mater (Pious mother)

What are the ventricles?

One of the communicating cavities within the brain. There are four ventricles: two lateral