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DISCOVERING PSYCHOLOGY: THE BEHAVING BRAIN

- There are approximately 10 trillion cells in the brain (neuron and glial). All of these cells are designed to do 3 things:
  1. Receive information from other cells
  2. Process information
  3. Transmit information to rest of body

Dendrites → Cell body → Axon (nerve impulse) → Terminal buttons → Synapse (neurotransmitters)

- Neurotransmitters: Chemical messages when released into the synapse they attach to cites on neighboring dendrites.
  1. Excitatory synapses – they cause the nerve cell on the receiving end of the synapse to generate a nerve impulse (electrical charge).
  2. Inhibitory synapses – reduce or prevent nerve impulse.

I. PARTS OF BRAIN:

II. TECHNIQUES USED TO STUDY BRAIN FUNCTIONING:

A. **Lesioning**: precise destruction of brain tissue in animals in order to correlate any loss of behavioral functioning or sensory processing with a specific brain area. Also used to look at patients who have lesioning caused by strokes, accidents, or traumas.

B. **Autopsies of Patients with Brain Damage of Stroke:** These were the earliest studies.

C. **Stimulate Parts Of The Brain** with electrical currents or chemicals.

D. **Brain Imaging:**

1. PET scan, or positron emission tomography, which measures the blood flow within regions of the brain in order to obtain a picture of brain activity. A tiny amount of radioactive chemical is injected into blood vessels that carry the chemical to the brain, and the active regions in the brain temporarily accumulate this chemical. A machine then passes X-ray beams through the head. (Matlin, 1998, p. 11-12 & 55-56)
   a. The brain has the greatest energy demands in the regions where it is most active. As a result, the blood flow to these areas increases dramatically. A research participant can perform a cognitive task (e.g., think of a specific use for an object) and the researcher notes the correspondence between this activity and the blood flow pattern.

2. MRI, or Magnetic Resonance Imaging (MRI): researchers pass a strong (but harmless) magnetic field through a person's head. The MRI scanner picks up radiation from certain molecules, which are present in different concentrations in different tissue. This technique provides detailed images of brain anatomy (Matlin, 1998, p. 12)
    a. fMRI, or Functional Magnetic Resonance Imaging, is used to gather a series of brain images, it can make an image of blood flow changes across a 5-second period, whereas and MRI requires 90 seconds. fMRI produces more highly detailed images than PET san at much lower cost.

3. EEG represents total activity of neurons in the cerebral cortex.

- "PET scans and the fMRI technique provide maps of brain activity, but they are still too slow to provide precise information about the timing of brain activity" (Matlin, 1998, p. 12)

4. ERP, Event Related Potential Technique, records the tiny fluctuations (lasting less than 1 second) in the electrical activity of the brain in response to a stimulus.

E. **Neurometrics**: the precise electrophysiological measurement of neural functioning.
1. Researchers compare a person's brain data to a norm and determine if brain activity is abnormally high or low in various regions.
2. This technique allows the identification of major psychiatric disorders (e.g., depression and schizophrenia) and alcoholism.
3. Allows researchers to see the effect of change of states or moods on brain activity. That is, the researcher can see fleeting abnormalities as a person thinks of different things (e.g., stressful breakup with a boyfriend, reunion with a loved one, promotion at work).

III. HOW BRAIN CHEMICALS AFFECT MEMORY AND LEARNING:

A. Chemicals that block receptor cites from absorbing the neurotransmitter acetylcholine will prevent memory formation (e.g., rats demonstrated amnesia for prior maze learning).
B. Chemicals that stimulate the synapse will result in more acetylcholine being present in synapse and this results in memory enhancement.
C. Application: Acetylcholine is dramatically reduced in Alzheimer's patient. Therefore, if we understand this chemical system better we may be able to develop drugs that help increase the memory capabilities of people with Alzheimer's Disease.

IV. NEURONAL IMPLANTATION:

A. Prenatal cells implanted into damaged area of brain $\rightarrow$ grafting of brain cells.
B. Animal Model: aged rats with brain deficits $\rightarrow$ memory improves with neuronal implant.
C. Parkinson's Disease: loss of dopamine neurons $\rightarrow$ use neuronal implant.