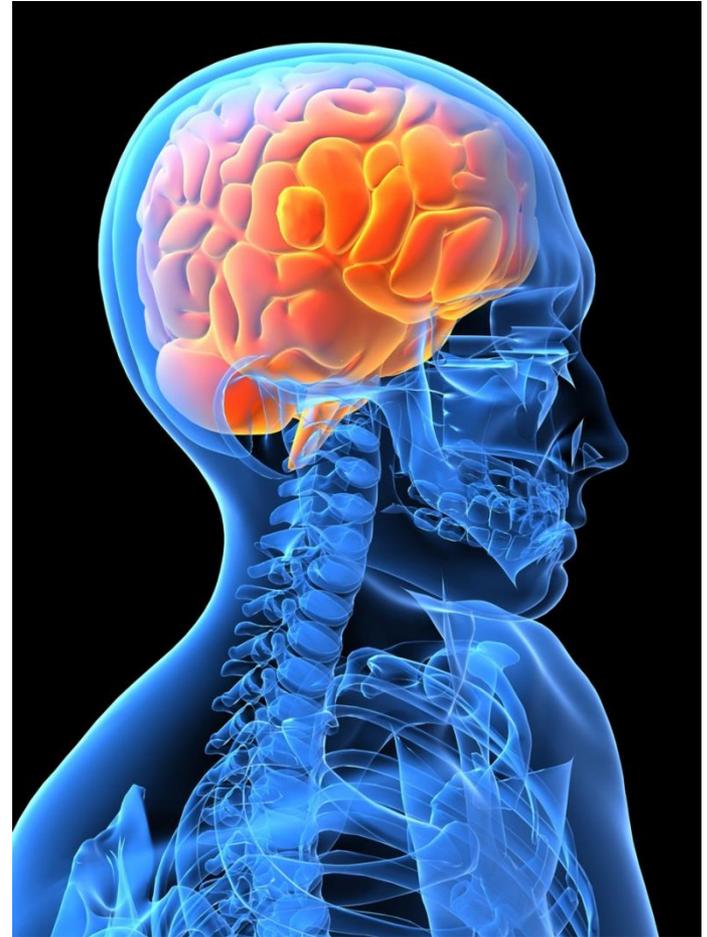
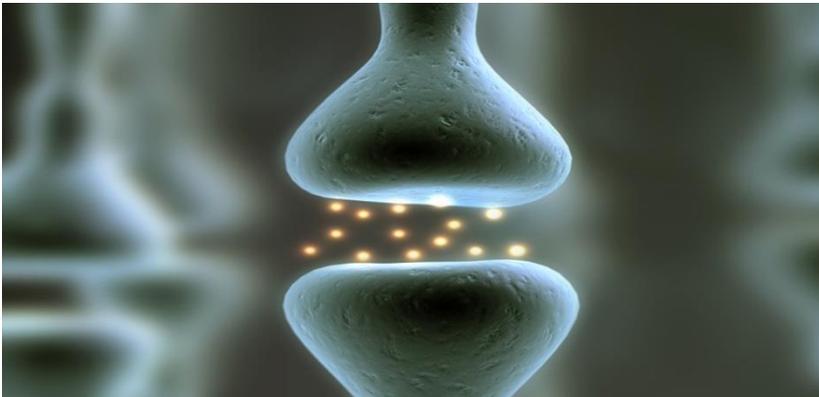
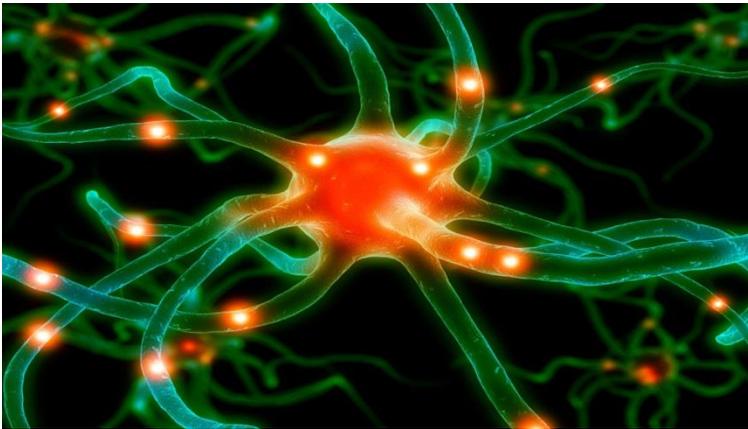


# The Nervous System

The Power Source to Life



# What You Are Expected to Know

1. Be able to identify the parts of the nervous system and explain their main functions.
2. Identify the four lobes of the cerebrum and the basic functions for each lobe.
3. Be able to explain symptoms of common diseases and disorders of the nervous system.
4. Explain three ways to protect the nervous system from various injuries.

# Why are you learning about the Nervous System?

- List two reasons how knowing about the nervous system can help to improve your life.
- A.
- B.

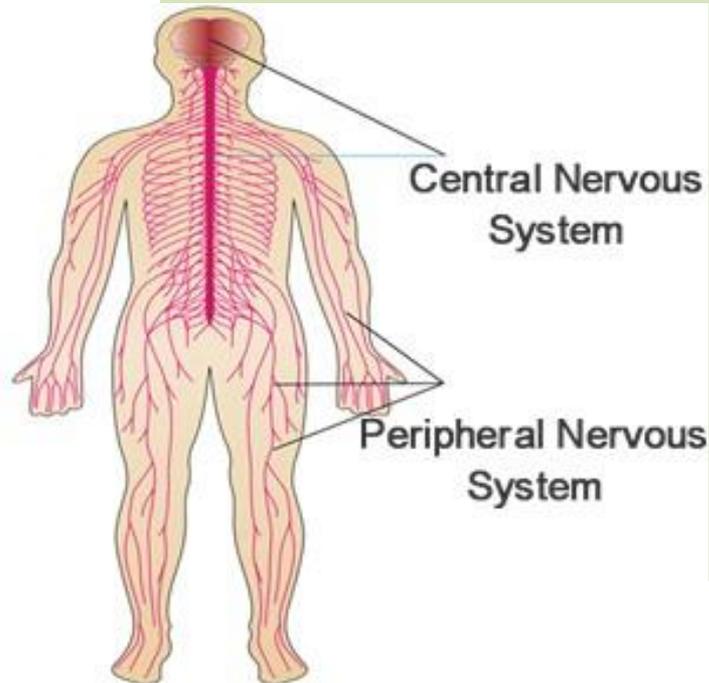
## *The Nervous System is divided into Two Major Systems*

### **Central Nervous System**

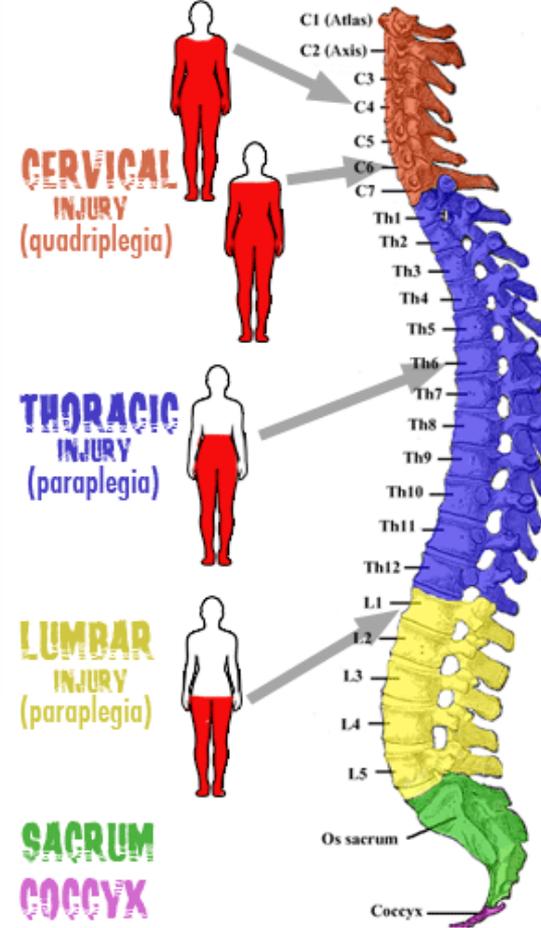
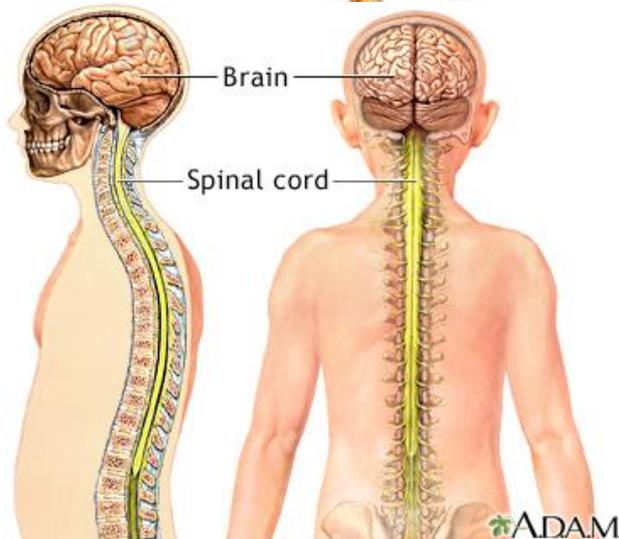
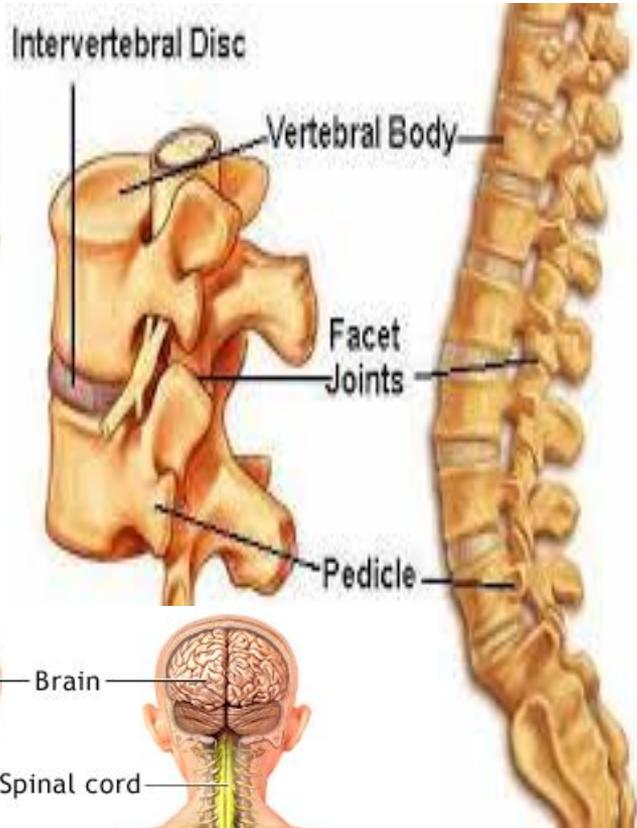
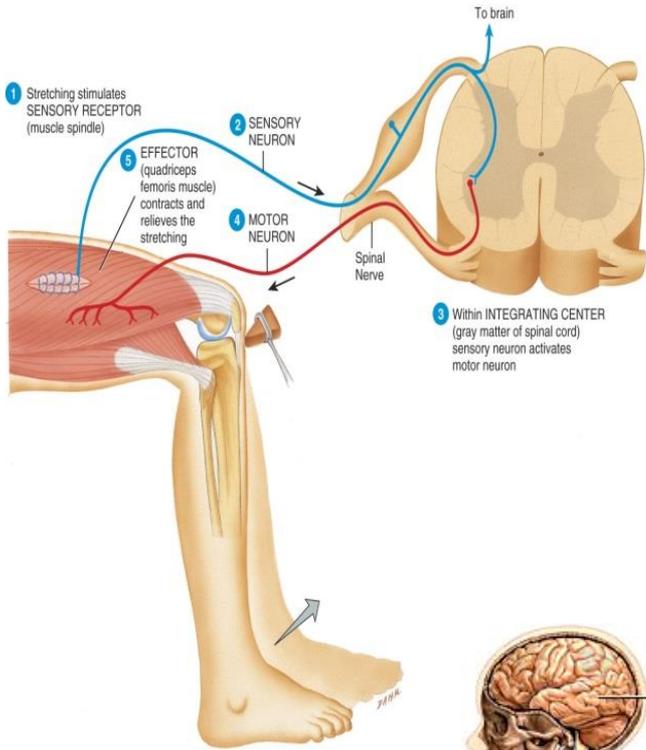
- \*Includes the brain and the spinal cord.
- \*The **Brain** is the body's control center and it weighs about 3 lbs.
- \*The brain is a mass of billions of neurons that control actions, thoughts, emotions, and memory.
- \*Blood Vessels carry oxygen and glucose to the brain
- \***The Spinal Cord** is a bundle of nerves that run down the vertebrae and it relays messages from all body parts, muscles, and glands.
- \*It is less than two feet long and is protected by the vertebrae.

### **Peripheral Nervous System**

- \*Consists of the nerves that branch off from the spinal cord.
- \*Each set of nerves controls different areas in the body.



# Spinal Cord Communication



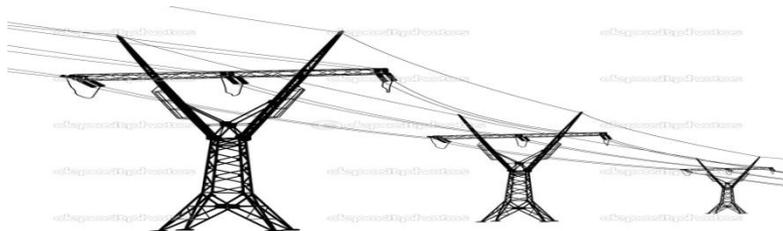
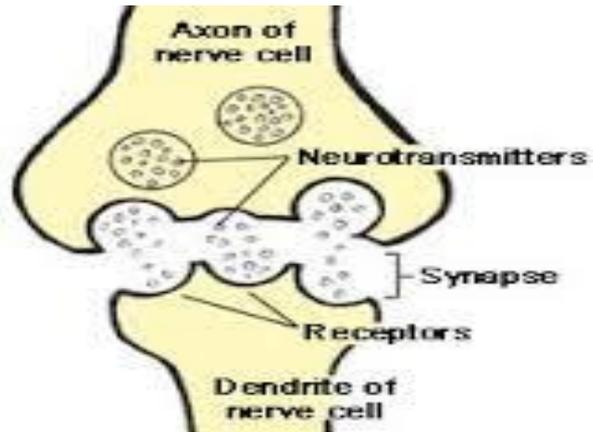
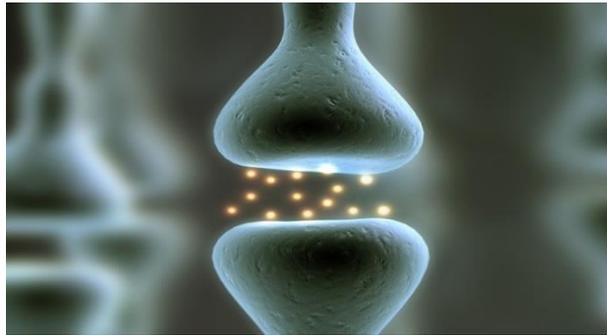
# Spinal Cord

- **\*The spinal cord is the bundle of nerves running down the middle of the vertebra and it routes all nerve signals travelling between the brain stem and the rest of the body.**
- **\*The spinal cord can work independently from the brain and sends out responses to the muscles directly once a common pattern has been learned and established. Ex. Walking**
- **\*The spinal cord is about 40-45 cm long.(15-17 inches) and is only about 1 cm thick. It is surrounded by membranes that keep the spinal cord healthy and protected.**
- **\*There are 31 pairs of nerves that branch off the spinal cord and control different parts of the body.**
- **\*Damage to the spinal cord can cause paralysis depending on where the damage occurred.**
- ? What is the difference between a paraplegic vs. a quadriplegic.
- ? List three ways a person can protect his or her spinal cord.

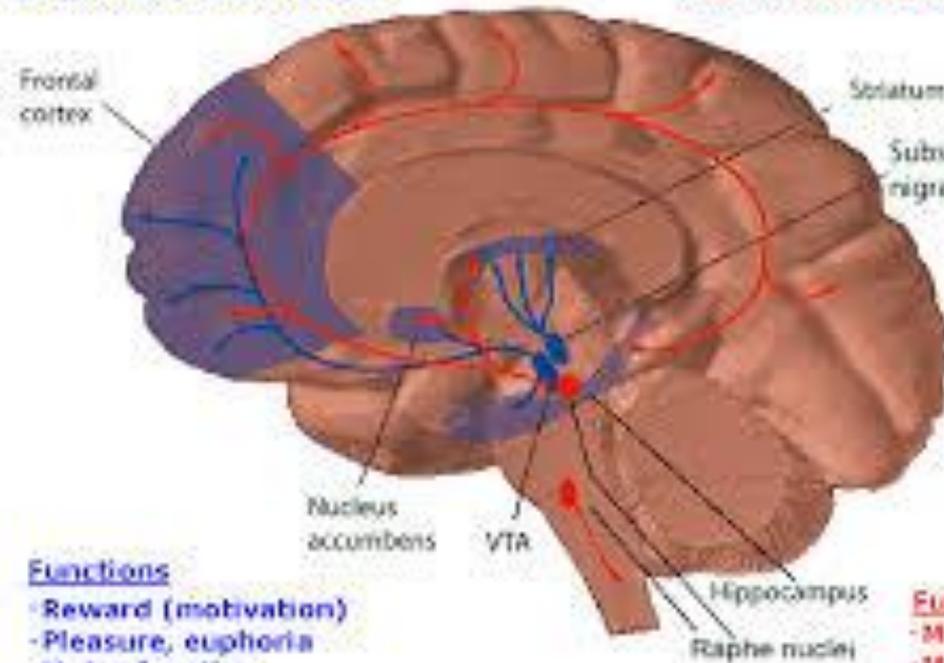
# Neurons (Nerve Cells) The Power Lines for Messages

- Neurons are cells with a nucleus at the center, a lot of branches called dendrites, and a tail called the axon.
- \*Axons link neurons either to the dendrite or the body of another neuron.
- \*Axons are covered with a layer of fat called myelin which helps messages to travel very fast from one neuron to another.
- \*Signals are sent with electrical pulses.
- \*Synapses are tiny gaps between nerve cells. The messages from one neuron to the next gets transported across the synapse by chemicals called **NEUROTRANSMITTERS**.
- \*Dopamine, Serotonin, Acetylcholine, are a few neurotransmitters of the 40 that have been identified.

# Pathways for neurons



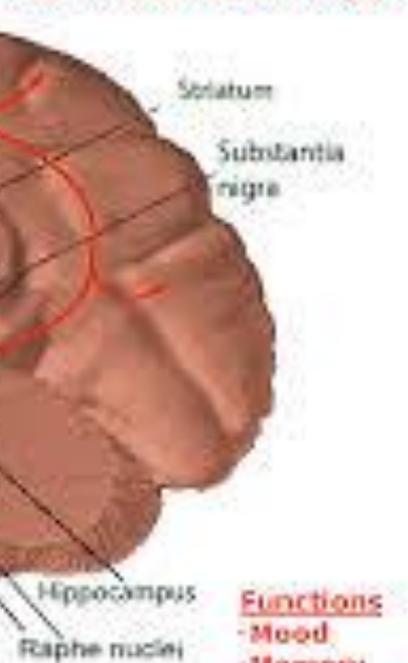
## Dopamine Pathways



### Functions

- Reward (motivation)
- Pleasure, euphoria
- Motor function (fine tuning)
- Compulsion
- Perseveration

## Serotonin Pathways

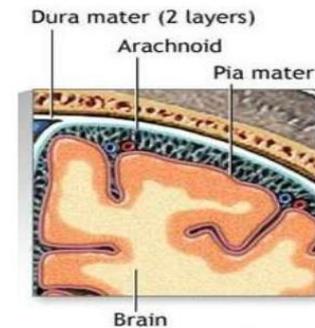


### Functions

- Mood
- Memory processing
- Sleep
- Cognition

## The Meninges

- The Meninges are the membrane covering the brain and spinal cord.
- The Meninges consist of three membranes:
  1. The dura mater,
  2. The arachnoid mater,
  3. The pia mater.



# Peripheral Nervous System has two main parts:

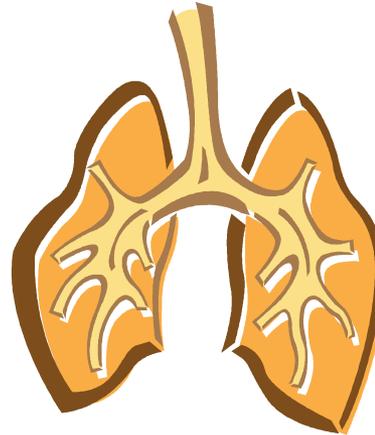
## Somatic (Voluntary)

- Actions you control: walking, running, writing, speaking, exercise, studying, learning, typing a paper, etc.

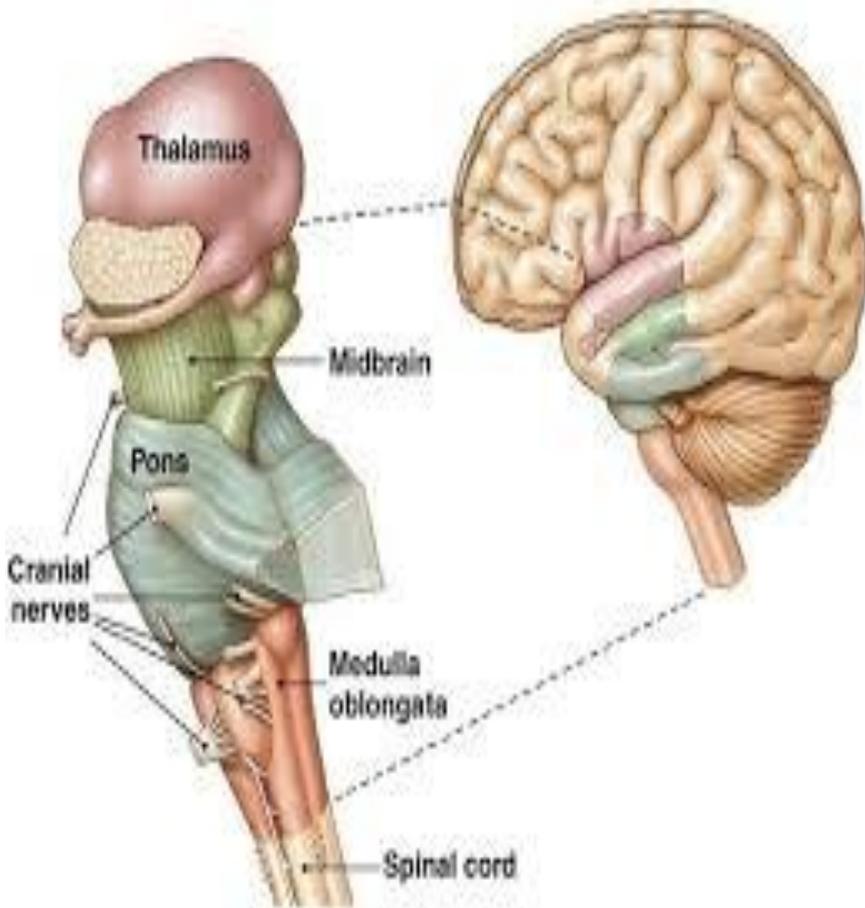


## Autonomic (Automatic)

- Actions you do not usually control: heartbeat, digestion, breathing, reflexes, pupils dialate, blood flow, etc.



# 3. Brain Stem



## Brain Stem Functions

\*The **brainstem** is the region of the **brain** that connects the cerebrum with the spinal cord. It consists of the midbrain, medulla oblongata, and the pons. Motor and sensory neurons travel through the **brainstem** allowing for the relay of signals between the **brain** and the spinal cord.

# Midbrain and Limbic System

## Mid Brain

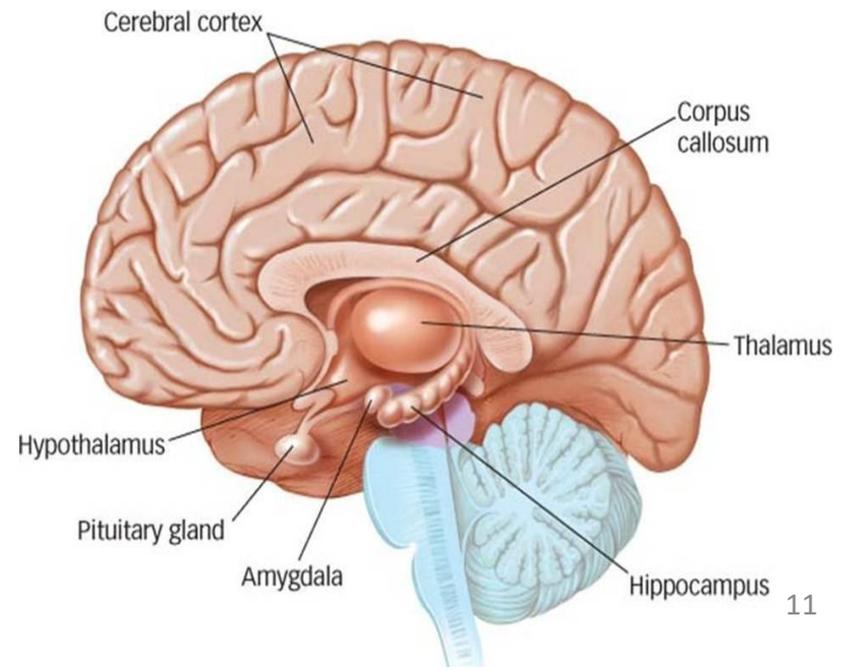
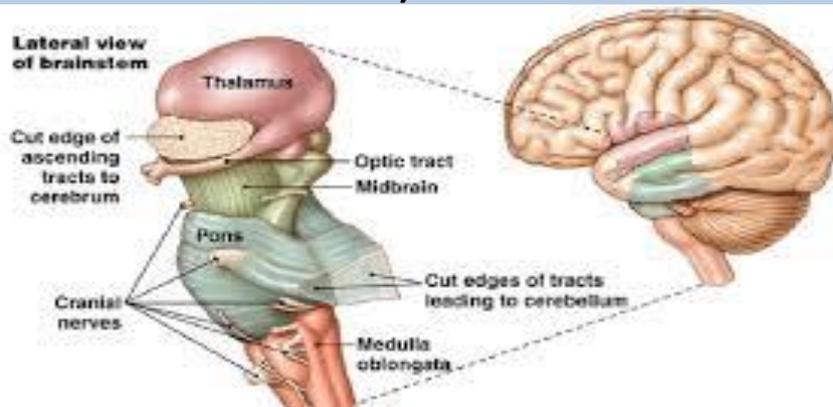
### Parts and Functions

The midbrain region is part of the central nervous system. It is located near the center of the brain, under the cerebral cortex. This region joins the spinal cord and the brain together and is part of the brain stem. The **hypothalamus** is in the midbrain and it monitors needs like hunger, thirst, and sleep.

**Hypothalamus** is also responsible for controlling body temperature and internal organs, and coordinates brain stem activity..

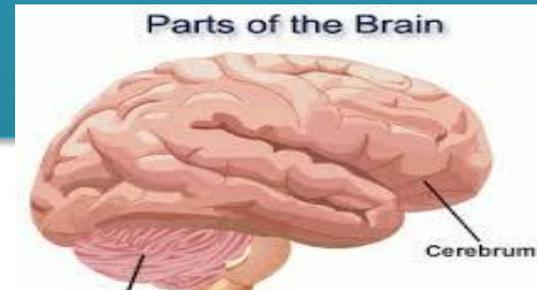
## Deep in the brain: Limbic System

**The amygdala is part of the midbrain and is primarily responsible for processing emotions.**



## 2. Cerebellum (Latin for little brain)

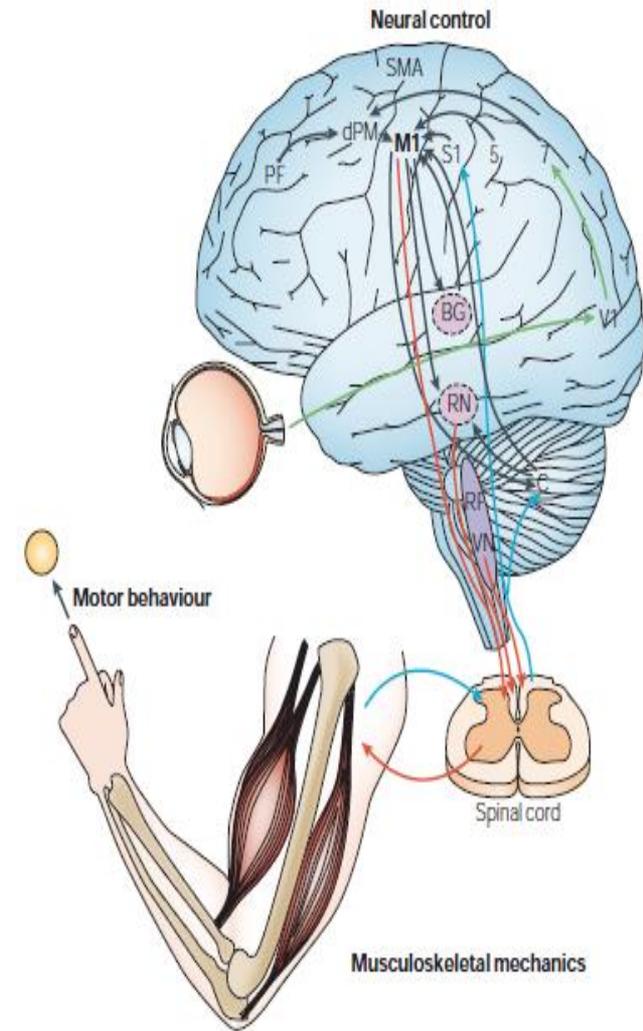
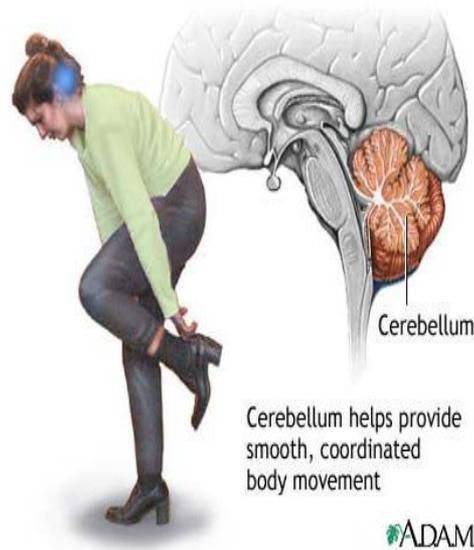
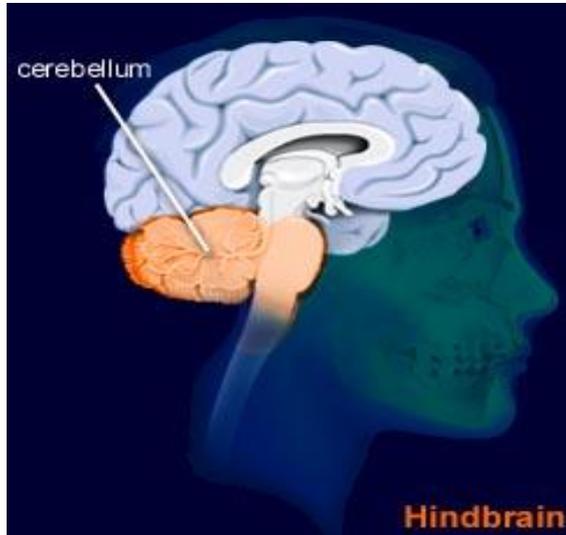
- \*Second largest part of the brain it is located at the back of the brain and just behind the brain stem.
- \*It receives information from parts of the brain and spinal cord and regulates muscle movements.
- \*It helps with muscle contraction, smooth movements, muscle tone, posture, all muscles working together.
- \*It is a smaller part of the brain but it contains half of the brain's neurons.



# Examples for the Cerebellum

- Movements

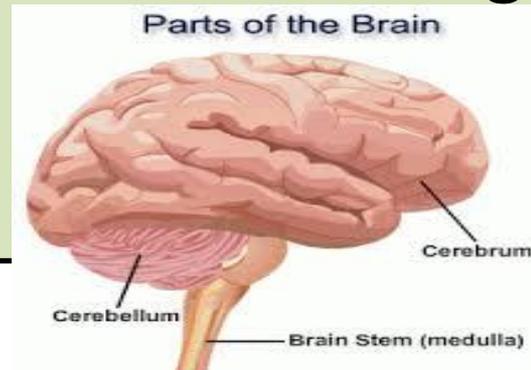
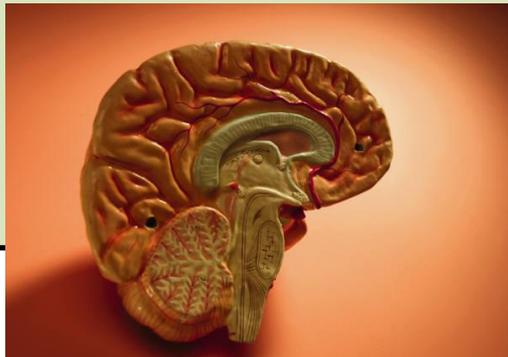
Location:



## Three Major Parts of the Brain

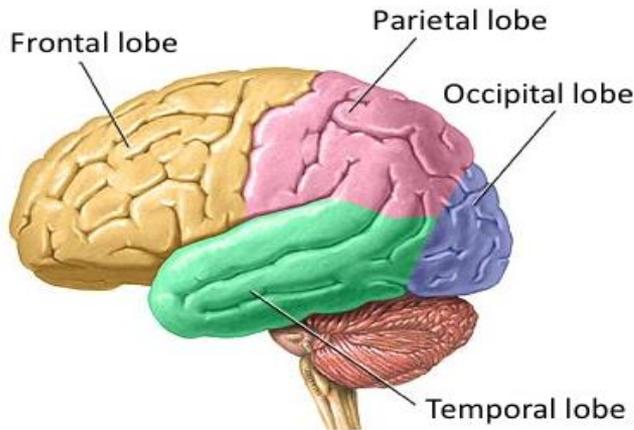
**1. The Cerebrum** is the largest part of the brain and weighs an average of 3 pounds.

- Why does it have so many folds????
- It is divided into four lobes and they process information from all other nerves in the body, and sends out responses to the specific parts.
- It is divided into two hemispheres. Right half controls the left and left controls the right.



# The Cerebrum has Four Lobes for Actions of the Body.

## Locations of Lobes



This area of the brain receives information from various lobes of the brain and utilizes this information to carry out body movements.

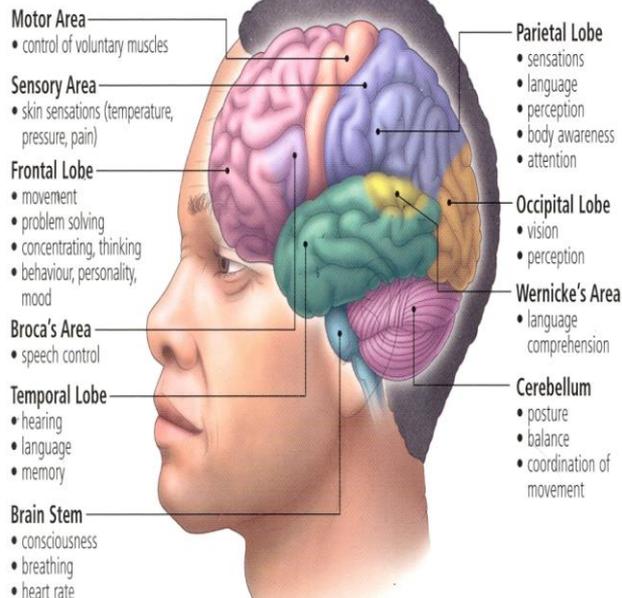
- **Frontal Lobe:** is located at the front of the brain and is associated with reasoning, motor skills, higher level understanding, and expressive language, planning, movement, emotions, and problem solving: Responsible for higher-order functioning (judgment, abstraction, and motivation) and the production of speech and has influence on personality. Damage results in difficulty with verbal expression, difficulty concentrating, and lack of emotional control.

- **The Parietal lobe** is located in the middle section of the brain and is associated with processing tactile sensory information such as pressure, touch, pain, reading, writing, arithmetic, understanding speech, posterior part is responsible for attention, and the right side is for understanding expressions and spatial relationships.

**The Occipital lobe** is located at the back portion of the brain and is associated with interpreting visual stimuli and information.

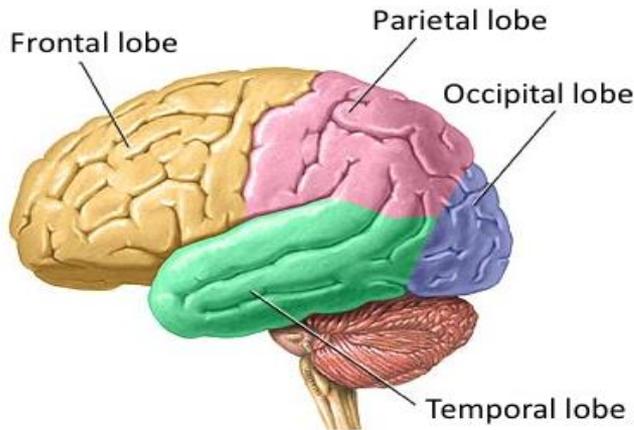
**Temporal Lobe-** Important for memory. When information enters the sensory registers it is briefly stored here and then sent to long-term memory or lost. associated with perception and recognition of sounds, long-term memory, and smell

## Functional Areas of the Brain<sup>1</sup>



# The Cerebrum has Four Lobes for Actions of the Body.

## Locations of Lobes



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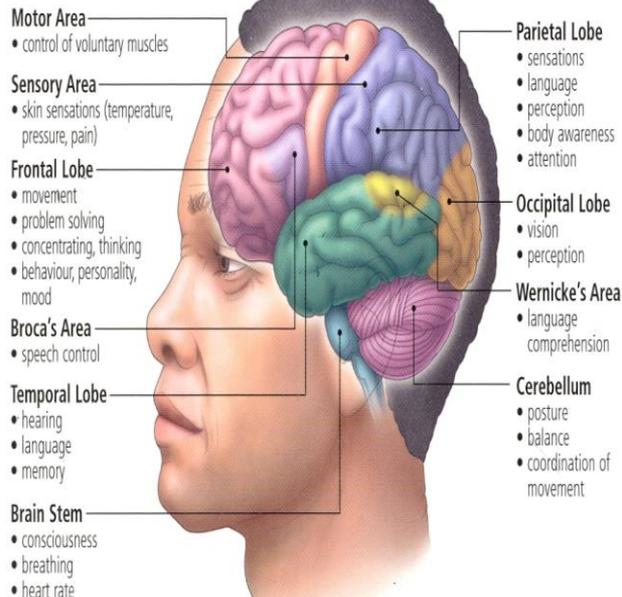
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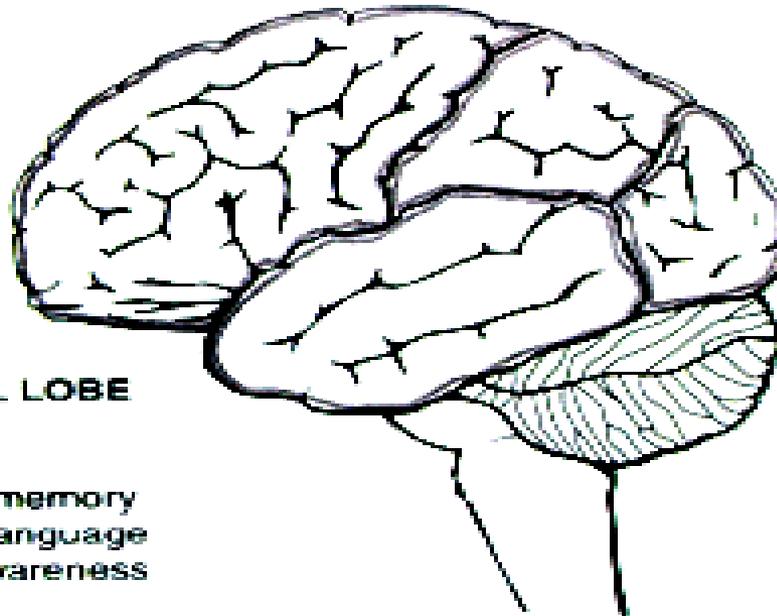
# Functions of the Lobes

## FRONTAL LOBE

- voluntary movement
- motor integration
- expressive language
- social functioning
- inhibition of impulse
- emotions
- lack of initiative
- short term memory

## PARIETAL LOBE

- sensation; also fine discrimination of temperature, pain and touch
- comprehension of speech and reading
- production of writing and calculation
- awareness of spatial relationships; also size and height



## OCCIPITAL LOBE

- visual perception

## TEMPORAL LOBE

- hearing
- smell
- long-term memory
- receptive language
- musical awareness

## CEREBELLUM

- coordination
- balance

## BRAIN STEM

- appetite
- chewing & swallowing
- hearing & balance
- wakefulness
- motor speech
- upper intestine peristalsis

- regulation of pulse, respiration & blood pressure
- vision
- eye & eyelid muscle movement
- smell
- facial & neck muscle movement
- facial sensation
- taste

# What is STRESS???

Stress is the body's response to a demand placed upon it.

What happens in the brain during a Stressor.

(Stressor: causes the stress response.) The activating event.

The person decides if the stressor is a threat to the person's safety or not.

If it is perceived as a threat- the body releases cortisol, adrenaline, & noradrenaline which has a ripple effect on the body.

Cortisol makes more glucose to be deposited into the blood stream so the muscles have energy to react.

(Read the captions for the illustration to the right.)

## Brain becomes more alert.

- Stress hormones can effect memory and cause neurons to atrophy and die.
- Headaches, anxiety, and depression
- Disrupted sleep

## Digestive system slows down.

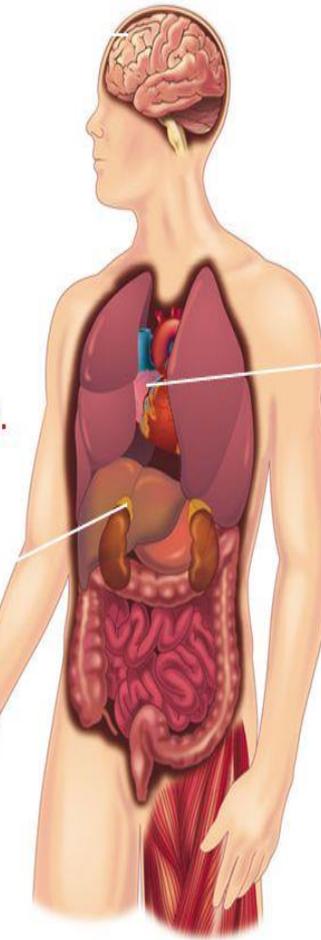
- Mouth ulcers or cold sores

## Adrenal glands produce stress hormones.

- Cortisol and other stress hormones can increase central or abdominal fat.
- Cortisol increases glucose production in the liver, causing renal hypertension.

Skin problems such as eczema and psoriasis

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# The Effects of Stress on the Body

## Heart rate increases and blood pressure rises.

- Persistently elevated blood pressure and heart rate can increase potential for blood clotting and risk of stroke or heart attack.
- Weakening of the heart muscles and symptoms that mimic a heart attack

■ = Immediate response to stress

■ = Effects of chronic or prolonged stress

■ = Other possible effects of chronic stress

# Stressors on the Body

## How **STRESS** Affects

## The **BODY**

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### **SKIN**

skin problems like acne, psoriasis, eczema, dermatitis, random breakouts, and skin rashes

### **STOMACH**

can cause peptic ulcer disease, IBD, IBS, food allergies, stomach cramps, reflux, nausea and weight fluctuations

### **PANCREAS**

results in elevated secretions of insulin, which if chronic could lead to diabetes, damaged arteries and obesity

### **IMMUNE SYSTEM**

suppressed effectiveness of the immune system to battle and recover from illness. Leads to high levels of inflammation in the body, which causes a variety of chronic health conditions

### **HEAD**

issues with mood, anger, depression, irritability, lack of energy, concentration problems, anxiety and panic attacks

### **HEART**

increased blood pressure, fast heart beat, increased risk of heart attack and stroke, and higher cholesterol

### **INTESTINES**

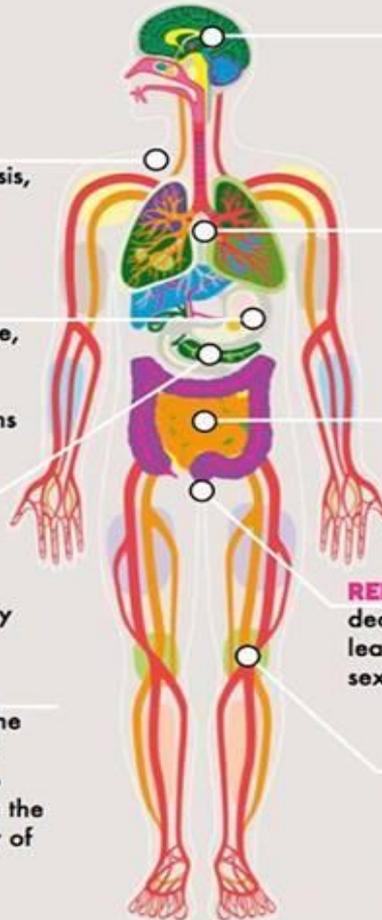
decreased nutrient absorption, reduced metabolism, decreased enzymatic output, increased risk for inflammatory bowel diseases, diabetes, and more

### **REPRODUCTIVE SYSTEM**

decreased testosterone and estradiol production leading to reduced fertility. Dampening of sexual behaviour and loss of sexual drive

### **JOINTS & MUSCLES**

aches and pains, inflammation, tension, lowered bone density (propensity for osteoporosis), tightness in the shoulders and back

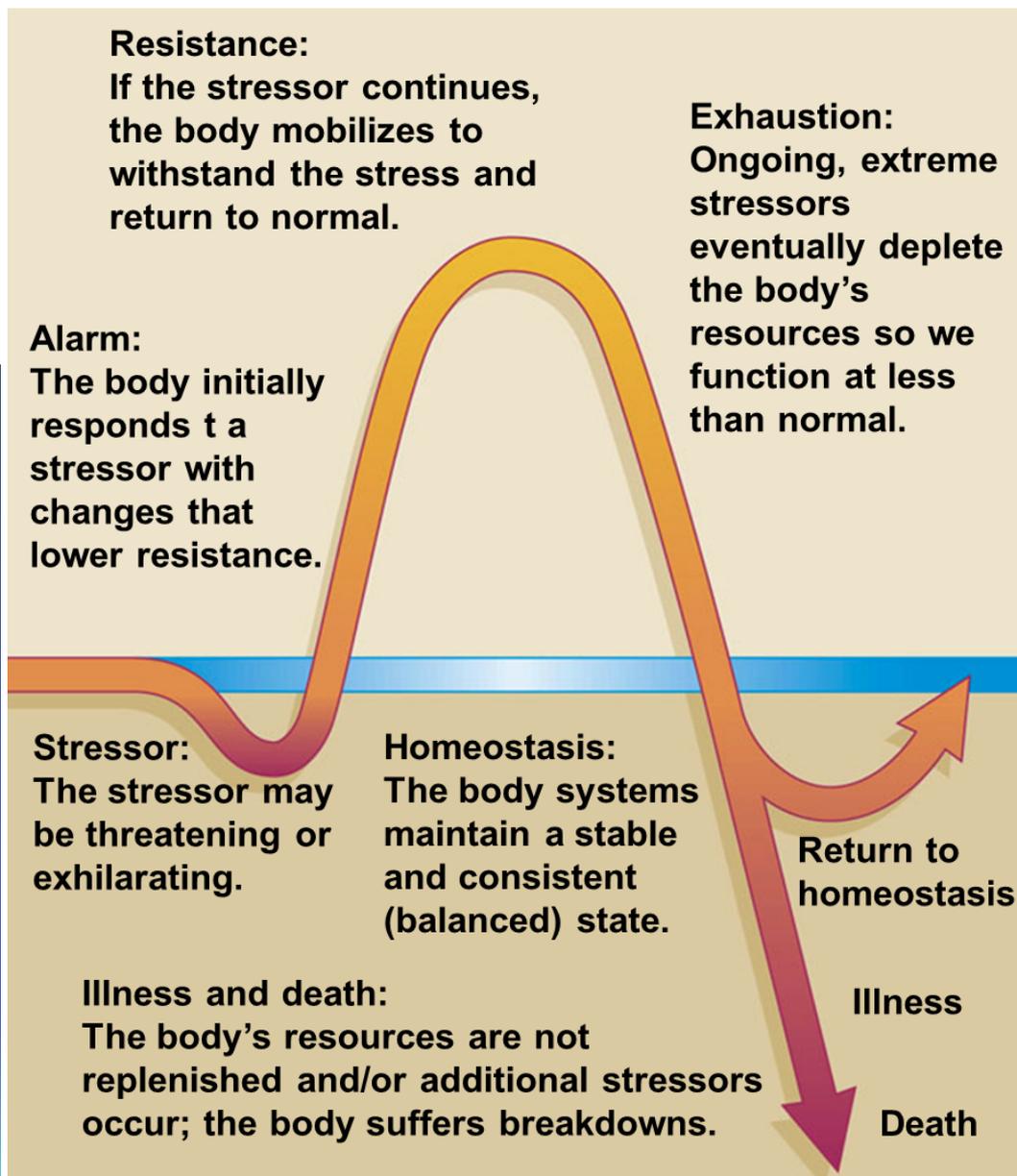


## How the body Reacts through the General Adaptation Syndrome.

If the body is under intense stress response for too long the body can begin to break down from the intensity.

### General Adaptation Syndrome

- **Alarm Stage:** Adrenaline released
  - Body Gets into Action
  - “Fight or Flight”
- **Resistance Stage:** body wants to go back to normal
- **Exhaustion Stage:** Stress is over or body gives out
  - Can actually cause physical illness, injury, or sickness



# Different Sources of Stressors

Eustress is "positive" stress

Distress is "negative" stress



## Sources of Stress

### The Good

- Promotion to next grade
- Graduation
- Getting in to the musical
- Meeting new friends
- Having a new girl/boyfriend



### The Bad

- Overscheduled
- Tough classes
- Moving
- Sibling Rivalry
- Peer Pressure
- Bad Teacher

### The Ugly

- Family verbal/physical violence
- Sexual Abuse
- Death of family member
- Divorce
- Bullied

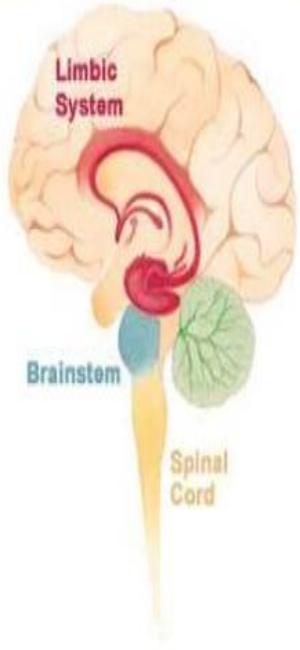


# What are Emotions?



## Emotions

Where Do They Come From?



Emotions are produced and experienced in the brain's limbic system.

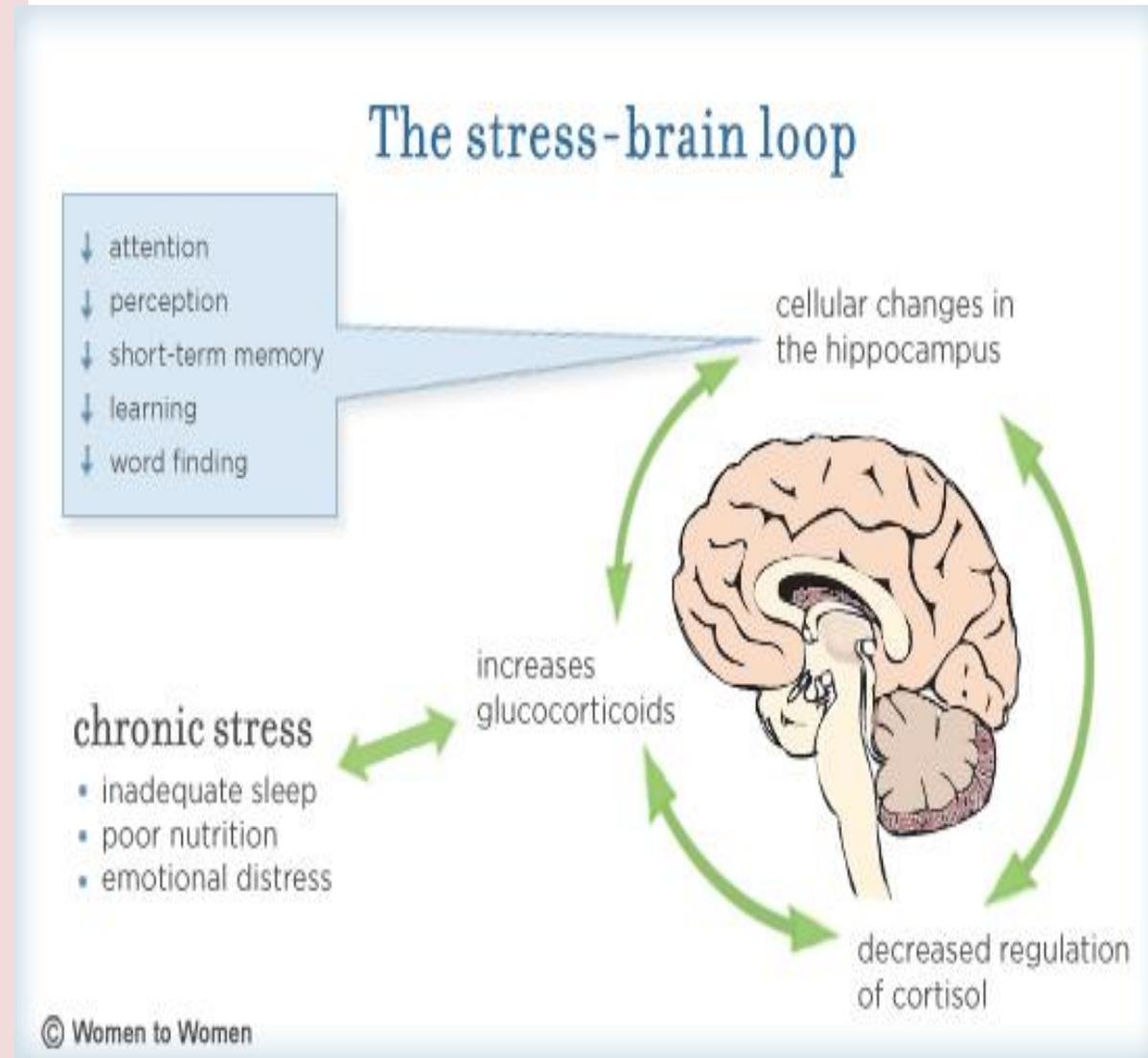
Emotional impulses travel from the limbic system to the front of the brain where rational, logical thinking can take place.

## Stress and the Brain

Long Term stress can lead to the following changes in your brain:

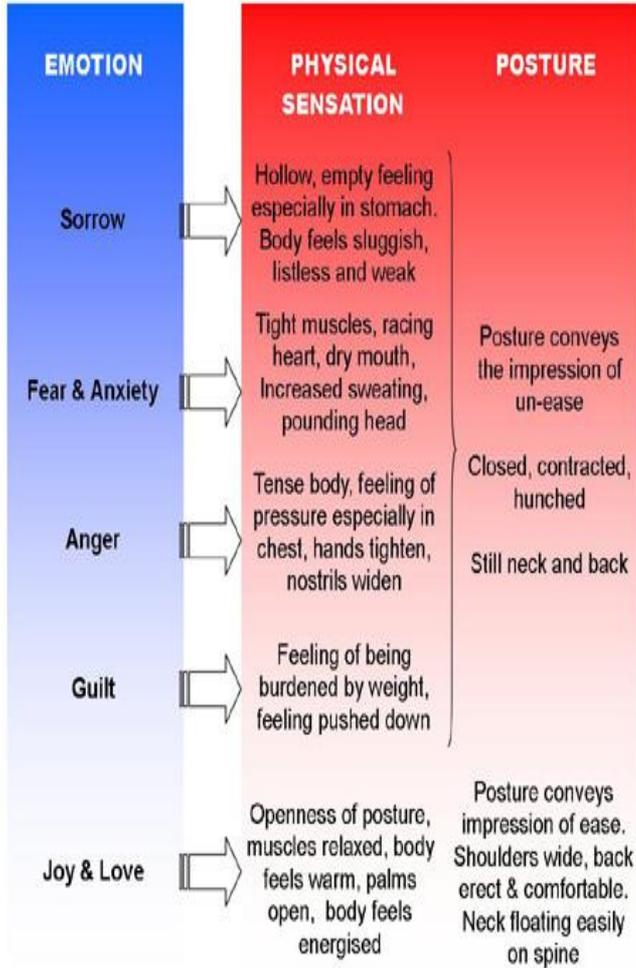
- \*Cellular changes in the hippocampus, the part of the brain important to learning and memory.
- \*Slowed or stopped neuron production.
- \*Lessened ability to take out toxic chemicals and inflammation, which can lead to accelerated brain aging.
- \*Disruptions in the production of neurotransmitters that help regulate our moods like serotonin and dopamine and brain function, leaving us irritable, depressed, or forgetful.

## Negative Stress lessens Actions



# Physical signs of Stress

**Mind-Body Communication:  
How Emotions Effect The Body**

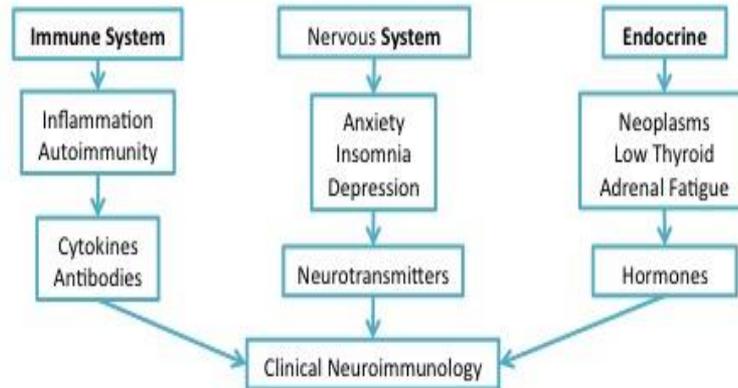


*Adapted from Ageless Body, Timeless Mind by Deepak Chopra*

# Stressors and Change

Dr. Jerry Moylan  
Your Potential is My Passion

| Chemical Stressors   | Mental Stressors  | Physical Stressors   |
|--|---|--|
| <ul style="list-style-type: none"> <li>•Drugs</li> <li>•Alcohol</li> <li>•Animal Products</li> <li>•Caffeine</li> <li>•Refined Foods</li> <li>•Sugar (Processed)</li> <li>•Food Additives</li> <li>•Poor Food Combinations</li> <li>•Inadequate Nutrition</li> </ul> | <ul style="list-style-type: none"> <li>•Negative Attitude</li> <li>•Financial Worries</li> <li>•Job/School Stress</li> <li>•Family Crises</li> <li>•Relationships</li> <li>•Nervousness</li> <li>•Change/Relocation</li> <li>•Hopelessness</li> </ul> | <ul style="list-style-type: none"> <li>•Surgery</li> <li>•Injuries</li> <li>•High Blood Pressure</li> <li>•Joint Disease &amp; Imbalances</li> <li>•Illness</li> <li>•Poor Posture &amp; Biomechanics</li> <li>•Headaches</li> <li>•Allergies &amp; Food Intolerance</li> <li>•Digestive Disturbances</li> <li>•Excessive or Inadequate Exercise</li> <li>•Inadequate Rest &amp; Sleep</li> <li>•Weight Changes</li> </ul> |



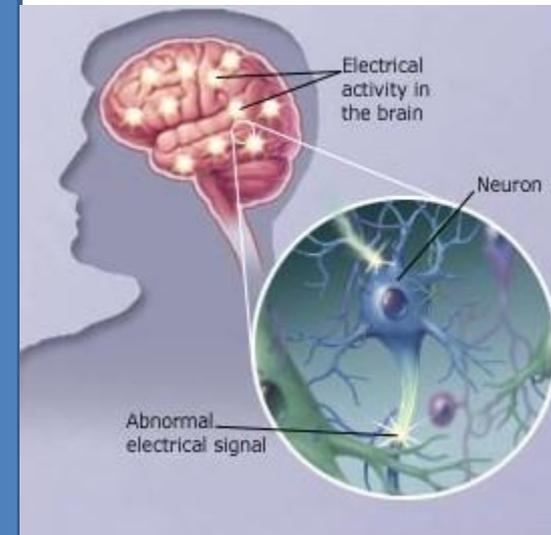
**Testing:** Blood Test, Hormone Panel, GI & Stool Panels, Neurotransmitter, Genetic

| Chemical Corrections   | Mental Corrections   | Physical Corrections  |
|--|--|---|
| <ul style="list-style-type: none"> <li>•Fresh Fruit &amp; Vegetables</li> <li>•Whole Grains</li> <li>•Bean Products</li> <li>•Fresh Air &amp; Sunshine</li> <li>•Proper Food Combinations</li> <li>•Vitamins, Minerals, Herbs</li> <li>•Fasting</li> <li>•Water</li> </ul> | <ul style="list-style-type: none"> <li>•Positive Attitude</li> <li>•Conflict Resolution</li> <li>•Direction</li> <li>•Relaxation</li> <li>•Smile &amp; Laughter</li> <li>•Prayer</li> <li>•Love</li> </ul> | <ul style="list-style-type: none"> <li>•Chiropractic Care Provides:</li> <li>•Correction of the Musculoskeletal System</li> <li>•Facilitation of Neurological System</li> <li>•Enhancement of Immune System</li> <li>•Correct Posture</li> <li>•Physiotherapy</li> <li>•Flexibility of Joints &amp; Tissues</li> <li>•Muscle Strengthening</li> <li>•Massage</li> <li>•Regular Balanced Exercise</li> <li>•Restful Sleep</li> </ul> |

# Various Diseases and Disorders of the Nervous System

## 1. Seizures

- A seizure is a sudden disruption of the brain's normal electrical activity accompanied by altered consciousness and/or other neurological and behavioral actions. Constant misfiring of the neurons in the brain.
- The term "seizure" is often used interchangeably with "convulsion." Convulsions occur when a person's body shakes rapidly and uncontrollably. During convulsions, the person's muscles contract and relax repeatedly. There are many different types of seizures. Some have mild symptoms without shaking.



## Causes of Seizures

- \*abnormal levels of sodium or glucose in the blood
- \*Brain infection, including meningitis
- \*Brain injury that occurs to the baby during labor or childbirth
- \*Brain problems that occur before birth (congenital brain defects)
- Brain tumor (rare)
- Drug abuse
- Electric shock
- Epilepsy
- Fever (particularly in young children)
- Head injury

## Symptoms of Seizures

- Specific symptoms depend on what part of the brain is involved. Symptoms occur suddenly and may include:
- Brief blackout followed by a period of confusion (the person cannot remember for a short time)
- Changes in behavior such as picking at one's clothing
- Drooling or frothing at the mouth
- Eye movements
-

# Seizures

## What NOT to do:

- **Do not restrain (try to hold down) the person.**
- **Do not place anything between the person's teeth during a seizure (including your fingers).**
- Do not move the person unless they are in danger or near something hazardous.
- **Do not try to make the person stop convulsing. They have no control over the seizure and are not aware of what is happening at the time.**
- Do not start CPR unless the seizure has clearly stopped and the person is not breathing or has no pulse.
- If a baby or child has a seizure during a high fever, cool the child slowly with lukewarm water. Do not place the child in a cold bath. You can give the child acetaminophen (Tylenol) once he or she is awake, especially if the child has had fever convulsions before.

### When to Contact a Medical Professional

- This is the first time the person has had a seizure.
  - A seizure lasts more than 2 to 5 minutes.
- The person does not awaken or have normal behavior after a seizure.
  - Another seizure starts soon after a seizure ends.

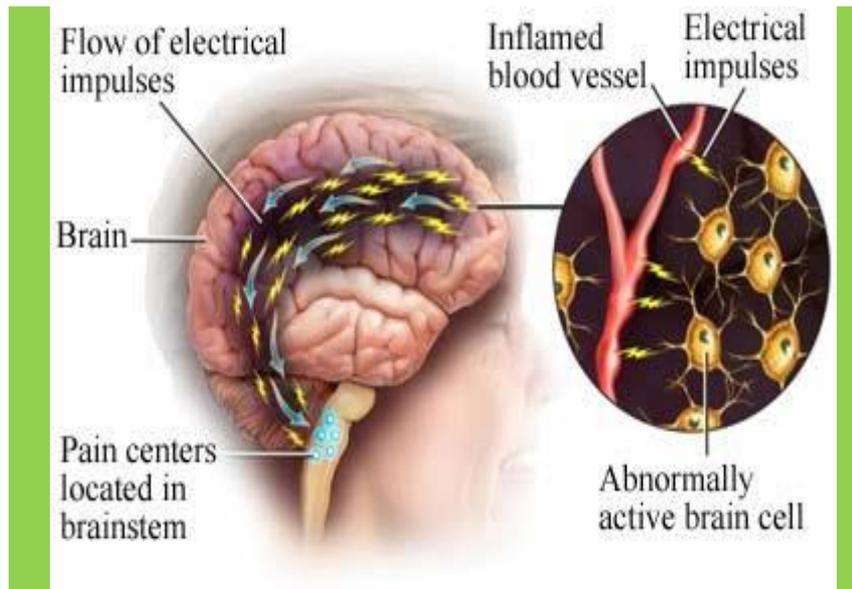
# Seizures

## What to Do

- Most seizures stop by themselves
- When a seizure occurs, the main goal is to protect the person from injury:
- Try to prevent a fall. Lay the person on the ground in a safe area. Clear the area of furniture or other sharp objects.
- Cushion the person's head.
- Loosen tight clothing, especially around the neck.
- Turn the person on the side. If vomiting occurs, this helps make sure that the vomit is not inhaled into the lungs.
- Look for a medical ID bracelet with seizure instructions.
- Stay with the person until he or she recovers, or until professional medical help arrives.
-

# Migraines/Headaches

## Anatomy of a headache



**Sinus:** pain is usually behind the forehead and/or cheekbones



**Cluster:** pain is in and around one eye



**Tension:** pain is like a band squeezing the head



**Migraine:** pain, nausea and visual changes are typical of classic form



ADAM

## Headaches

- The pain starts from the tissues and structures that surround the brain because the brain itself has no nerves that give rise to the sensation of pain (pain fibers). Blood vessels dilate and cause pressure.
- Tension and migraine are primary headaches.
- Treatments: Ibuprofen (Advil, Motrin IB, others)
- Acetaminophen (Tylenol, others)
- Meditation
- Relaxation training
- Cognitive behavioral therapy
- Massage

# Migraines

- Migraines are painful headaches often accompanied by nausea, vomiting, and sensitivity to light.

\*Causes can be from a genetic sensitivity to lights, fatigue, weather, emotional stress, sensitivities to food preservatives, caffeine, hunger, and abnormal sleeping patterns.

## Treatments:

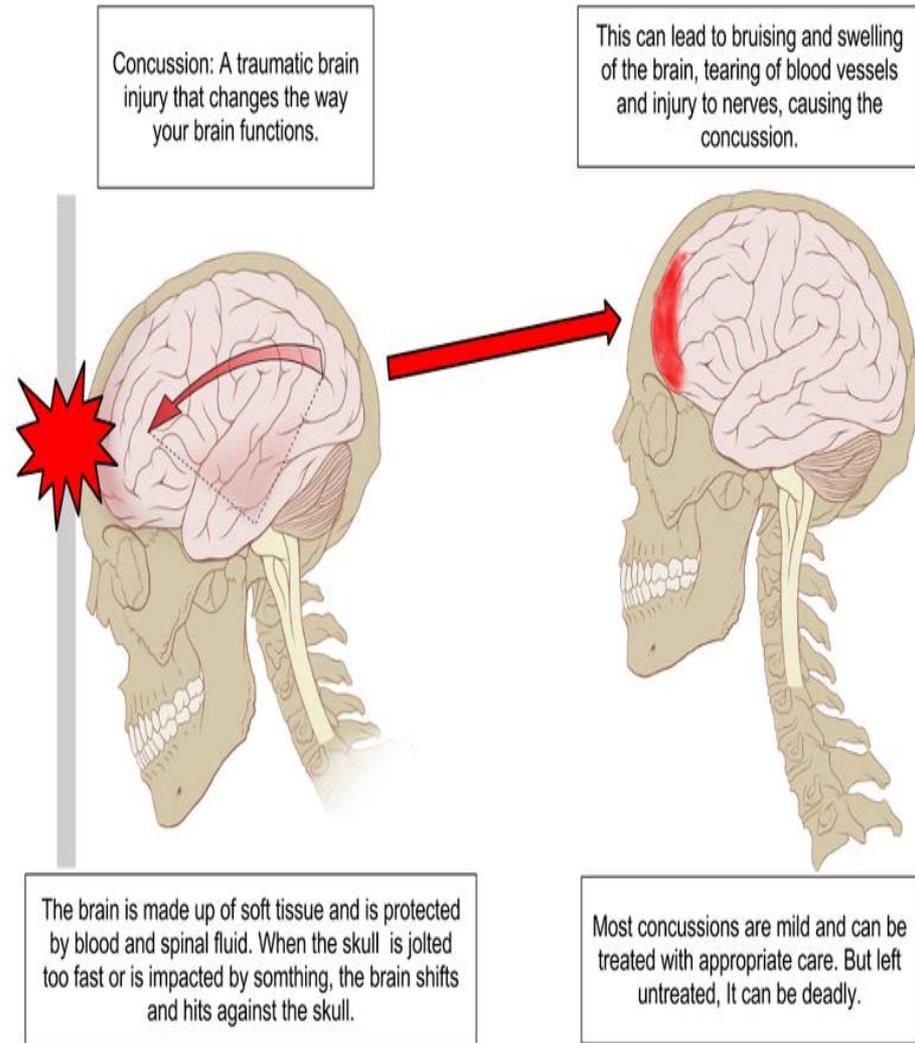
- Adopt lifestyle changes
- Avoid migraine triggers
- Use preventive medications or devices

# Concussions

## What is a concussion?

- The brain is made of soft tissue. It's cushioned by spinal fluid and encased in the protective shell of the skull.
- When you sustain a concussion, the impact can jolt your brain. Sometimes, it literally causes it to move around in your head.
- Traumatic brain injuries can cause bruising, damage to the blood vessels, and injury to the nerves.
- If a child has a concussion, an adult should monitor him or her for the first 24 hours. It's important to watch for behavioral changes.
- Young children, especially, may not be able to fully communicate what they are feeling, so it is critical to watch them closely. Do not give medications, including aspirin, which may cause bleeding, to a child without consulting a doctor.

## What it looks like:



# Concussions

## Symptoms:

- confusion or feeling dazed
- clumsiness
- slurred speech
- nausea or vomiting
- headache
- balance problems or dizziness
- blurred vision
- sensitivity to light
- sensitivity to noise
- sluggishness
- ringing in ears
- behavior or personality changes
- concentration difficulties
- memory loss

## Treatment:

### What to Do:

- Have the person stop activity and rest.
- Apply ice wrapped in a washcloth.
- Contact your doctor.
- Avoid electronic screens
- Rest the brain
- Limit activity and movement

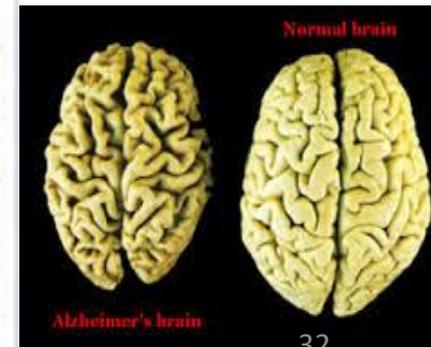
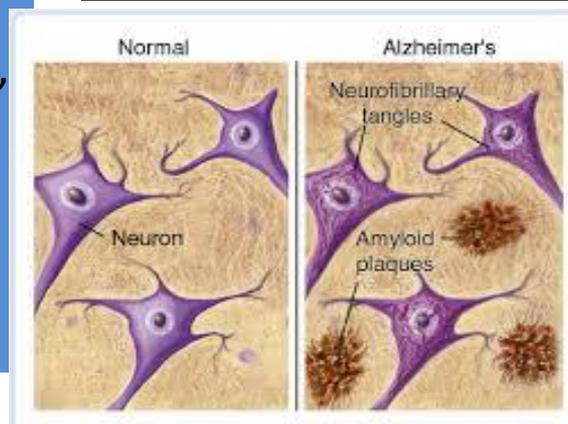
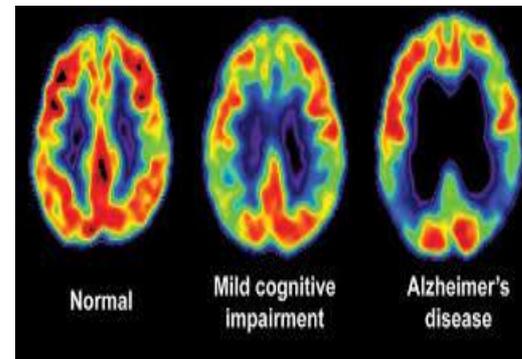
# Alzheimer's

## What is Alzheimer's

- Alzheimer's disease is a disease that slowly **destroys memory** and other important mental functions.
- In Alzheimer's disease, the **brain cells themselves stop working and die**, causing a steady decline in memory and mental function.
- **Plaques.** These **clumps of a protein** called beta-amyloid may **damage** and destroy brain cells in several ways, including interfering with cell-to-cell **communication**.
- **Tangles.** Brain cells depend on an internal support and transport system to carry nutrients and other essential materials throughout their long extensions. This system requires the normal structure and functioning of a **protein called tau**. In Alzheimer's, threads of tau protein **twist** into abnormal **tangles inside brain cells**, leading to failure of the transport system.

## The six pillars of a brain-healthy lifestyle are:

- Regular exercise
- Healthy diet
- Mental work
- Quality sleep
- Stress management
- An active social life
- Medicines that slow the degeneration



# Meningitis

## What is it?

- Meningitis is an inflammation of the membranes (meninges) surrounding your brain and spinal cord.
- Most cases of meningitis in the U.S. are caused by a viral infection, but bacterial and fungal infections also can lead to meningitis. Depending on the cause of the infection, meningitis can get better on its own in a couple of weeks — or it can be a life-threatening emergency requiring urgent antibiotic treatment.
- It's easy to mistake the early signs and symptoms of meningitis for the flu (influenza). Meningitis signs and symptoms may develop over several hours or over one or two days.

## Signs and Symptoms

The signs and symptoms that may occur in anyone older than age of 2 include:

Sudden high fever

Severe headache that isn't easily confused with other types of headache

Stiff neck

Vomiting or nausea with headache

Confusion or difficulty concentrating

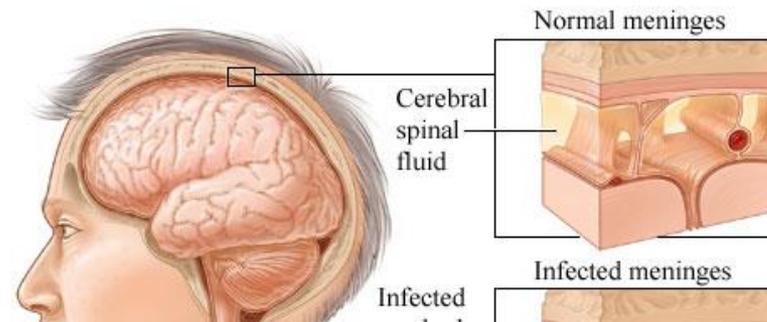
Seizures

Sleepiness or difficulty waking up

Sensitivity to light

Lack of interest in drinking and eating

Skin rash in some cases, such as in meningococcal meningitis



# Cerebral Palsy

## What is it?

- Cerebral palsy (CP) is a broad term used to describe a group of chronic "palsies" (disorders that impair control of movement due to damage to the developing brain.) CP usually develops by age 2 or 3 and is a non-progressive brain disorder, meaning the brain damage does not continue to worsen throughout life.

## What is the Cause?

- There is a lot unknown about the disorder's causes, but scientists know that genetics, infections, birth injuries, and poor oxygen supply to the brain before, during, and immediately after birth are common factors. Premature infants are particularly vulnerable. Severe illness (such as meningitis) during the first years of life, physical trauma, and severe dehydration can cause brain injury and result in CP.

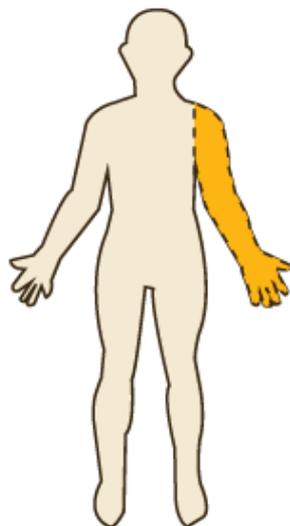
# Different Types of CP

CEREBRAL PALSY AWARENESS

## TYPES

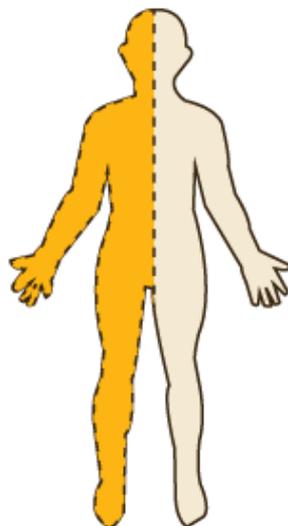
## CEREBRAL PALSY

**Monoplegia**



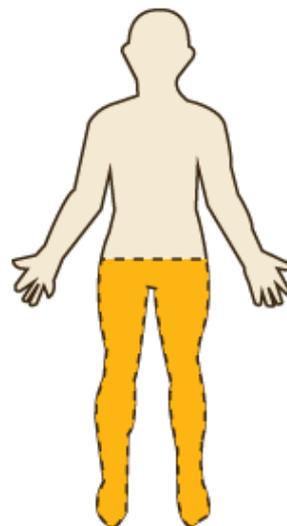
Affects one limb, usually an arm.

**Hemiplegia**



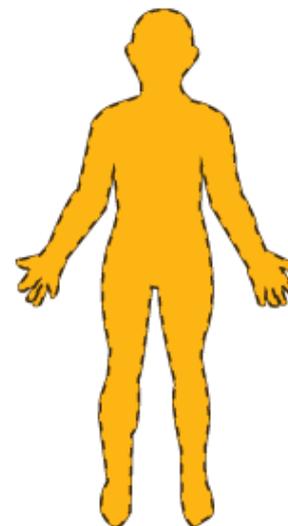
Affects one side of the body, including arm, leg, and trunk.

**Diplegia**



Affects symmetrical parts of the body (legs or arms).

**Quadriplegia**



Affects all four limbs

March is National Cerebral Palsy Awareness Month

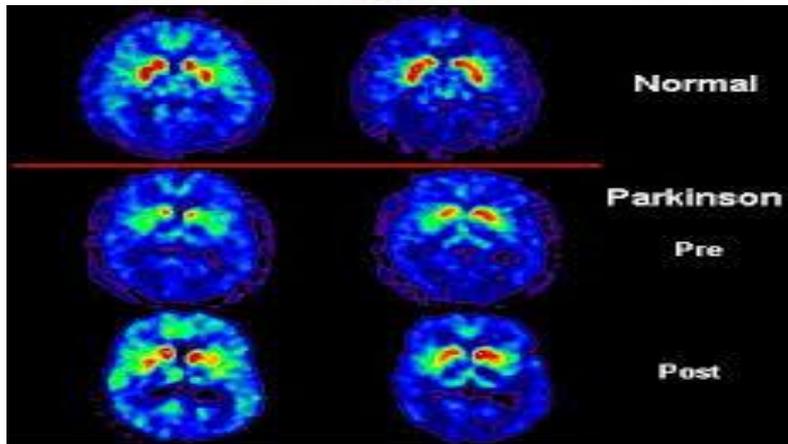
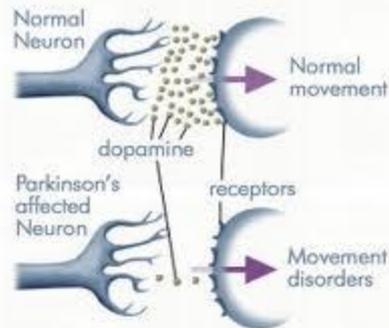
# Parkinson's

## Symptoms and Treatment

### Definition

- Parkinson's disease is a progressive disorder of the nervous system that affects movement.

Dopamine levels in a normal and a Parkinson's affected neuron.



- **Tremor.**
- **Slowed movement (bradykinesia).**
- **Loss of automatic movements.**
- **Speech changes.** speak softly, quickly, slur or hesitate before talking
- **Medications** may greatly reduce many of these symptoms. These medications increase or substitute for dopamine, a specific signaling chemical (neurotransmitter) in your brain. People with Parkinson's disease have low brain dopamine concentrations.

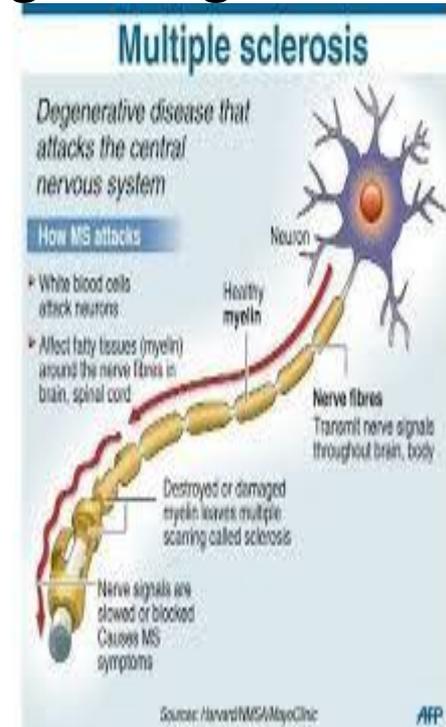
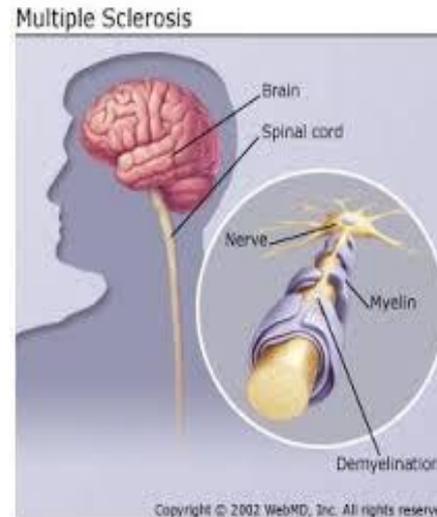
# Multiple Sclerosis

## How it affects the body.

- Within the CNS, the immune system attacks myelin — the fatty substance that surrounds and insulates the nerve fibers — as well as the nerve fibers themselves.
- The damaged myelin forms scar tissue (sclerosis), which gives the disease its name.
- When any part of the myelin sheath or nerve fiber is damaged or destroyed, nerve impulses traveling to and from the brain and spinal cord are distorted or interrupted, producing a wide variety of symptoms.
- The disease is thought to be triggered in a genetically susceptible individual by a combination of one or more environmental factors.

## Symptoms: Loss of movement

- Myelin covering damaged



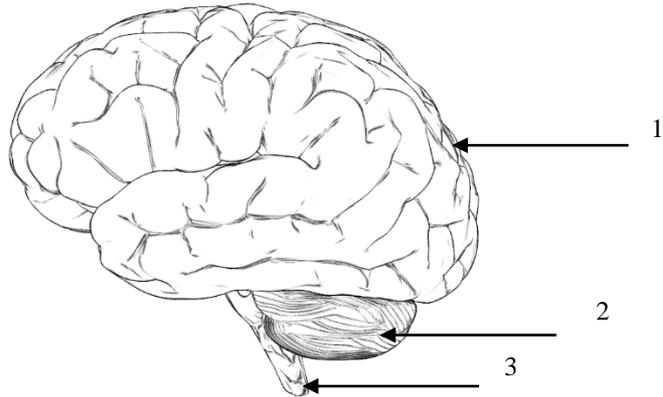
Medications can help ease MS attacks and possibly slow the disease. Physical therapy and other treatments help control symptoms -- and improve the quality of life.

# Review Questions to Answer

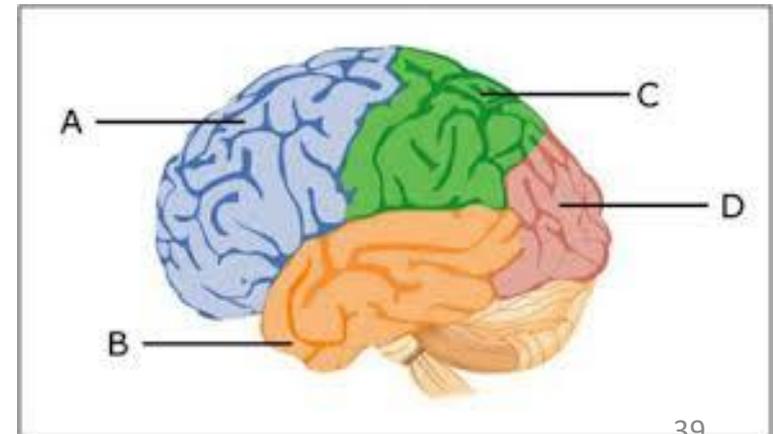
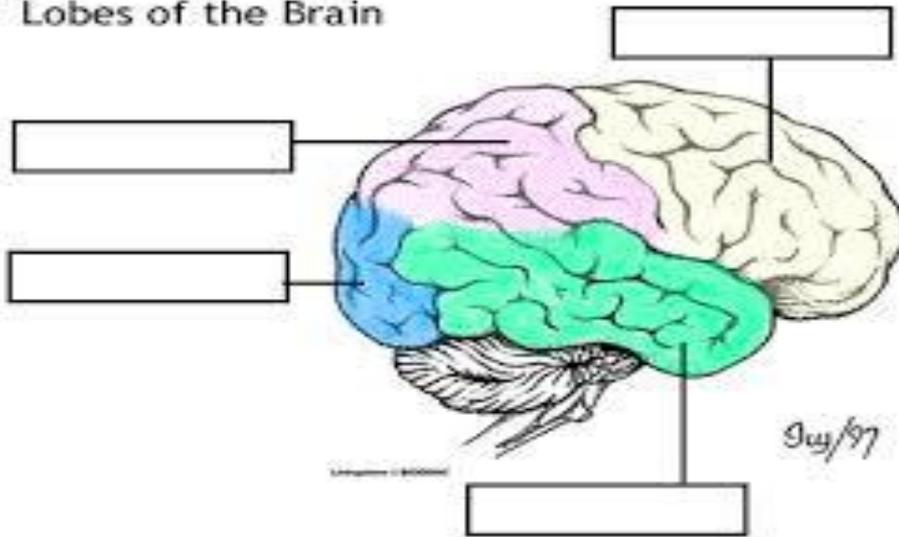
1. What are the specialized cells that carry messages.
2. Why are neurotransmitters important for daily function?
3. What are the two major parts of the Nervous system.
4. Why is the spinal cord located inside the vertebrae?
5. Explain the difference between a paraplegic and quadriplegic.
6. List three ways a person can protect their spinal cord.
7. What is the job of the PNS?
8. List three actions of the somatic and three for the autonomic systems.

- Which lobe is each describing?
9. A person is learning the meaning of the meaning of words.
  10. A person is able to hear the bacon sizzle and to smell the bacon.
  11. A person is deciding which vehicle to purchase.
  12. Which lobe is responsible for problem solving?
  13. Which part of the brain helps a person to maintain balance and smooth muscle movements.
  14. What is the hippocampus responsible for?

# Label the parts of the brain.



Lobes of the Brain



# Questions to answer: Diseases and Disorders

1. What happens in the brain during a seizure?
2. How can a person help someone with a seizure? List two ways.
3. How does the brain get damaged during a concussion?
4. List 3 steps a should a person do to care for a concussion.
5. What happens in the brain to cause a headache?
6. Why is it difficult for a person to remember when he/she has Alzheimer's?
7. What are ways to reduce the likelihood of Alzheimer's?
8. How does Multiple Sclerosis damage the nerves of the CNS?
9. Which neurotransmitter is low in the brain for Parkinson's?

# Foods that fuel the Brain

- **Berries.** Studies have shown that Berries are great antioxidants and help to reduce the risk of Alzheimer's and help to build healthy connections between synapse's.



- Fish

Eat **oily fish**. Essential fatty acids (**EFAs**) cannot be made by the body and must be obtained through diet. The most effective omega-3 fats occur naturally in **oily fish** as EPA and DHA. Good sources include linseed (**flaxseed**) oil, **soya bean oil**, pumpkin seeds, walnut oil and soya beans.



# Brain Foods

- **Proteins**

Protein provides amino acids, building blocks that are used to form NTs and support structures in neurons. Tryptophan from turkey and milk is used to produce serotonin, an NT creating feelings of well-being.

- Tyrosine, an amino acid found in almonds, an avocado, bananas and meat, is used to make dopamine, associated with enthusiasm and positives events or items.

- Amino acids are also reassembled into powerful antioxidants that are used to protect DNA and other cell components from damage. Proteins also form receptors, structures embedded in membranes that aid in cell communication.

- **Carbohydrates**

Carbohydrates are an energy source for the brain. Glucose (Sugar )is the main fuel for the brain. Most of us have experienced the energy boost we get from eating something that provides sugar.

- However, most students consume excessive sugar, even for breakfast, causing bursts of energy followed by fidgeting, headaches, trouble concentrating, or drowsiness - often in mid-morning or mid-afternoon. Eat whole grain foods for longer lasting energy.

# Brain Foods

- **Water**

Water is essential for optimal brain health and function. Water is necessary to maintain the tone of membranes for normal neurotransmission. It enhances circulation and aids in removing wastes. Water keeps the brain from overheating, which can cause cognitive decline and even damage.



- **Nuts and Seeds:**

Packed with protein and essential fatty acids, nuts and seeds are also of the amino arginine, which stimulates the pituitary gland at the base of the brain to release growth hormone, a substance that declines quickly after age 35;

- **Cruciferous Vegetables**

Broccoli, cauliflower and Brussels sprouts are all rich in choline, an essential nutrient for memory and brain health. Choline is a precursor to the neurotransmitter acetylcholine, which contributes to healthy and efficient brain processes. As we age, our body's natural choline output declines, and its neurochemical action weakens. You can eat choline-rich foods to increase your production of acetylcholine, which will improve your brain power. Other sources of choline include eggs, soybeans, peanuts, black beans and kidney beans.

