Part 2: How Your Brain and Nervous System Work

How The Nervous System Works

- Brain Parts
- Neurons
- Synapses
- Neurotransmitters
- Myelin Sheaths

How The Nervous System Works

- Can be excitatory or inhibitory

Medical Disclaimer: The information in this presentation is not intended to replace a one-on-one relationship with a qualified health care professional and is not intended as medical advice. It is intended as a sharing of knowledge and information from the research and experience of Dr. Ritamarie Loscalzo, drritamarie.com, and the experts who have contributed. We encourage you to make your own health care decisions based upon your research and in partnership with a qualified health care professional.
**BRAIN: Part 2 - How Your Brain and Nervous System Work**

**Neurotransmitters**
- Chemical messengers of the brain
- Location and action varies
- Excitatory or inhibitory

**The Major Neurotransmitters**

- **Inhibitory**
  - Serotonin
  - Dopamine
  - GABA
  - Glycine

- **Excitatory**
  - Glutamine
  - Acetylcholine
  - Norepinephrine

**Actions of Neurotransmitters**
- **Serotonin**: Most is produced by and found in the intestine. Regulates appetite, sleep, memory, learning, temperature, mood, behavior, muscle contraction, and function of the cardiovascular system and endocrine system.
- **Dopamine**: Has a number of important functions in the brain. Dysfunction can result in Parkinson’s disease and schizophrenia.
- **GABA**: Inhibitory synapses in virtually every part of the brain. Many sedative/tranquilizing drugs act by enhancing the effects of GABA.
- **Norepinephrine**: Epinephrine (adrenaline)
- **Histamine**: Arousal, control of pituitary hormone secretion, suppression of eating and cognitive functions.
- **Glutamate**: Excitatory synapses in the brain and spinal cord.
- **Glycine**: The inhibitory transmitter in the spinal cord.
- **Acetylcholine**: Neuromuscular junction connecting motor nerves to muscles.
- **Substance P**: Transmission of pain from sensory neurons to the CNS.
- **Phenylethylamine (PEA)**: Feel good and enhancing your mental and physical performance, love.
Monoamines

- **Catecholamines**
  - Epinephrine,
  - Norepinephrine
  - Dopamine

- **Indolamines**
  - Serotonin

- **Histamine**

**Present in various areas of the brain**
**Functions vary with area**
**Some excitatory, some are not: linked with emotions (pleasure)**
**Eliminated by:**
1. Reuptake into the synaptic axon and
2. With enzymatic degradation by monoamine oxidase (MAO) and catechol-o-methyltransferase (COMT)

**Serotonin**

- CNS neurotransmitter (brainstem)
- 80% produced in the gut
- Functions:
  - Regulating sleep
  - Emotions
- LSD mimics serotonin
- Antidepressants like Prozac, Paxil, and Zoloft inhibit reuptake

**Serotonin Imbalance Symptom**
**BRAIN: Part 2 - How Your Brain and Nervous System Work**

**Serotonin Metabolism**

- **Tryptophan** → 5-HTP (5-hydroxytryptophan) → **Serotonin** → N-acetylation → **Melatonin**
- **Vitamin B6**
- **Vitamin B3, B12, Folate, Iron**

**Phenylalanine** → **Tyrosine** → **L-Dopa** → **Dopamine** → **Noradrenaline** → **Adrenaline**

**Dopamine**

- CNS neurotransmitter
- Has effects outside nervous system – i.e. vasodilator
- Functions
  - Pleasure/Reward
  - Motivation
- Addictive drugs increase dopamine in the brain – amphetamines, marijuana, cocaine
- Deficiency associated with ADD, Parkinson’s, schizophrenia

**Dopamine Metabolism**

- **Phenylalanine** → **Tyrosine** → **L-Dopa** → **Dopamine** → **Noradrenaline** → **Adrenaline**

**Dopamine Deficiency Symptoms**

- Apathetic depression
- Lack of energy
- Lack of drive
- Easily bored
- Lack of focus
- Inability to concentrate
- ADD

**Phenylalanine** → **Tyrosine** → **L-Dopa** → **Dopamine** → **Noradrenaline** → **Adrenaline**
**Dopamine Imbalance Symptoms**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>Do you have feelings of hopelessness?</td>
<td></td>
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<tr>
<td>Do you have self-damaging thoughts?</td>
<td></td>
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<tr>
<td>Do you have an inability to handle stress?</td>
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<tr>
<td>Do you have anger and aggression while under stress?</td>
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<tr>
<td>Do you feel you are not refreshed after long hours of sleep?</td>
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<tr>
<td>Do you prefer to isolate yourself from others?</td>
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<tr>
<td>Do you have unexplained lack of emotion for family and friends?</td>
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<tr>
<td>Are you estranged away?</td>
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<tr>
<td>Do you have an inability to finish tasks?</td>
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<tr>
<td>Do you feel the need to consume caffeine to stay alert?</td>
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<tr>
<td>Do you feel your libido has been decreased?</td>
<td></td>
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<tr>
<td>Do you lose your temper for minor reasons?</td>
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<tr>
<td>Do you have feelings of worthlessness?</td>
<td></td>
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<tr>
<td>Have you lost your motivation and drive?</td>
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<tr>
<td>Do you lack energy?</td>
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<tr>
<td>Are you easily bored?</td>
<td></td>
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<tr>
<td>Do you lack focus and concentration?</td>
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<tr>
<td>Do you have ADD?</td>
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**GABA (gamma-Amino butyric acid)**

- **Inhibitory** CNS neurotransmitter
- **Functions outside nervous system**: intestine, stomach, pancreas, fallopian tube, uterus, ovary, testis, kidney, urinary bladder, lung, and liver
- Regulates muscle tone
- Calms nervous system
- Affects attention and memory

**Nutrients that Support GABA**

- Lysine
- Aspartic Acid
- Glutamic Acid
- Glutamine
- Taurine

http://www.DrRitamarie.com
Summary

- Nutrition
- Deficiencies
- Relationship with digestion

GABA Assessment

<table>
<thead>
<tr>
<th>SECTION 1 - GABA</th>
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<tbody>
<tr>
<td>Do you feel anxious or panic for no reason?</td>
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<tr>
<td>Do you have feelings of dread, or pending gloom?</td>
</tr>
<tr>
<td>Do you feel knots in your stomach?</td>
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<tr>
<td>Do you have feelings of being overwhelmed for no reason?</td>
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<tr>
<td>Do you have feelings of guilt about everyday decisions?</td>
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<tr>
<td>Does your mind feel restless?</td>
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<tr>
<td>Is it difficult to turn your mind off when you want to relax?</td>
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<tr>
<td>Do you have disorganized attention?</td>
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<tr>
<td>Do you new worry about things you were not worried about before?</td>
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<tr>
<td>Do you have feelings of inner tension and inner restlessness?</td>
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<tr>
<td>Do you have stiff and tense muscles</td>
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<tr>
<td>Do you feel stressed or burned out?</td>
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<tr>
<td>Do you get easily overwhelmed?</td>
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</tbody>
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GABA Metabolism

How the Brain Functions