

OMICS International Journals are welcoming Submissions

OMICS International welcomes submissions that are original and technically so as to serve both the developing world and developed countries in the best possible way.

OMICS Journals are poised in excellence by publishing high quality research. OMICS International follows an Editorial Manager® System peer review process and boasts of a strong and active editorial board.

Editors and reviewers are experts in their field and provide anonymous, unbiased and detailed reviews of all submissions. The journal gives the options of multiple language translations for all the articles and all archived articles are available in HTML, XML, PDF and audio formats. Also, all the published articles are archived in repositories and indexing services like DOAJ, CAS, Google Scholar, Scientific Commons, Index Copernicus, EBSCO, HINARI and GALE.

For more details please visit our website:

<http://omicsonline.org/Submitmanuscript.php>

MOHAMMAD REZA DALIRI

Biomedical Engineering Department

Faculty of Electrical Engineering

Iran University of Science and Technology

Tehran, Iran

COGNITIVE NEUROSCIENCE

Outline

1. From Neuron to Brain
 1. Structure of the Neuron
 2. Organization of the Nervous system
2. Methods of Cognitive Neuroscience
3. Cognition in the Brain
 1. Gross anatomy of the Brain
 2. Cerebral Cortex and Localization
 3. Hemispheric Function

Basic Concepts

- Cognitive Neuroscience
 - The field of study linking the brain and other aspects of the nervous system to cognitive processing and, ultimately, to behavior
- Localization of Function
 - Whether specific areas of the brain control specific abilities or behaviors

1.From Neuron to Brain

1. *Structure of the Neuron*

- Neuron
 - Individual neural cell
 - Transmits electrical signals from one location to another in the nervous system

1.From Neuron to Brain

1. Structure of the Neuron

- Soma
 - Responsible for the life of the neuron
 - Connects the dendrites to the axon
- Dendrites
 - Receive information from other neurons
- Axon
 - Long, thin tube that extends from the soma and responds to the information, when appropriate

1.From Neuron to Brain

1. Structure of the Neuron

- **Myelin**
 - White fatty substance which insulates and protects axons and speeds up the conduction of information
- **Nodes of Ranvier**
 - Small gaps in the myelin coating along the axon, which serve to increase conduction speed even more
- **Terminal buttons**
 - Small knobs found at the ends of the branches of an axon
- **Synapse**
 - Small gaps, which serve as a juncture between the terminal buttons of neuron and dendrites

1.From Neuron to Brain

2. *Organization of the Nervous System*

- Peripheral nervous system (PNS)

All of the nerve cells except those of the brain and the spinal cord

Consists of:

- Somatic voluntary part (sensory and motor nerves)
- Autonomic involuntary part
 - Sympathetic (activated under stress)
 - Parasympathetic (maintains body functions)

1. From Neuron to Brain

2. *Organization of the Nervous System*

- Central nervous system
 - Consists of
 - Brain – most directly controls our thoughts, emotions, and motivations
 - Spinal Cord

2. Methods of Cognitive Neuroscience

1. Postmortem Studies

- **Characterization**
 - Researchers look carefully at the behavior of people who show signs of brain damage while they are alive
 - After the patients die, the researchers examine the patient's brains for lesions
- **Examples**
 - Paul Broca's patient Tan
 - Speech problems, linked to lesions in an area of the frontal lobe now called Broca's area

2. Methods of Cognitive Neuroscience

2. Animal Studies

- **Single-cell recordings**
 - Microelectrodes are inserted into the brain of an animal to measure the activity of a single neuron
- **Selective lesioning**
 - Surgically removing or damaging part of the brain to observe resulting functional deficits

2. Methods of Cognitive Neuroscience

3. *Electrical Recordings*

- EEG
 - Recording of electrical activity in the brain, which appears as waves of various widths and heights
- ERP
 - EEG waves associated with a particular event or task averaged over a large number of trials
- Advantage
 - Very good temporal resolution

2. Methods of Cognitive Neuroscience

4. Static Imaging Techniques

- Allow for the observation of large abnormalities of the brain, such as damage resulting from strokes and tumors
- Examples
 - CT: computerized axial tomography
 - MRI: magnetic resonance imaging
 - A strong magnetic field is passed through the brain of a patient and a rotating scanner detects various patterns of electromagnetic changes in the molecules of the brain

2. Methods of Cognitive Neuroscience

5. Metabolic Imaging

- Relies on changes that take place within the brain as a result of increased consumption of glucose or oxygen in active areas of the brain
- Examples
 - PET: positron emission tomography
 - Increased glucose consumption in active brain areas
 - fMRI: functional magnetic resonance imaging
 - Increased oxygen consumption in active brain areas

3. Cognition in the Brain

1. Gross anatomy of the brain

FOREBRAIN

- Cerebral Cortex
 - Outer layer of the cerebral hemispheres
 - Processing sensory information, thinking, planning
- Basal ganglia
 - Crucial to the function of the motor system
- Limbic system
 - Includes hippocampus, amygdala, and septum
 - Involved in learning, emotions, and motivation

3. Cognition in the Brain

1. Gross anatomy of the brain

FOREBRAIN (cont.)

- **Thalamus**
 - Primary relay station for sensory information coming into the brain
- **Hypothalamus**
 - Controls endocrine system
 - Controls autonomic nervous system (body temperature, appetite and thirst regulation)

3. Cognition in the Brain

1. Gross anatomy of the brain

MIDBRAIN

- RAS (reticular activating system)
 - Important in controlling consciousness (sleep, arousal), attention, cardiorespiratory function and movement
 - Extends into the hindbrain
- Other structures involved in vision, hearing and controlling movement

3. Cognition in the Brain

1. Gross anatomy of the brain

HINDBRAIN

- **Cerebellum**
 - Essential to balance and coordination of muscles
- **Pons**
 - Involved in consciousness
- **Medulla oblongata**
 - Cardiorespiratory function, digestion, and swallowing

3. Cognition in the Brain

2. *Cerebral Cortex and Localization of Function*

- Frontal lobe
 - Located toward the front of the head
 - Judgment, problem solving, personality, planning
- Parietal lobe
 - Primary somatosensory cortex – receives information from the senses about pressure, texture, temperature, and pain
 - If electrically stimulated
 - you probably would report feeling as if you had been touched

3. Cognition in the Brain

2. Cerebral Cortex and Localization of Function

- Temporal lobe
 - Complex auditory analysis needed in understanding speech or listening to music
 - If electrically stimulated
 - You would report having heard some sort of sound
- Occipital lobe
 - Complex visual analysis
 - If electrically stimulated
 - You would report having seen some visual stimuli

3. Cognition in the Brain

3. Hemispheric function

- Brain hemispheres
 - The two halves of the brain (left and right)
- Corpus callosum
 - Dense aggregate of neural fibers
 - Connects the two cerebral hemispheres, allowing transmission of information back and forth

3. Cognition in the Brain

3. Hemispheric function

- Left hemisphere
 - Language (grammar and phonetics)
 - Movement
- Right hemisphere
 - Semantic knowledge
 - Pragmatics of language – context, conversation, metaphor

3. Cognition in the Brain

3. *Hemispheric function*

- Split-brain patients
 - When asked to give an answer about what they saw in words, they report that they saw the image in the right half of the picture
 - When asked to use the fingers of the left hand to point to what they saw, they choose the image from the left half of the picture

OMICS Journal of Radiology related journals

[Journal of Nuclear Medicine & Radiation Therapy](#)



Radiology Related Conferences

For further details please go through the link

[Radiology Conferences](#)



OMICS International Open Access Membership

Open Access Membership with OMICS International enables academicians, research institutions, funders and corporations to actively encourage open access in scholarly communication and the dissemination of research published by their authors.

For more details and benefits, click on the link below:

<http://omicsonline.org/membership.php>

