Neuroscience Notes

Contents

Biopsychology as a Neuroscience

Write an overview of the topic here.

1 Biopsychology as a Neuroscience

Concept: What is Biopsychology?

Definition: The scientific study of biology of behavior.

- Biopsychology is also referred to as physiological psychology, psychobiology, behavioral biology, or behavioral neuroscience.
- Whenever we talk about biopsych, there must a biological approach of biological aspect.

Example: Reaction to a drug, specific symptom of a mental disorder, change in perception.

Key Points:

- Figuring out: **What is the biological mechanism of whatever it is that's happening?**.

Concept: Why studying biopsychology?

Definition: Allows us to examine the activity of the nervous system and how it underlies our mental experiences and behavior.

- How the activities, changes, in the nervous system affect our emotion, our mind, our behavior, how we perceive things on a day to day basis.

Concept: What do biopsychologist study?

Definition: There are various specializations biopsychologist can adopt. Some of these specializations include:

- Psychology

  Studying human reaction, human emotion in response to a certain stimulus.

- Biology

  Studying a specific set of proteins, or a specific molecule present in the brain.

- Neurology
- Psychiatry

  Neurology and psychiatry based is when the doctors prescribed drug, they asked: "How does this drug affect my patient's behavior?"

- Physiology

- Engineering

  Neural-engineer, study CBI, develop prosthetics.

  Collaborate with biologist and biopyschologist to solve any issue that the engineer have and improve their products.

  Collaboration between these specializations are vital in furthering our knowledge of the brain and behavior.

Concept: What do biopsychologist study?

Definition: Biopsychologists typically receive training in one or more of the below areas:

- Neurobiology: The study of the underlying biological bases of the nervous system.

  Thinking about how the biological aspect of the human body, like proteins, affect human behavior.

- Neurochemistry: The study of chemical compounds that modulate the nervous system.

  Study neurotransmitters: serotonin, dopamine, etc.

- Neurophysiology: The study of nervous system function.
- Neuroanatomy: The study of nervous system structure.
- Neuropathology: The study of nervous system disorders.
- Neuropharmacology: The study of psychotropic drugs.

Biopsychology Research

Write an overview of the topic here.

2 Biopsychology Research

Concept: How do we approach research in biopsychology?

Definition: Biopsychology consists of methodologies involving the following:.

- Human and non-human subjects.

  Human subject

  Advantages to using human subjects...

  – Humans are capable of following directions.
  – Humans can report subjective experiences, i.e. feelings, mood, thoughts, etc.

However, there are at times ethical and practical constraints with humans, so animal research becomes necessary.

Non-human subjects

In biopsychology, rats and mice are most used as non-human subjects.

Advantages to using rodents in research:

– Simpler models with similar brain structures, genes, and developmental processes.

Example: In human, at the shift from the age of three to four, there is a proteins that helps with memory consolidation. This also happen in rodents at around two weeks of age.

Results in these rodents, there non-human beings are generalizable to human beings.

– Allow for a comparative approach, i.e., we can study biological processes by comparing results of different species.

2.1 Ethics in Animal Research

* Animal research has shown us a lot about how our brains work.
* But, there is an apparent issue here, which is simultaneously being able to increase our knowledge of a phenomenon while also decreasing discomfort and distress in animals.

2.2 Oversight of Animal Research

There will always be the question of if animal experimentation constitutes animal cruelty.

* However, upon approval for an animal-based study, researchers must prove they have explored all other options before resorting to the utilization of animals. If there is no other way to conduct the study, permission to use animals will be granted.
* Speed at which diseases are studied vs. animal experimentation.
* Most institutions have very strict regulations regarding animal use...
  IACUC (Institutional Animal Care and Use Committee)

- Experiments and non-experiments.

  Experiments

Definition: An experiment is a method used to determine whether a change in one variable causes a change in another variable...

Required characteristics of an experiments include:

– Random assignment

- Avoidance of confounding variables

  Make as many steps as possible to mitigate these variables.

- Independent variable (treatment manipulated by experimenter)
- Dependent variable (variable measured by the experimenter)

Non-experiments

Although an experiment is typically the ideal way to approach a study, there are some cases where this is not feasible. Therefore, one of the two approaches below may be used:

1. A **quasi-experiment** is a method used study the effects of one variable on another when random assignment to treatment groups is not possible.

   Example: Patients with a certain psychiatric condition

2. A **case study** is an in-depth focus on a single case or subject.

   Example: Amnesiac patient H.M. and usually not generalizable

- Basic(pure) and applied research.

Definition: Basic (pure) research is pursued when the purpose is solely to acquire knowledge.

Motivated by the curiosity of the researcher.

To understand something.

Definition: Applied research is pursued when the intention is to directly benefit mankind.

Many studies/research programs have elements of both.

To solve problems, to come up with solutions.

3 The subdisciplines of Biopsychology

There are six major subdisciplines of biopsychology...

- Physiological psychology

  Biopsychologist that based in physiology, how nervous system or our central nervous function, that affect our behavior.

- Psychopharmacology

  Studies drugs, see how drugs affect people behavior.

- Neuropsychology

  Centered around studying different legion in the brain affect how people behave.

- Psychophysiology

  How are things are working in the nervous system, in terms of our mood, our feeling, and our behavior.

- Cognitive neuroscience

  How is our brain affecting how we are perceiving things, processing things.

- Comparative psychology

  Comparing the behavior between different species and find similarities and differences.

Concept: Major subdisciplines in details

3.1 Physiological Psychology

Definition: Physiological Psychology is the study of the neural mechanisms of behavior and perception.

- Direct manipulation and recording of the brain.
- Commonly basic research, unless experimentation is aimed at developing a new apparatus.

Example: EEG, electrophysiological study

3.2 Psychopharmacology

Definition: Psychopharmacology is the study of how drugs affect our behavior.

- Both humans and non-humans.
- Both basic and applied.

3.3 Neuropsychology

Definition: Neuropsychology is the study of the psychological effects of brain damage.

- Neuropsychological testing facilitates diagnoses and establishment of treatment.
- Applied research in human patients.

3.4 Psychophysiology

Definition: Psychophysiology is the study of the relationships between physiological activity and psychological processes.

- Record physiological activity for the aim of establishing a relationship between physiology and behavior.
- Non-invasive measures in human subjects.
- Basic and/or applied.

Example: Hypothalamic Pituitary Adrenal axis - HPA axis

3.5 Cognitive neuroscience

Definition: Cognitive Neuroscience is the study of the neural bases of cognition.

- Comprised of studying (subfield of neuroscience):
  - How we sense things
  - How we perceive
  - How we recognize
  - How we attend to things
  - Learning and memory
  - Language
  - Decision making, and motor control.
- Usually non-invasive in human studies.
- Both basic and/or applied.

3.6 Comparative psychology

Definition: Comparative psychology is the study of similarities and differences in the behaviors of different species.

- Lab setting or natural setting (ethological or ecological? research)
- Basic research

Pictures in different subdisciplines from the textbook.

Concept: Contributions of Biopsychology

Constant overlap of the above disciplines allows us to...

- Satisfy our curiosity about the brain-behavior relationship.
- Increase our understanding of brain disorders and brain disorder treatment.

Summary

Summarize key findings or notes about neural signaling.

4 Figures and Diagrams

5 References

Include all references used here in standard citation format.