END-2413: NEUROPHYSIOLOGY OF ELECTROENCEPHALOGRAPHY/SLEEP DISORDERS

Cuyahoga Community College

Viewing: END-2413 : Neurophysiology of Electroencephalography/Sleep Disorders

Board of Trustees:
January 2023

Academic Term:
Fall 2023

Subject Code
END - Electroneurodiagnostic

Course Number:
2413

Title:
Neurophysiology of Electroencephalography/Sleep Disorders

Catalog Description:
Analysis of the central and peripheral nervous system, electrophysiology, and nerve conducting velocities in health and disease. Includes discussion of neurophysiology of sleep and the role of the autonomic nervous system. Emphasis on respiratory and cardiovascular effects, regulation of sleep, circadian rhythms and maturation of the sleep stages addressing neonates to adults.

Credit Hour(s):
3

Lecture Hour(s):
3

Requisites

Prerequisite and Corequisite
BIO-2341 Anatomy and Physiology II, and END-1450 Intermediate Electroencephalography (EEG), or departmental approval.

Outcomes

Course Outcome(s):
Apply knowledge of human anatomy and physiology in the analysis of wave forms from Electroencephalogram, Polysomnographs, Evoked Potentials and Nerve Conduction studies.

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
Oral Communication: Demonstrate effective verbal and nonverbal communication for an intended audience that is clear, organized, and delivered effectively following the standard conventions of that language.

Objective(s):
1. Describe anatomy and physiology of the nervous system.
2. Differentiate between sympathetic and parasympathetic divisions of the autonomic nervous system.
3. Describe the organization of the somatic nervous system.
4. Contrast the anatomy of Obstructive Sleep Apnea and Central Sleep Apnea.
5. Recognize how OSA and CSA cause congestive heart failure and cardiac arrhythmias.
6. Describe major divisions of nervous system.
7. Describe neurons.
8. Describe spinal cord/cranial nerves.
9. Describe major areas/structures of brain.
10. Describe electrical activity in nervous system/action potentials.
11. Describe neurotransmission neurotransmitters.
12. Interpret electrical activity in the nervous system.

Course Outcome(s):

Identify normal patterns of sleep and sleep disorders in neonates through adulthood.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Contrast the anatomy of obstructive sleep apnea and central sleep apnea.
2. Discuss the physiology of sleep and the role of the autonomic nervous system.
3. Identify the normal respiratory and cardiovascular changes that take place in sleep and anesthesia.
4. Relate circadian rhythms to certain periods of sleep and wakefulness.
5. Describe cardio-respiratory disorders in sleep.
6. Differentiate between circadian rhythm disorders and neurological sleep disorders.

Course Outcome(s):

Discuss activity of the nervous system in seizures and epilepsy.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Describe the functional anatomy of seizures.
2. Describe major areas/structures of brain.
3. Interpret electrical activity in the nervous system.

Course Outcome(s):

Describe mechanisms of nerve injuries and restoration on muscle action via Functional Electrical Stimulation.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
Information Literacy: Acquire, evaluate, and use information from credible sources in order to meet information needs for a specific research purpose.
Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Discuss mechanisms of nerve injuries and restoration on muscle action via Functional Electrical Stimulation.
2. Describe electrical activity in nervous system/action potentials.
3. Interpret electrical activity in the nervous system.

Methods of Evaluation:

a. Quizzes
b. Exams
c. Comprehensive final exam
d. Research paper
e. Oral Presentation on research paper

Course Content Outline:

a. Anatomy and physiology of nervous system
    i. Major divisions of nervous system
    ii. Neurons
    iii. Spinal cord/cranial nerves

iv. Major areas and structures of the brain
v. The role of the hypothalamus in control of autonomic nervous system
vi. Voluntary and automatic control
vii. Neuroanatomy of sympathetic and parasympathetic divisions
viii. Electrical activity in the nervous system and action potentials
ix. Neurotransmission and neurontransmitters
x. Recording of the electrical activity in the nervous system
    1. EEG (Electroencephalogram)
    2. EP (Evoked Potentials)
    3. NCV (Nerve Conduciton Velocity)
    4. EMG (Electromyography)
    5. PSG (Polysomnography)
    6. Field potentials
xi. Ventilation and respiratory mechanisms
xii. Neural control of respiration and circulation
xiii. Superchiasmatic nucleus (SCN) and Zeitgebers

b. Patterns of sleep and sleep disorder
    i. Functions of sleep
    ii. Physiology of sleep
    iii. Neural mechanisms in sleep
    iv. Thermoregulation of sleep
    v. Sleep stages
    vi. Stages of sleep and electrical patterns
    vii. Cardiovascular control during sleep
    viii. Central regulation of sleep and autonomic physiology
    ix. Circadian rhythms
    x. Free-running sleep
    xi. Age related changes in sleep
    xii. Maturation of waveforms
    xiii. Factors influencing sleep in aging
    xiv. Aging effects on central nervous system and peripheral nervous system
    xv. Effects of anesthesia on sleep/wakefulness and cardio-respiratory control
        1. Similarities between anesthesia and sleep
        2. Effects of anesthesia on the respiratory system
        3. Ventilation monitoring
    xvi. Sleep Disorders
        1. Delayed/Advanced sleep phase
        2. Narcolepsy/ REM Behavior Disorder
        3. Sleep deprivation
        4. OSA/CSA
    xvii. Neurological correlates of sleep disorders
    xviii. Integration of knowledge of other neurological disorders to sleep.

c. Seizures and Epilepsy
    i. Define seizures
    ii. Define Epilepsy
    iii. Activities of the nervous system in seizures and epilepsy
        1. Functional anatomy of seizures

d. Mechanisms of nerve injuries
    i. Brachial plexus injury
    ii. Lumbar-sacral plexus injury
    iii. Peripheral nerve injury
    iv. Neuropathy

e. Functional electrical stimulation (FES)
    i. Define FES
    ii. Use of FES to restore motor function

Resources

Kryger, M. HJ., Roth, T., Dement, W. C. *Principles and Practice of Sleep Disorders Medicine.* 4th ed. Philadelphia: Elsevier/Saunders, 2005.

Lydic, R., Biebuyck, J. *Clinical Physiology of Sleep.* Bethesda: American Physiological Society, 1988.

Sheldon, S. *Evaluating Sleep in Infants and Children.* Philadelphia: Lippincott-Raven, 1996.

Cooper, Raymond, Colin Binne, and Ricard Billings. *Techniques in Clinical Neurophysiology, A Practical Manual.* Elsevier, Churchill, Livinston, 2005.

"Journal of Sleep Sleep Disorders Research: Sleep" 2004-01-01 00:00:00.0.

Resources Other

a. Sleep Multi Media CD
b. http://www.neurosci.pharm.utoledo.edu/PHCL3720/Lecture11.htm#/Neurophys
c. http://faculty.washington.edu/chudler/neurok.html
d. http://www.sleephomepages.org/sleepsllabus/sleephome.html
e. http://sleepmed.bsd.uchicago.edu/sleepphysiology.html
f. http://www.sleepstudy.org/Index.htm
g. *American Journal of Electroneurodiagnostic Technology (AJET)* by the ASET; 4 issues annually; which reflects most recent changes and updates in the field.

Top of page
Key: 5089