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Seizures and the Mysterious Co-morbidities between Autism, Childhood Trauma, and ADHD

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Learning Outcomes

1) Describe the various forms of seizures, signs, and the neurological connections

2) Identify the prevalence of both epileptic and non-epileptic seizures in the pediatric population

3) Recognize treatment implications for occupational therapists working with children who have, or are suspected to experience, seizures including reading EEG results, what to look for, and clinical presentations
**Introduction**

- Prevalence
- Symptoms and Prognosis
- Impact to the field of Occupational Therapy

Some possible signs of subclinical seizure activity include:

- Exhibiting behavior problems, such as aggression, self-injury, and severe tantrums
- Making little or no academic gains after doing well during childhood and pre-teen years
- Losing some behavioral and/or cognitive gains.
What is a Seizure?

- An abnormal electrical discharge in the brain altering function or behavior
- Paroxysmal behavioral spell generally caused by an excessive disorderly discharge of cortical nerve cells
- It is the most common neurological condition in children, with a prevalence of more than 4%.
- Most seizures last for about 1 minute

Retrieved December 8, 2018 from: https://www.naec-epilepsy.org

Brain Storms...

- A seizure occurs when too many nerve cells in the brain “fire” too quickly causing an “electrical storm”
- The source of seizures is the brain.
- Neurons (brain cells) communicate with electrical signals.
- Seizures can change as the child ages.

Retrieved December 8, 2018 from https://www.epilpesy.va.gov/
Epilepsy vs. Seizure Disorder

- Epilepsy, defined as two or more unprovoked seizures, occurs in 2-3% of the general population.
- Epileptic seizures range from clinically undetectable (“electrographic seizures”) to convulsions.
- Nonepileptic events (also called nonepilepsy seizures) are not caused by electrical activity in the brain.

Seizure types: Signs and Symptoms

- Symptoms vary depending upon the part of the brain involved in the epileptic discharge.
- Psychogenic seizures or events are caused by subconscious thoughts, emotions, or "stress," not abnormal electrical activity in the brain.
- Doctors consider most of them psychological in nature, but not purposely produced. Usually the person is not aware that the spells are not "epileptic."
Focal Awareness Seizure

- A seizure that starts in one area of the brain and the person remains alert and able to interact is called a focal onset aware seizure.

- Replaces previous terminology of simple partial seizure

- These seizures are brief, lasting seconds to less than 2 minutes.

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Focal Onset Impaired Awareness Seizures (complex partial seizures)

- A seizure that starts in one area or side of the brain and the person is not aware of their surroundings
- Replaces complex partial seizures
- Focal impaired awareness seizures typically last 1 to 2 minutes.
- These seizures may have an aura (or warning, which technically is itself a focal aware seizure).
- Signs include lip smacking, picking at clothes, fumbling), becoming unaware of surroundings, and wandering.

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Focal to Bilateral Tonic-clonic Seizures (secondarily generalized seizures)

- A seizure that starts in one area of the brain, then spreads to both sides of the brain.
- This term replaces secondarily generalized seizure.
- They usually last 1 to 3 minutes, but it may take a longer for a person to recover.
- A focal to bilateral tonic-clonic seizure lasting longer than 5 minutes is a medical emergency.

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Absence seizures

- Cause lapses in awareness, sometimes with staring.
- They are a type of generalized onset seizures, meaning they begin in both sides of the brain at the same time.
- Replaces former term; petit mal seizures.
- They begin and end abruptly, lasting only a few seconds.
- Absence seizures can be so brief they sometimes are mistaken for daydreaming and may not be detected for months.
- They are more common in children.

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Tonic-clonic Seizures

- Another word for this is a convulsion formally “grand mal.”
- A tonic-clonic seizure usually begins on both sides of the brain but can start in one side and spread to the whole brain.
- A person loses consciousness, muscles stiffen, and jerking movements are seen.
- These types of seizures usually last 1 to 3 minutes and take longer for a person to recover.
- A tonic-clonic seizure lasting more than 5 minutes is a medical emergency.

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Common Treatments

- Various treatment options to address symptoms such as, medications, dietary therapy, surgery, and devices.

Connection to Autism

- Autism is more common in people with epilepsy
  Approx. 20%
- Epilepsy is more common in people with autism
  Approx. 25-40%
- Most cases of epilepsy in children with ASD present after 10 years of age (two peaks: infancy and puberty)
- More frequent in children with ASD than other children
- All seizure types have been reported. (Besag, 2018)
Connection to ASD Continued

- Sudden loss of language skills or behavioral regression may be caused by epileptic disruption which may not always show up clinically.
- Electrical status epilepticus of sleep
- A number of studies have found abnormalities in corpus callosum connectivity associated with ASD.
- About 20% of corpus callosum abnormalities are caused by single or multiple gene mutations or by chromosomal abnormalities.

(Besag, 2018)

Connection to Self-stimulatory behaviors?

- Dopamine connection
- Neurons that fire together wire together
- Too much?
- Coupling
Connection to Connected Childhood Trauma

- Abusive Head Trauma
- Emotional Complex Trauma
- Damage to brain cells
- PTSD = Brain damage
- Elevate exposure to trauma = increased risk

(Myers, Perrine, Lancman, Fleming, & Lancman, 2013)

PNES

- PNES are a physical manifestation of a psychological disturbance and are a type of Somatoform Disorder called a conversion disorder.
- Up to 90% of patients with psychogenic nonepileptic seizures (PNESs) have history of childhood trauma (sexual and physical) abuse when compared to the general population.
- PNES are diagnosed in 20 to 30% of patients seen at epilepsy centers for intractable seizures.

(Myers, Perrine, Lancman, Fleming, & Lancman, 2013; www.epilepsy.com)
Damage to the brain?  
Brain's survival mechanism?  

(Perry, 2009)

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Connection to ADHD

- 30% children with Epilepsy have ADHD  
(Besag, 2018)

- 1 in 5 adults with Epilepsy also have ADHD

- More than 18 percent had significant ADHD symptoms

- Compared to other epilepsy patients, those with ADHD symptoms were also nine times more likely to have depression, eight times more likely to have anxiety symptoms  
(Ettinger et. al, 2015)
Neural Dynamics

- “Neural oscillations are a fundamental mechanism that enables the synchronization of neural activity within and across brain regions and promotes the precise temporal coordination of neural processes underlying cognition, memory, perception, and behavior.”

- From: The Neurobiology of Schizophrenia, 2016

Neuronal Oscillations

- Lower Gamma waves; and Alpha waves correlated to things versus language
- Waves show a peak with attention to an object versus typically peaking with surprise
- Children with Autism respond to the familiar not novel objects or experiences
- Improve with treatment
- We conclude-> Learning must address the what is familiar first for implicit memory (attending) to occur!
Research

- ASD lacked change in Alpha waves with visual distractors
- Atypical EEG oscillations = atypical arousal levels
- Excitatory/inhibitory imbalance.


Asynchrony = Dysfunction

- Poor Arousal
- Challenges with Attention
- Emotional Dysregulation
- Memory Difficulty
Synchronization versus Over Coupling

How?

Oscillations start outside of the brain!
Brain waves and Electrical Signals

- F = frontal
- Fp = frontopolar
- T = temporal
- C = central
- P = parietal
- O = occipital
- A = auricular (ear electrode)

Electrode Numbers

- T3, T4, P3, P4
- Even numbers identify electrode positions on the right side of the head
- Odd numbers refer to the left side
- "z" points to electrode sites in the midline of the head
EEG Readings

Video Example
Connection to Intervention

What to look for...

- Face
- Body
- Communication
- Altered mental status
- Change in behavior
- Triggers
Selecting Tx. Interventions

- Interprofessional Collaboration
  - MD: Triggers
  - Reporting changes and reactions

- Appropriate sensory activities
  - Lighting
  - Smell

Mind-Body Connection

- Movement can connect to brain oscillations
- Rocking can effect brain patterns
- Calming the body can occur with rhythmic breathing
- Brain oscillations affected by
- Enriched activities, oral motor activity, and novel stimulation

(Bayer, 2011)
Vagus Nerve!

Vagus Stimulation

- Inversion
- Prone Activities
- Valsava (resistive blowing activities)
- Cold temperature
- Sucking and Swallowing (use of water bottles)
- Facial and eyelid massage (connection to cranial nerves)
Case Examples

Rhythmic Activities

- Multi-sensory
- Whole Body
- Proprioceptive Feedback
- Vestibular
Client Hx:
Likes to run around, jump, tense hands, fixates on objects, self-stimulatory behaviors, difficulty with gross motor play, self-help, and handwriting.
Questions and Answers
info@drvgibbs.com

References:

  Panel II: EEG in ASD: Can Brain Waves Help Us Predict Treatment Response and Outcomes?