Cognitive Effects of Epilepsy
Outline

- Defining Cognition
- Cognitive effects of Epilepsy
- Cognitive effects of Anti-epileptic medications
- How to deal with these effects
- Resources available to you and your families
Definition: mental processes

This includes *attention, *remembering, *producing and understanding language, *solving problems, and *making decisions.

Also can include *emotional problems like depression and anxiety (*which will be covered at future lectures*), *attention problems like attention-deficit disorder (ADD)*.
The brain controls not only what people think and do, but who they are... “The Seat of the Soul”

- Makes us move and speak, see and hear, feel and understand
- ....also is the source of epilepsy
The Brain and Signals

- “A Living Computer”
- “An organ of communication”: obtaining and processing information
  - Touching a hot stove=>understanding danger/pain=>pulling the hand away
  - Seeing the face of a child=>recognizing this is your child=>feeling overwhelming love
  - Seeing symbols on a page=>interpreting the symbols=>reading the sentence on a page
Communication is done through electrical and chemical signals that pulse between neurons (specialized brain cells): Similar to circuits in a computer.

...Both can malfunction e.g. a computer screen freezing like a brain during a seizure.
For various reasons (e.g. birth injury, TBI, genetic misprogramming) a group of neurons can become hyperactive

“A bad connection”

Over-firing neurons can activate their neighbors, and, can then spread to the whole brain (leading to loss of consciousness and convulsion)
Different areas of the brain have different functions

**Brainstem**: primitive structures: concerned with breathing, eating, sexual activity, emotion

**Neocortex**: “Newer” part of the brain: Complex reasoning, sensation, movement
  - Regions separated by folds (sulci) and hemispheres (right vs. left), and lobes
Symptoms Correlate to Location

- Every brain is unique and everyone’s seizures are different, depending on where the seizures are coming from.
- For example, seizures coming from _____ cause ______:
  - Occipital lobe/visual area cause perception of color/shapes/hallucination
  - Temporal lobe/emotional areas/memory cause emotions like fear, déjà vu
  - Taste center causes metal taste, etc.
People are likely to have a different impact on their cognition based on, including:

- **Etiology**: Where their seizures originate and what causes them
- **Age** of onset
- **Seizure type** and severity (e.g. how frequently they involve the whole brain)
- **Anti-epileptic medications**
Some people with epilepsy had difficulty academically **BEFORE** their first seizure.

Psychiatric, behavioral, and academic problems commonly precede seizures in children AND adults.

This may suggest an underlying abnormality leading to **BOTH** problems: problems with thinking AND epilepsy.
Memory is Complicated

- There are several different types of memory (remembering names vs. reading a map vs. completing a puzzle)
- Memory also changes naturally as one ages (Remembering details from childhood...but where are those darn keys ?!)
- ...how do you know whether it is the epilepsy causing the problem??
  - Age vs. Epilepsy
  - Medications vs. Epilepsy
  - Underlying brain disease vs. Epilepsy
This is a hot area of discussion, with disagreement amongst the experts.

**Prolonged seizures** lasting longer than an hour (status epilepticus) can immediately damage the brain.

**Small seizures** (e.g. continuous right hand twitches)—no impact on cognition.

**Large seizures** (complex partial seizures)—if poorly controlled FREQUENT for years may impact SOME people, however, others have NO complaints.
Memory Problems can manifest in different ways

- “I can’t find my keys” or forgetting appointments
- Feeling less sharp at work
- Easy tasks needing to be written down
- Difficulty remembering people’s names
Temporal lobe epilepsy may be more likely to cause long term problems in memory. This is based on the anatomy of the temporal lobe, including the hippocampus and amygdala—important in memory.
After a Seizure

- A single seizure DOES NOT permanently impair intellectual or behavioral abilities.
- **Postictal Period**: After a seizure, most people have a period of poor memory, concentration, and tiredness.
- This generally lasts several minutes to hours.
- You may have difficulty remembering things during this period
**WRONG ASSUMPTION**: Sometimes people thought to have poor concentration may be having under-recognized seizures.

- Best example: Children with frequent staring spells (sometimes several per hour) have been diagnosed with learning and attention disorders—really they are missing critical pieces of conversations.
- Treat the seizures => They do better.
ALL antiepileptic medications have the potential to have the detrimental side-effect of slowing cognition.

This is by nature of the medication: stopping brain “over-activity” like during a seizure.

The newer medications generally have less side effects than the older medications.

Some seizure medications even have cognitive ENHANCING side-effects.
Older Medications and Cognition

- The most significant thinking side-effects have been shown to be from **Phenobarbital** and **Phenytoin (Dilantin)**.
- These effects can be related to the DOSE, and typically are REVERSIBLE when the medication is stopped.
- Some of these side-effects may wear off with time, as has been shown with **carbamazepine (Tegretol)** 1-month into treatment.
- **Valproic acid (Depakote)** may have minimal cognitive side-effects.
Most new medications have NO or MINIMAL cognitive side-effects, impacting around 5% of patients.

**Topiramate (Topamax)** has been thought to have more side-effects than other seizure medications...however, this is dose dependant and may be related to epilepsy types (20% of children even had an improvement in alertness/behavior).
Some medications have been shown to improve cognitive testing in patients:

- **Tegretol** has been shown to IMPROVE memory in some patients (though may be more likely to cause problems)
- In one study, 72% of patients on **Clobazam** have reported improvement in thinking
- Positive effects also reported with **Lamotrigine**, **Levetiracetam (Keppra)**, **Topamax** (!), and others
Some of the thinking side-effects are present at bigger doses, but not lower doses.

Some or all of the effect might wear off with time.

These side-effects might be minimalized by increasing the dose slowly.
Multiple Medications?

- The side-effects of different medications may add-up
  - 4 medications added together may be more likely to cause cognitive side-effects than any of these medications alone
Sleep disorders are common among people with epilepsy.

Poor sleep can worsen the ability to concentrate and worsen memory.
How to Improve Your Cognition

- Many resources are available to help you improve your cognition!!!
- Some ideas follow in the next few slides
Discuss with your physician your specific cognitive concerns (whether it be word finding difficulty, concentration, memory problems, etc.)

- Be specific as to WHAT your problem is, WHEN it started, and HOW is it progressing...
Ask Your Doctor...(cont.)

- Have a discussion with them as to how your specific seizure medications may be contributing to the problem and solutions (breaking up the dosing, taking the bigger dose at night time, trying smaller doses, or if necessary, trying a DIFFERENT medication, etc.)

- They can do quick screening assessments during the visit that may be useful information—Mini Mental Status Examination, etc.
Ask for treatment for OTHER factors that may be contributing, for example:

- Poor sleep
- Depression, anxiety
- Other medical illnesses
Resources to Help You

- Request formal **NEUROPSYCHOLOGICAL TESTING**:
  - This can pinpoint areas of difficulty for you and then you can develop strategies to overcome them.
  - This can also help determine whether your memory complaints are from epilepsy, medications, normal aging, or commonly, depression.
Tricks You Can Do At Home

- KEEP YOUR MIND ACTIVE AND ENGAGED!
- For Concentration:
  - Avoid multi-tasking!
  - Minimize distractors!
- For Memory:
  - Using memory aids and reminders
    - Sticky-notes
    - Writing Lists
    - Cell-phone alarms and reminders
Cognition is how we think, and can be affected by many things, including age, poor sleep, depression, and importantly seizures and seizure medication, etc.

Some seizure types are more likely to cause problems with thinking.

Older seizure medications may be more likely to cause greater problems with thinking.

EVERY person is different and needs to be approached individually: There are solutions available to help you!
My References (Useful books, too):

**BOOKS:**
- *Living Well with Epilepsy and other seizure Disorders: An Expert Explains What You Really Need to Know*; by Carl Bazil, MD, PhD; 2004.
- *Epilepsy*; by Orrin Devinsky, MD; 2008.

**ARTICLES:**
THANK YOU!!!

QUESTIONS AND DISCUSSION