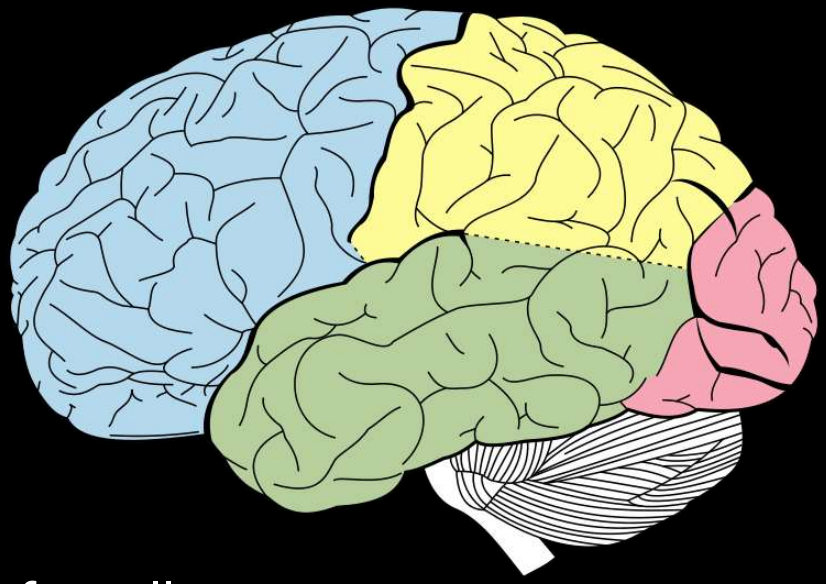

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Cognitive Effects of Epilepsy

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

Cognition

- **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

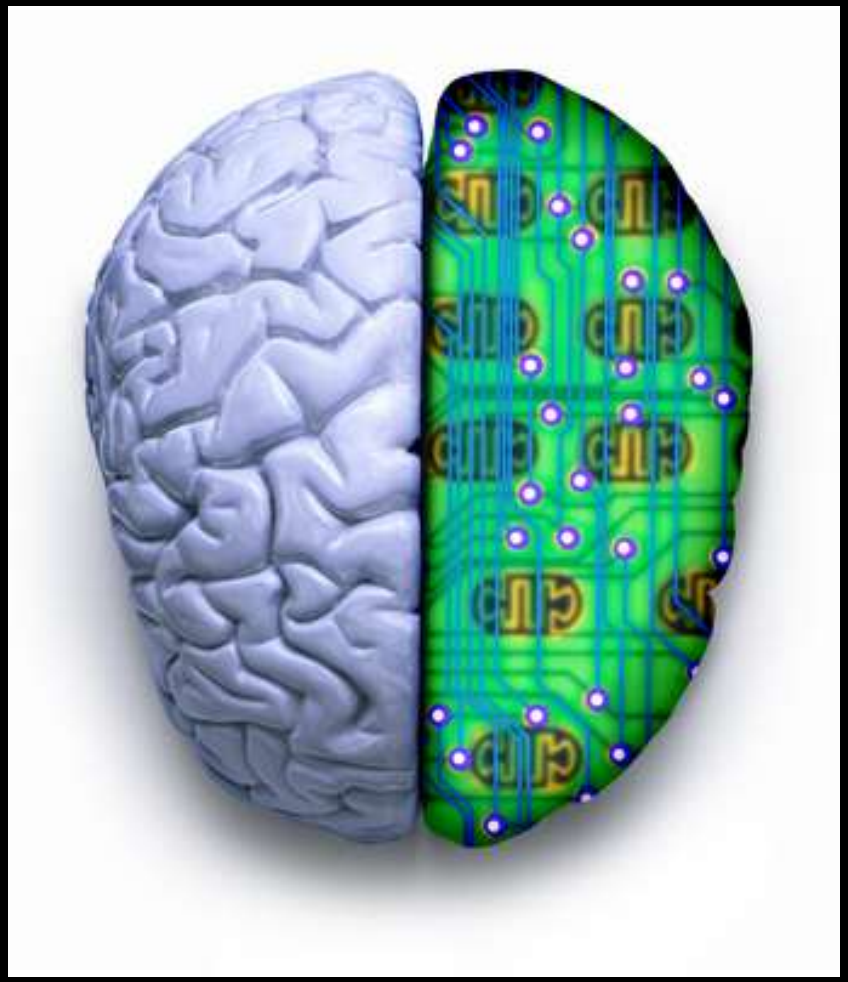
- The brain controls not only what people think and do, but who they are… "The Seat of the Soul"
- Makes us move and speak, see and hear, feel and understand
- ….also is the source of epilepsy

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

The Brain: A Living Computer

- 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

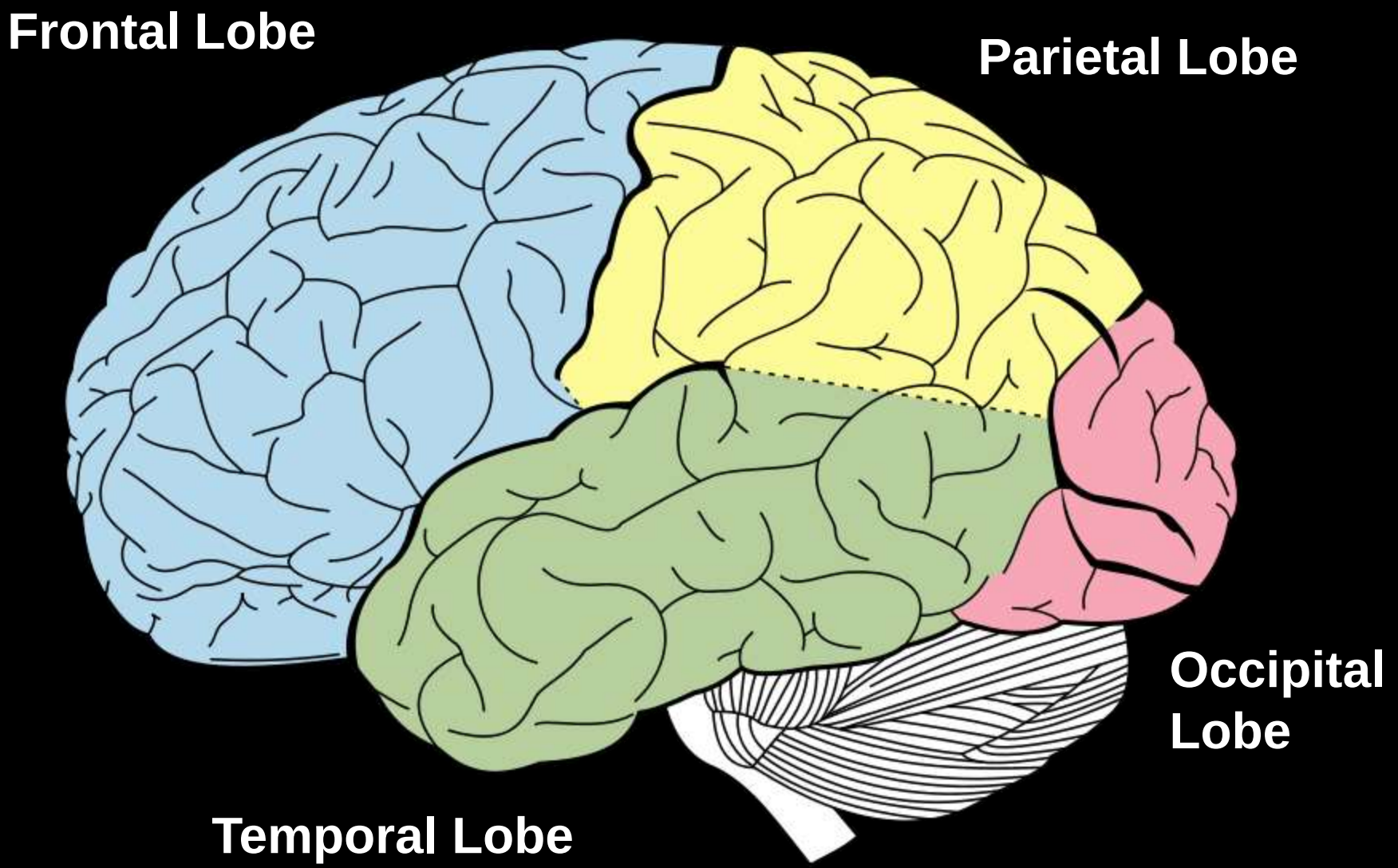


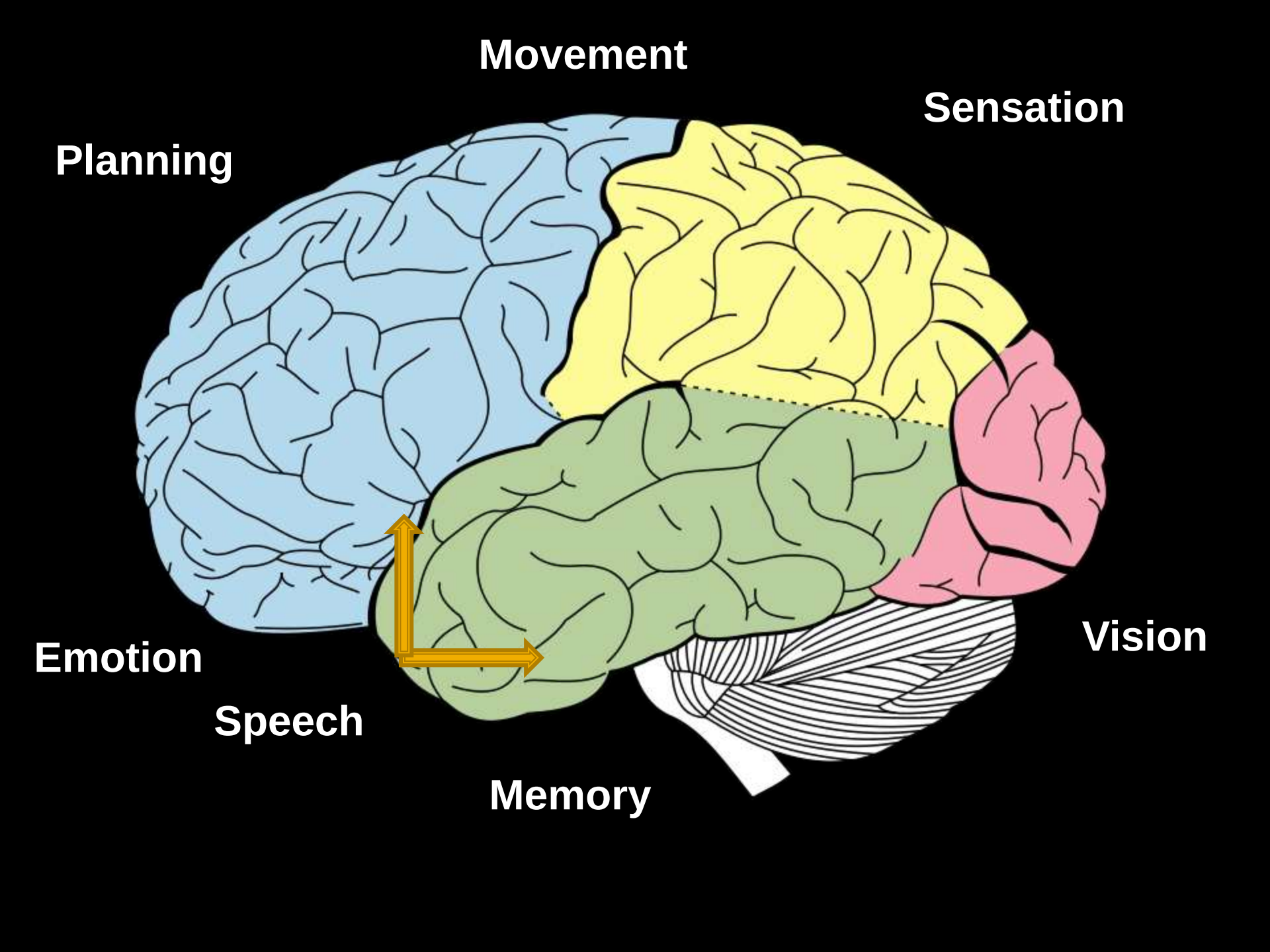
Hyperactive neurons: A Seizure

- 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)

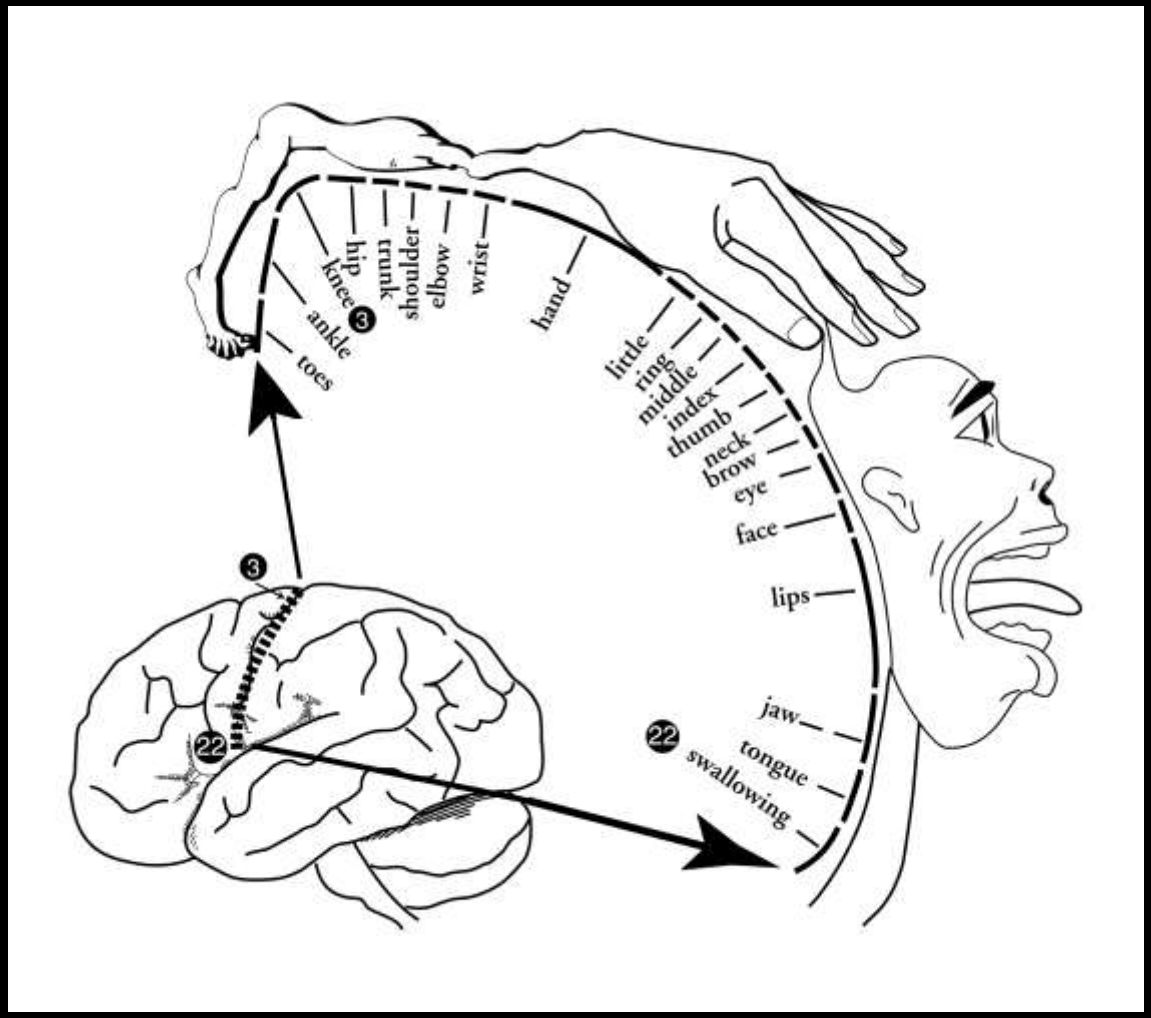
Brain Function Differs with Location

- 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


Frontal Lobe
Parietal Lobe
Occipital Lobe
Temporal Lobe


Movement
Sensation
Planning
Vision
Emotion
Speech
Memory

Homunculus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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.

Cognition and Epilepsy

- 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**

Which Comes First?

- 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

Does Epilepsy impact Memory?

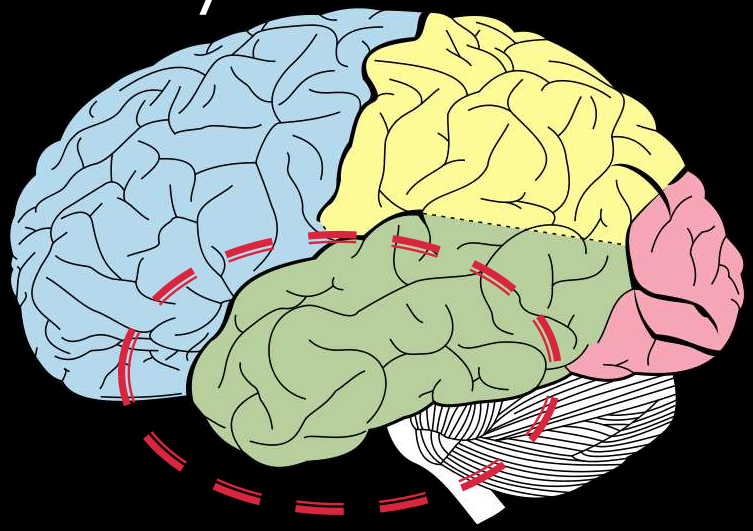
- This is a hot area of discussion, with disagreement amongst the experts
- **Prolonged seizures** lasting longer than an hour (status epilepticus) can immediately damage the brain
- **Small seizures** (e.g. continuous right hand twitching)—no impact on cognition
- **Large seizures** (complex partial seizures)—if poorly controlled FREQUENT for years may impact SOME people, however, others have NO complaints

Epilepsy Effects on Memory

- 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

Memory & the Temporal Lobe

- **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

Epilepsy effects on Concentration

- **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

Seizure Medications and Cognition

- **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.

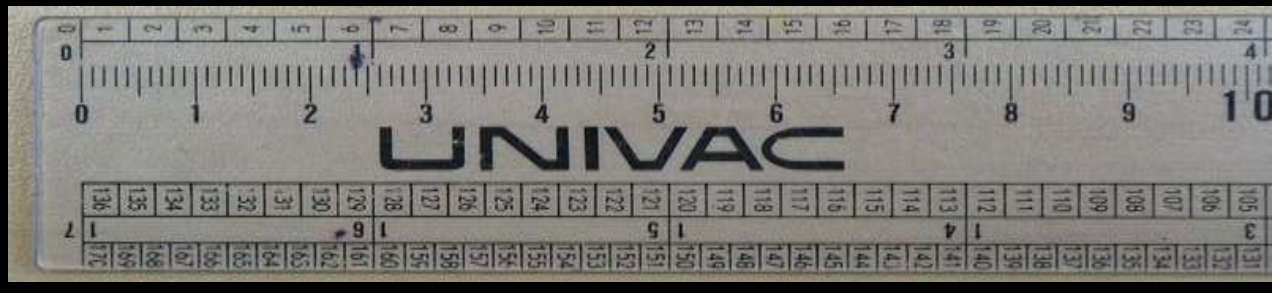
Newer Medications and Cognition

- 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)

POSTIVE (!) Effects on Cognition

- **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

Dose Size



- 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 and Memory/Concentration

- 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

Ask Your Doctor…

- 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 Your Doctor….(cont.)

- 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

CONCLUSION

- 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:

- Eddy C, Rickards H, Cavanna A. (2011) The cognitive impact of antiepileptic drugs. Ther Adv Neurol Disord 4(6): 385-407

THANK YOU!!!

QUESTIONS AND DISCUSSION