

PSYC301: Epilepsy

Jay Hosking, PhD

Overview

- A. Seizures, epilepsy, and the epileptic aura
- B. Types of seizures
- C. Etiology
- D. Treatments for epilepsy

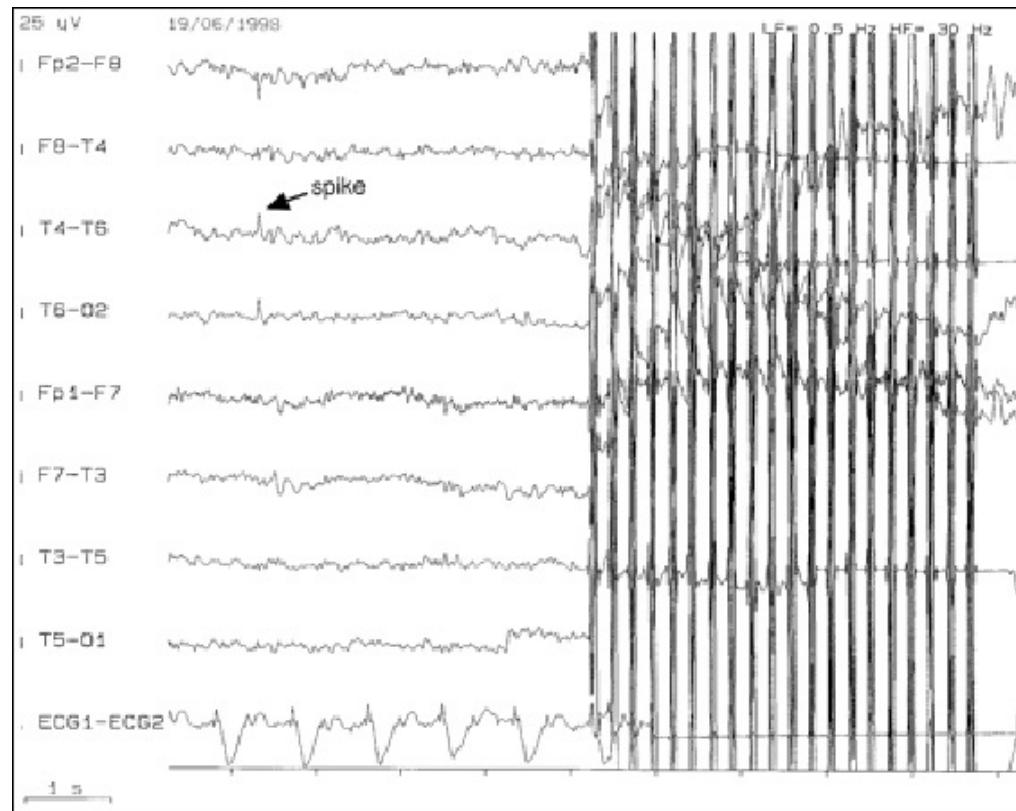


Learning objectives



1. Define seizure and epilepsy.
2. Explain what an epileptic aura is and why it is important.
3. Compare focal vs. generalized seizures.
4. Name and describe four types of seizures.
5. Describe some risk factors for epilepsy. What causes epilepsy?
6. Describe and compare five different sorts of treatments for epilepsy.
7. Describe a study that benefitted from the generosity of patients undergoing epileptic surgery.
8. Why are some brain regions more likely to have the epileptic focus?
9. Read the associated article by Husvedt (2013). The author is a writer, not a neuroscientist. What inherent problems do we encounter in neuroscience when we use terms like “psychological” vs “biological”? How does a “psychogenic” diagnosis affect a person?

Epilepsy is characterized by **recurrent unprovoked seizures**—due to atypical, excessive or synchronous neuronal activity in the brain.



Diagnosis relies heavily on the EEG

Epilepsy

Pre-ictal, ictal, post-ictal, interictal patterns

Despite “unprovoked” in the definition,
evidence suggests it can be otherwise

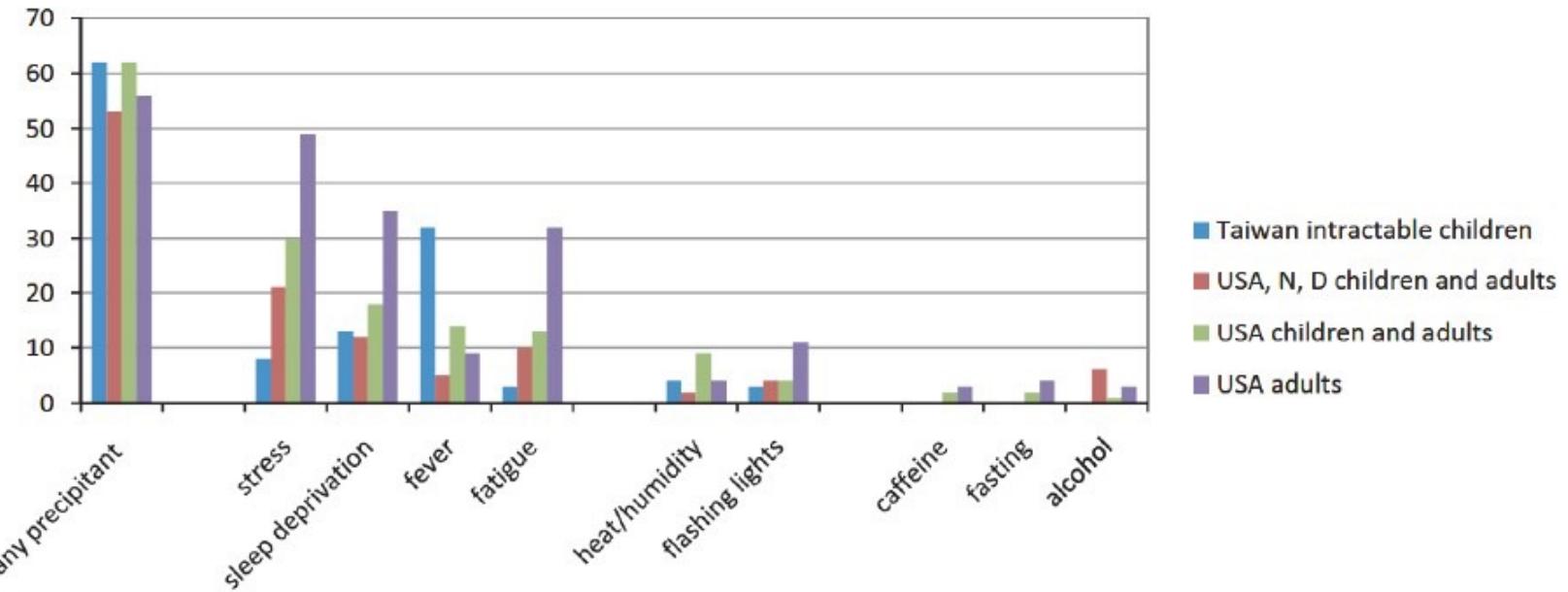


Figure 1.

Percentage of patients with epilepsy in different populations who recognize various precipitating factors. One factor can be reported per patient. The studies are based on questionnaires and interviews. from the following studies and patient populations: Fang et al., 2008; 120 (M = 71; F = 49) in Nakken et al., 2005; 1,677 (M = 788; F = 889) children and adults collected through a twin registry, Frucht et al., 2000; 400 (M = 200; F = 200) children and adults; and Sperling et al., 2008; 198 (M = 86; F = 112) adults. USA, United States of America; N, Norway; D, Denmark.

from Trenite, 2012

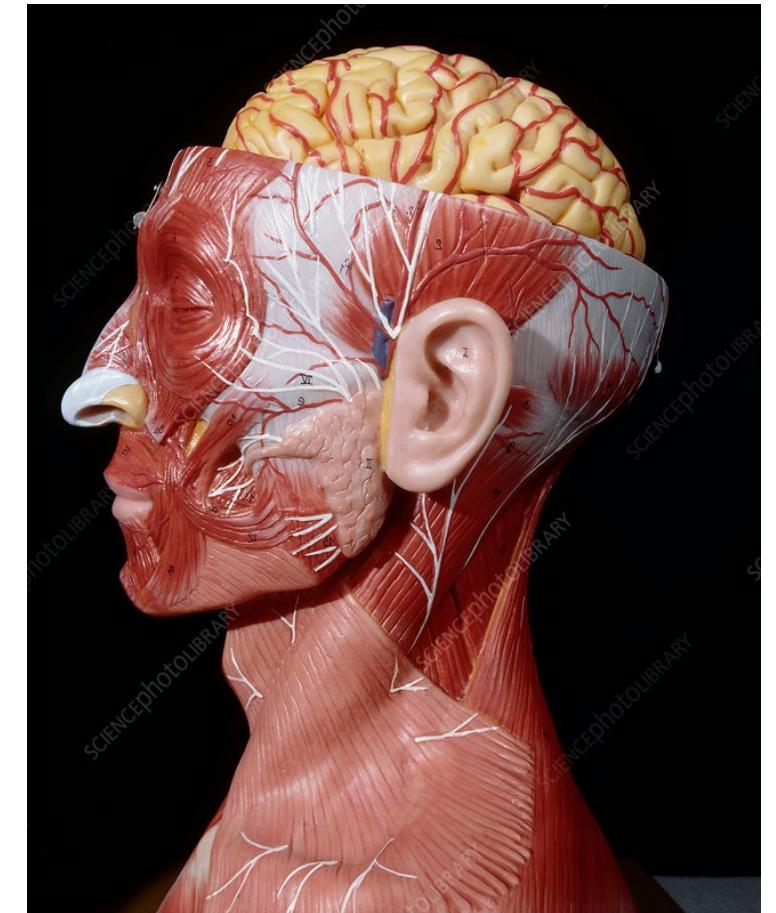
Epilepsy is common

We have anticonvulsant (anti-seizure) drugs, but not anti-epileptic drugs

Anticonvulsant drugs are often ineffective

Seizure vs. convulsion: an important distinction

Stigma is extremely common



Epilepsy

Epileptic Aura

Can take a variety of forms

Important for two reasons:

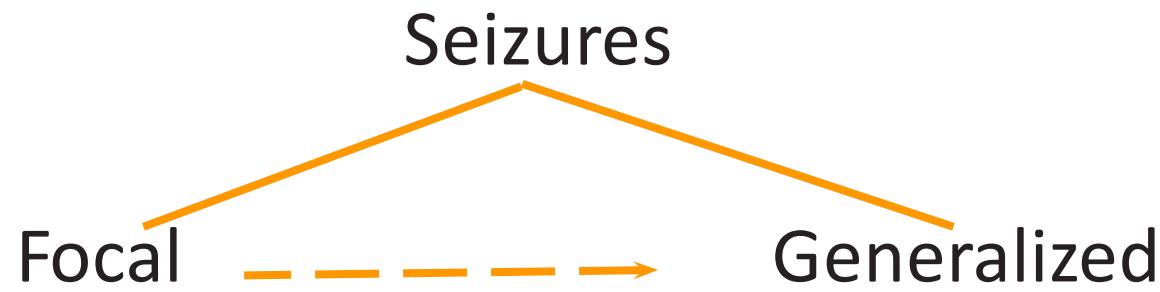
- 1.
- 2.





Focal seizure: Does not involve the entire brain. Usually localized to a single brain area.

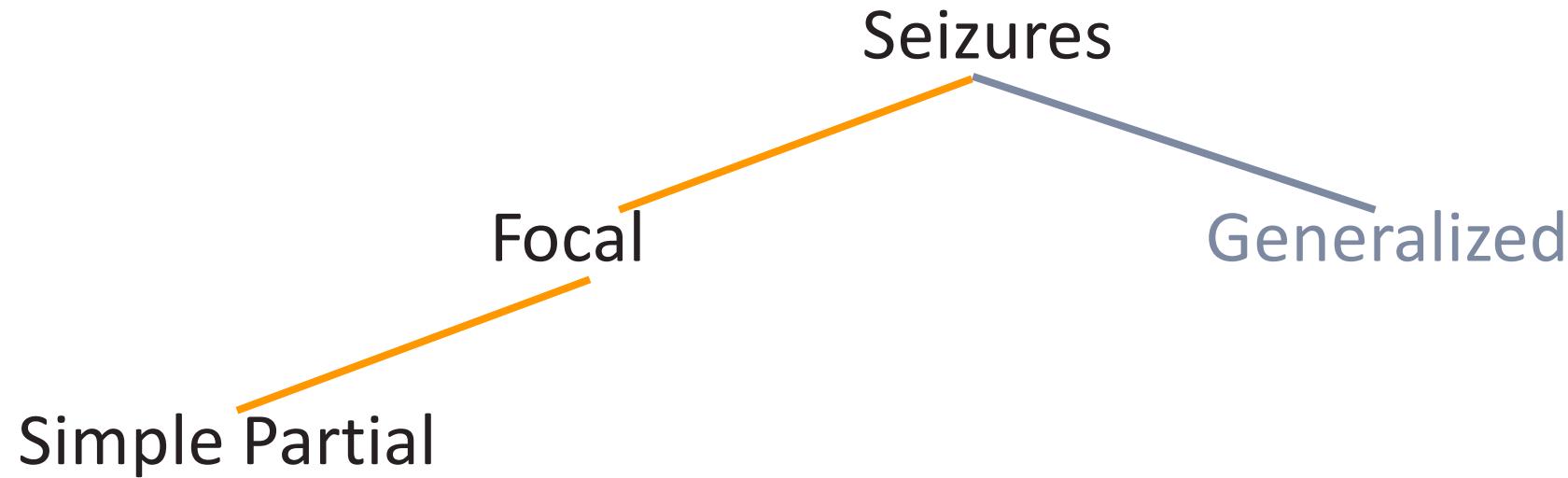
Generalized seizure: Involves the entire brain.



Focal seizure: Does not involve the entire brain. Usually localized to a single brain area.

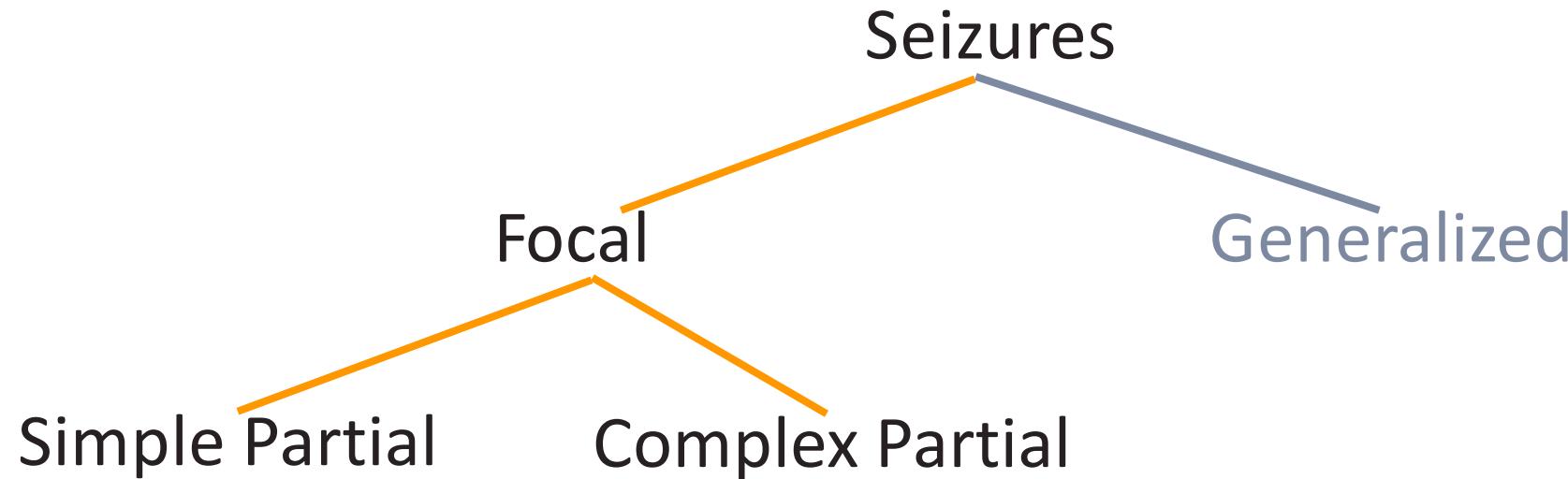
Generalized seizure: Involves the entire brain.

Secondary generalization: When a focal seizure evolves into a generalized seizure.



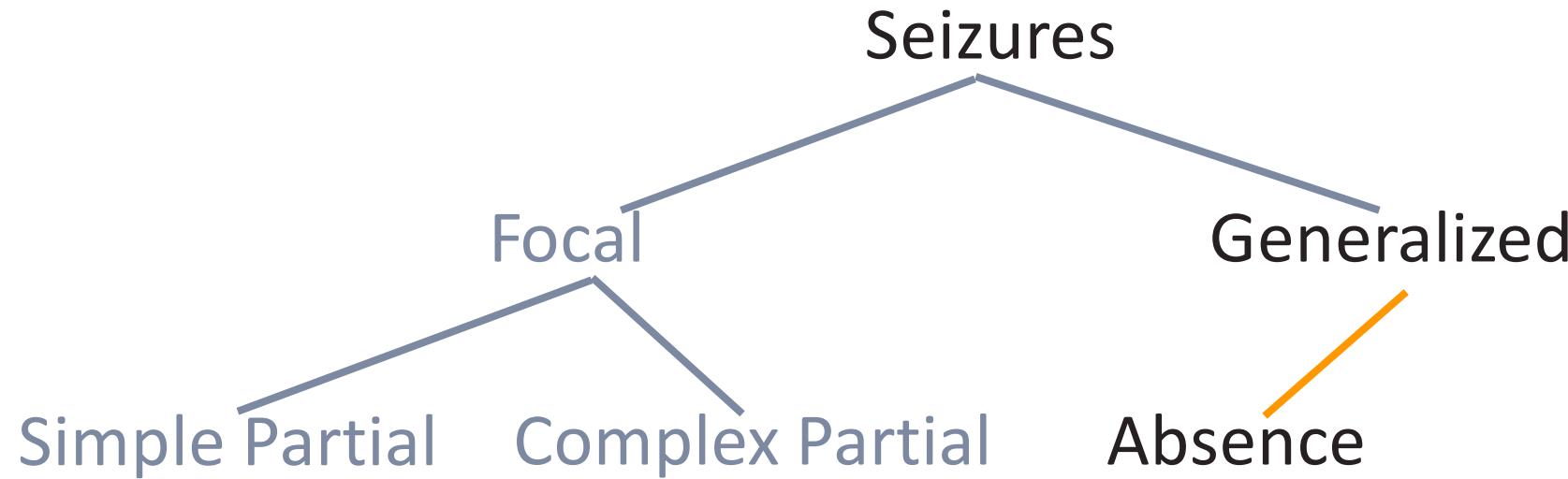
Simple partial seizure: Symptoms are primarily sensory or motor or both. Typically no loss of consciousness.

https://www.youtube.com/watch?v=X3_pv6us8A0



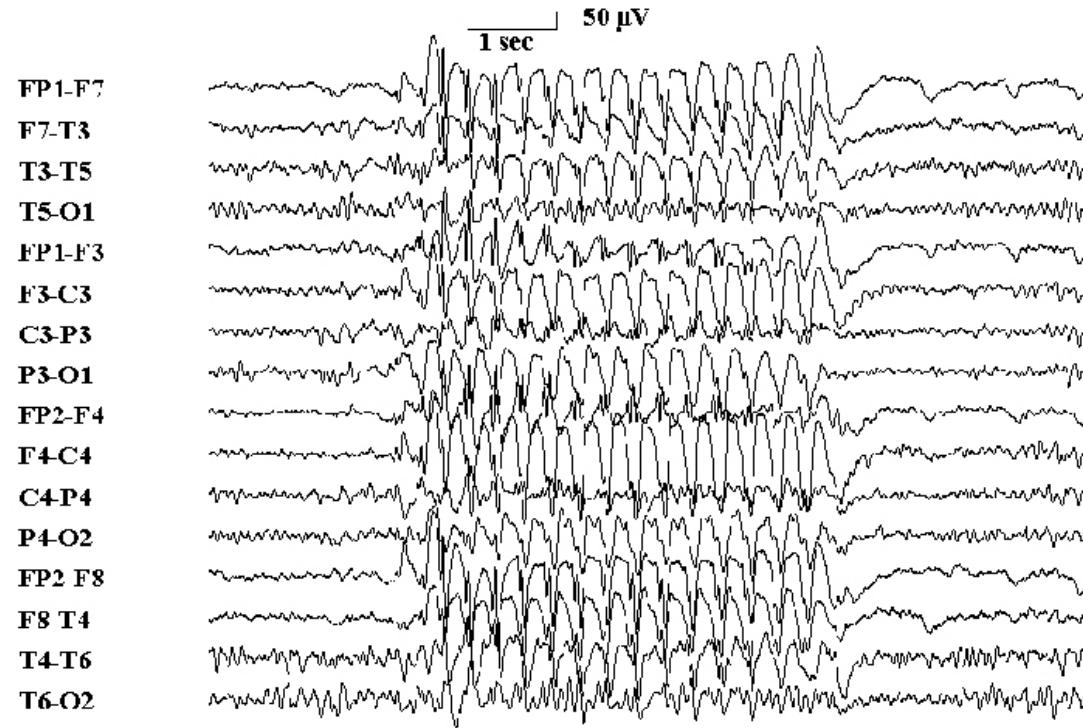
Complex partial seizure: Patients engage in compulsive, repetitive, simple behaviours (automatisms) and more complex behaviours that can appear perfectly normal. Disruption and/or alteration of consciousness is common.

Most common type, usually temporal lobes, most treatment resistant

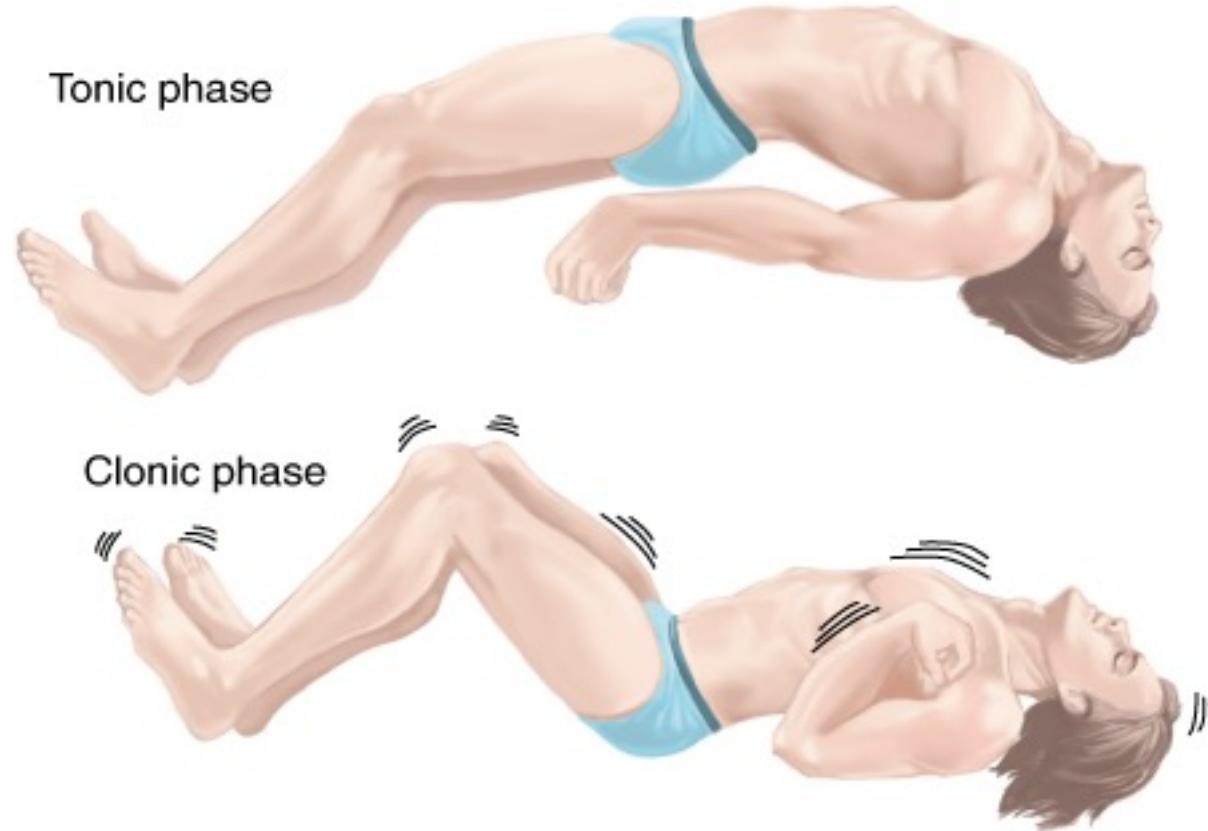
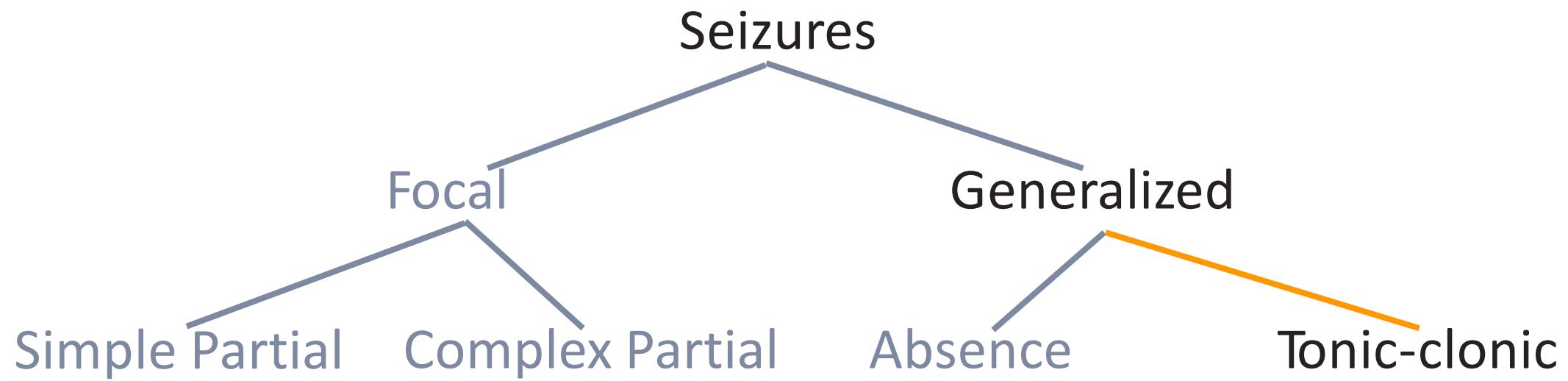


Absence seizure: No significant convulsion. The primary symptoms are: loss of consciousness, cessation of ongoing behaviour, vacant look, fluttering eyelids.

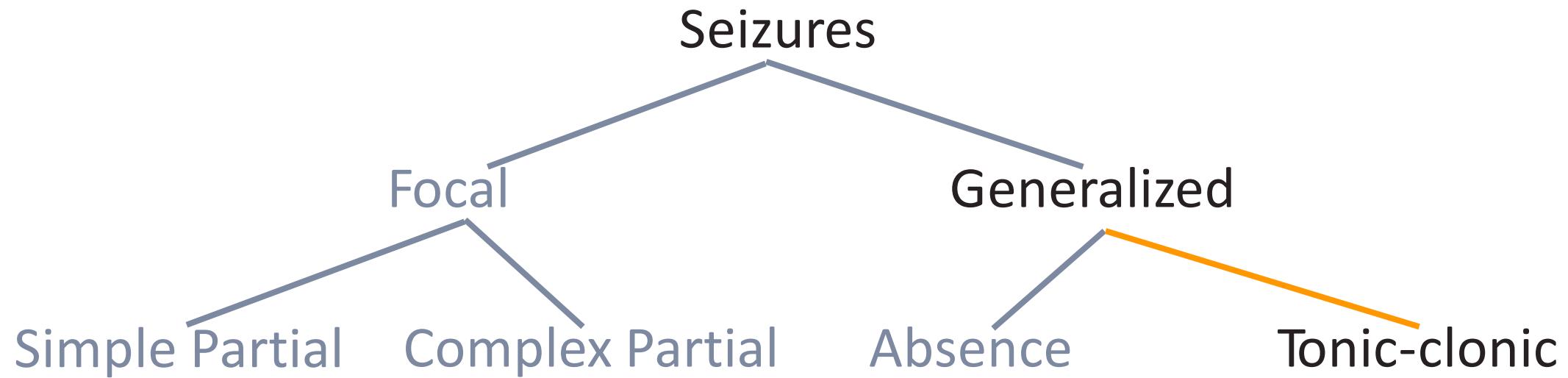




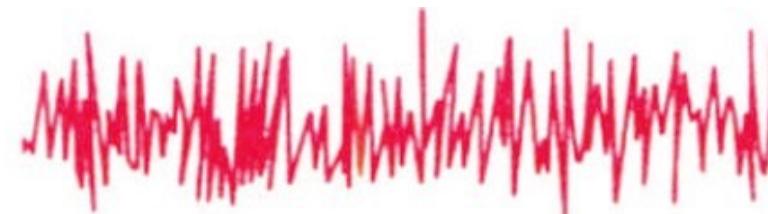
Absence seizure: Bilaterally symmetrical 3-per-second spike-and-wave discharge.



Types of seizures



Tonic-clonic seizure: Loss of consciousness, loss of equilibrium, violent tonic-clonic convulsion. Tongue-biting, urination, and cyanosis are also common.



Types of seizures

<https://www.youtube.com/watch?v=TKiT8uj8-F4&list=PL5blmDt6LEewOp0eJGWeKOks2na-gjHh&index=5>

What to do if someone is having a seizure

First aid for any type of seizure

There are many types of seizures. Most seizures end in a few minutes.

These are general steps to help someone who is having any type seizure:

- Stay with the person until the seizure ends and he or she is fully awake. After it ends, help the person sit in a safe place. Once they are alert and able to communicate, tell them what happened in very simple terms.
- Comfort the person and speak calmly.
- Check to see if the person is wearing a medical bracelet or other emergency information.
- Keep yourself and other people calm.
- Offer to call a taxi or another person to make sure the person gets home safely.



Stay with the person until the seizure ends and he or she is fully awake.

What to do if someone is having a seizure with convulsions

First aid for generalized tonic-clonic (grand mal) seizures

When most people think of a seizure, they think of a generalized tonic-clonic seizure, also called a grand mal seizure. In this type of seizure, the person may cry out, fall, shake or jerk, and become unaware of what's going on around them.

Here are things you can do to help someone who is having this type of seizure:

- Ease the person to the floor.
- Turn the person gently onto one side. This will help the person breathe.
- Clear the area around the person of anything hard or sharp. This can prevent injury.
- Put something soft and flat, like a folded jacket, under his or her head.
- Remove eyeglasses.
- Loosen ties or anything around the neck that may make it hard to breathe.
- Time the seizure. Call 911 if the seizure lasts longer than 5 minutes.

Stop! Do NOT

Knowing what **NOT** to do is important for keeping a person safe during or after a seizure.

Never do any of the following things



- Do **not** hold the person down or try to stop his or her movements.
- Do **not** put anything in the person's mouth. This can injure teeth or the jaw. A person having a seizure cannot swallow his or her tongue.
- Do **not** try to give mouth-to-mouth breaths (like CPR). People usually start breathing again on their own after a seizure.
- Do **not** offer the person water or food until he or she is fully alert.

Types of seizures

General risk factors

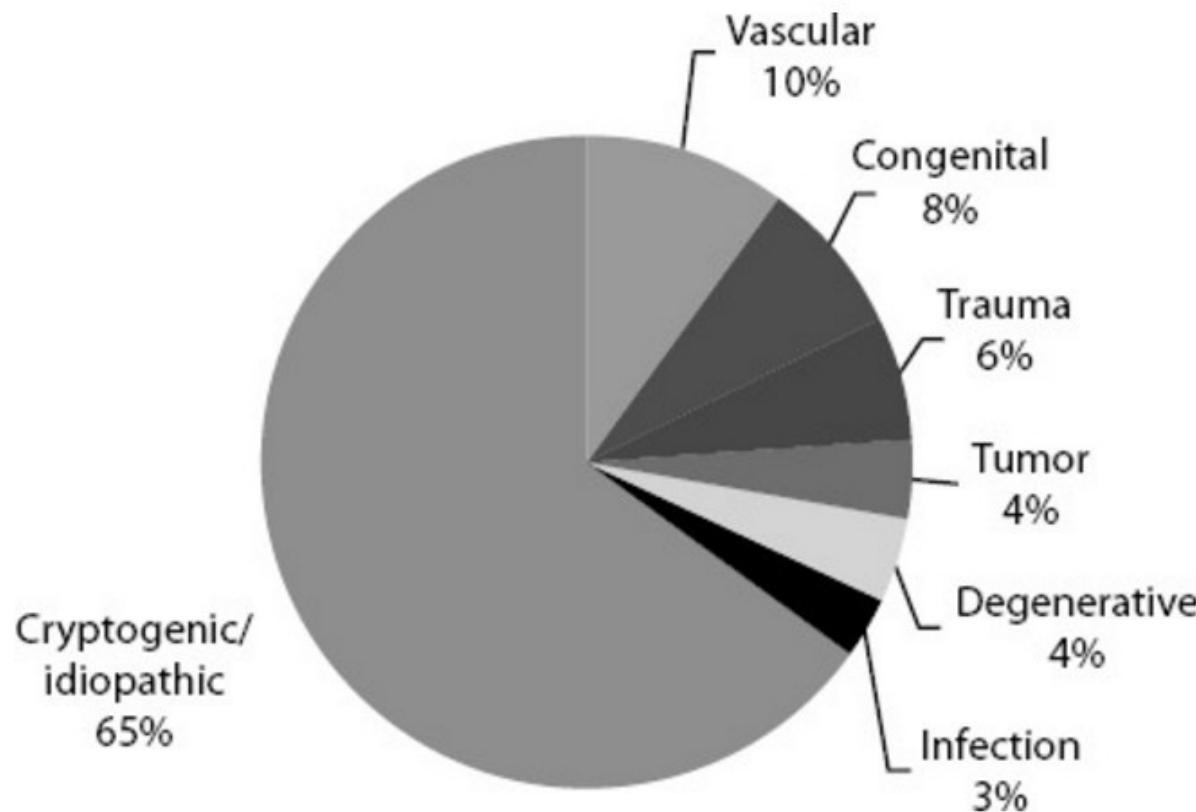


FIGURE 14.1

Proportion of incidence cases of epilepsy by etiology in Rochester, Minnesota, 1935–1983.

from Ding et al. (2016)

Etiology

Table 1
Risk factors for epilepsy

Risk Factors

Febrile seizures
Family history of seizures
Congenital/developmental
CNS infections
Head trauma
Neurodegenerative
Strokes
Vascular malformations
CNS tumors
Neuronal migrational disorders
Other neurologic conditions associated with epilepsy

from Singh & Trevick (2016)

“Epilepsy... is best understood as a collection of individual disorders that share an abnormal tendency to cause epileptic seizures, consisting of dozens of epilepsy syndromes.”
(Keezer et al., 2016)

Seizures and head injury

Immediate seizures = occurring within 24 h after injury

Early seizures = occur less than 1 week after injury

Late seizures = occur more than 1 week after injury

Latent period = time between injury and onset of late seizures



Etiology

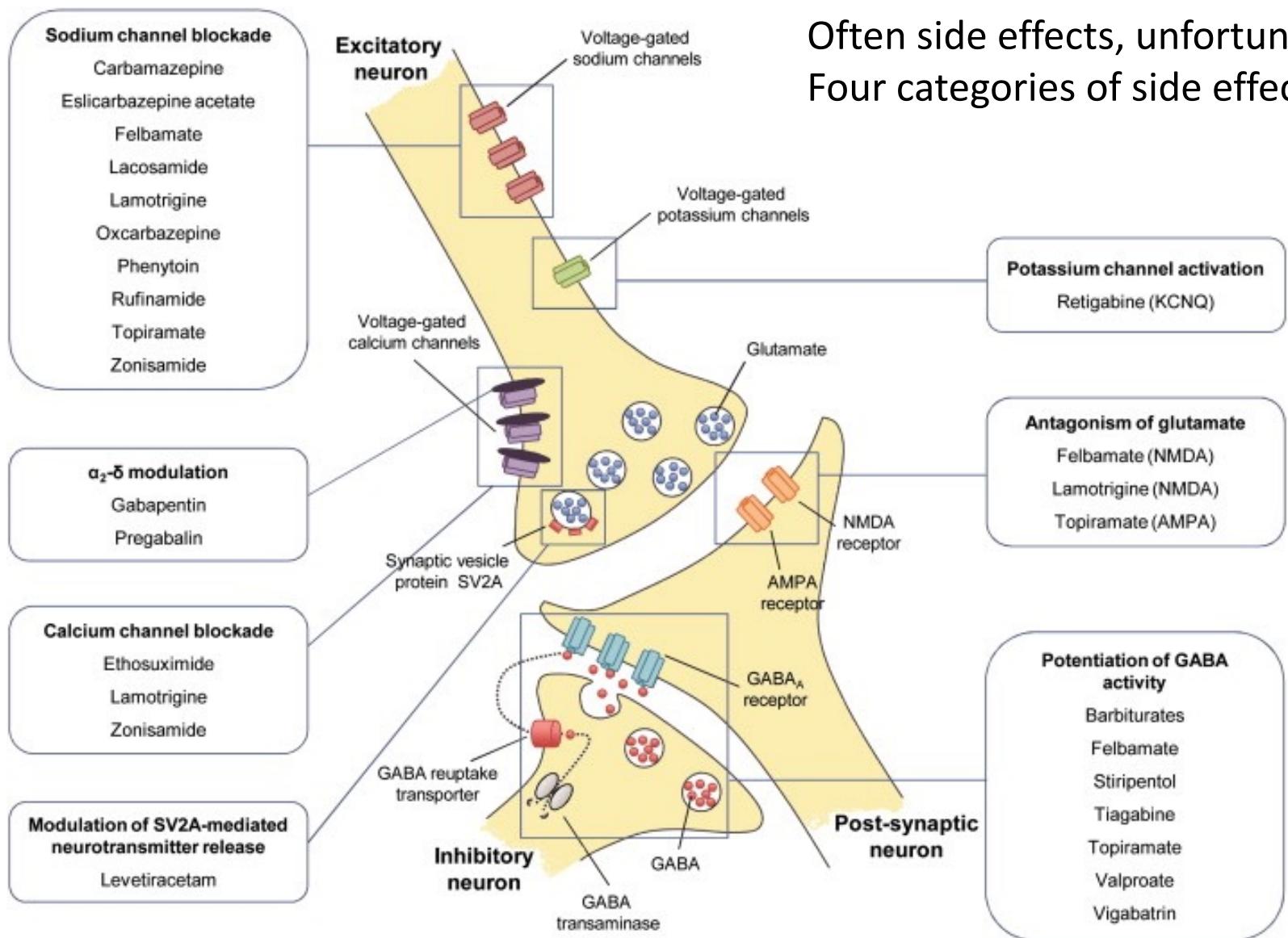
Comorbidities

People with epilepsy are more likely to experience the following co-existing medical conditions:

- Diabetes
- Major depressive disorder
- Anxiety disorders
- Migraine headaches
- Stroke
- Heart disease
- Asthma
- Arthritis
- Suicide

Some common treatments:

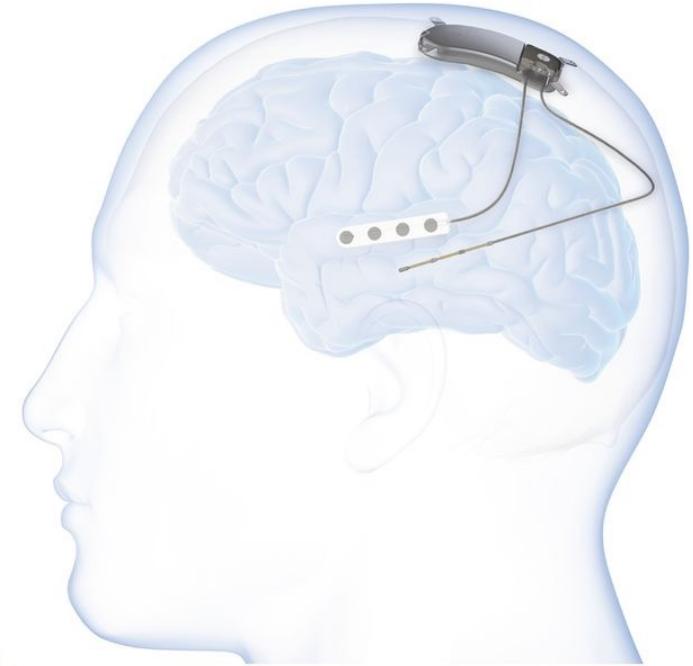
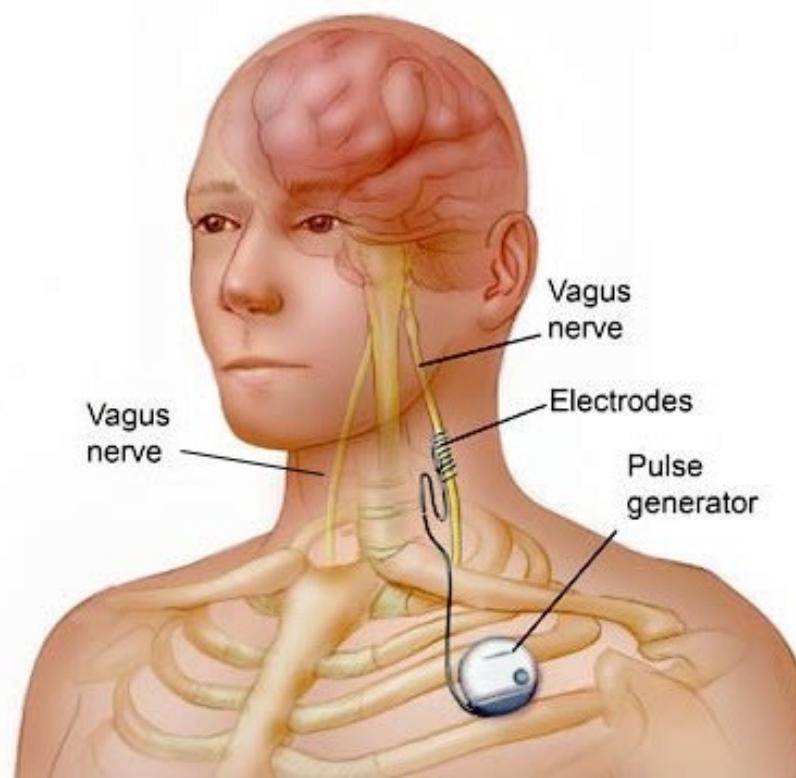
1. Anticonvulsants



Often side effects, unfortunately
Four categories of side effects

Some common treatments:

1. Anticonvulsants
2. Vagus nerve stimulation
3. Ketogenic diet
4. Cannabidiol (CBD)
5. Brain-responsive neurostimulation



Treatments

Some common treatments:

1. Anticonvulsants
2. Vagus nerve stimulation
3. Brain-responsive neurostimulation
4. Ketogenic diet
5. Cannabidiol (CBD)

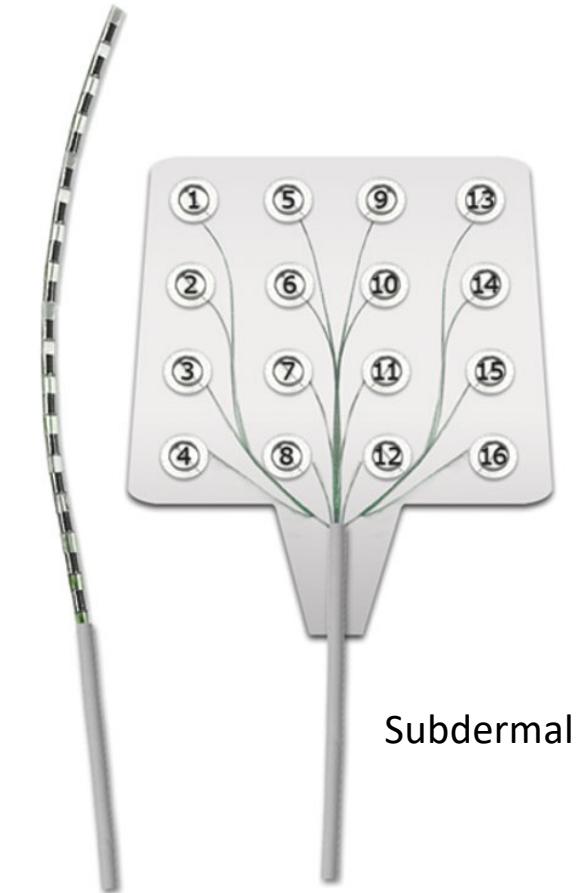
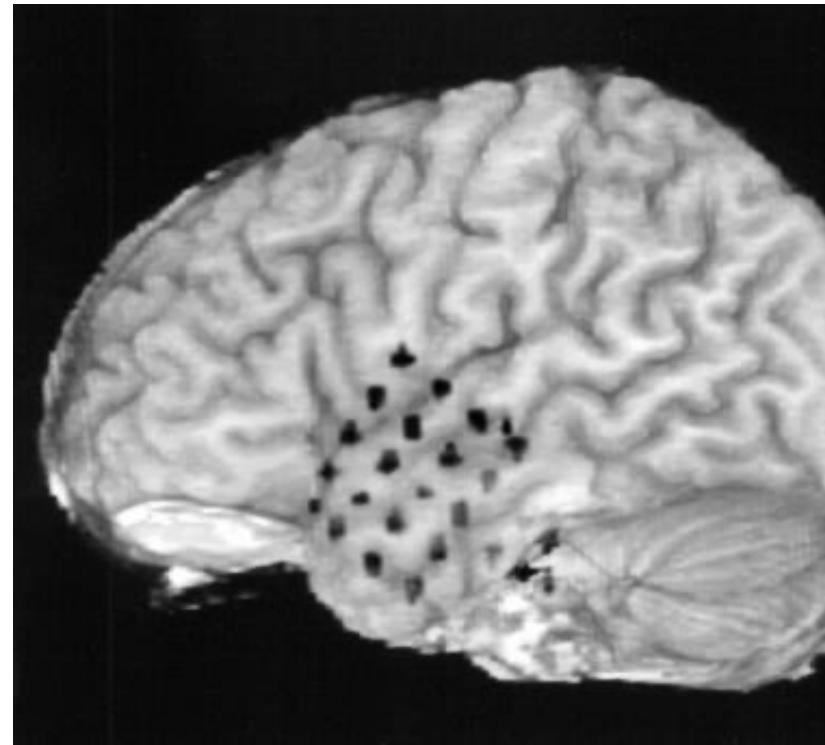


For severe intractable epilepsy,
surgical procedures are sometimes required.

“No brain is better than bad brain.”

Treatments

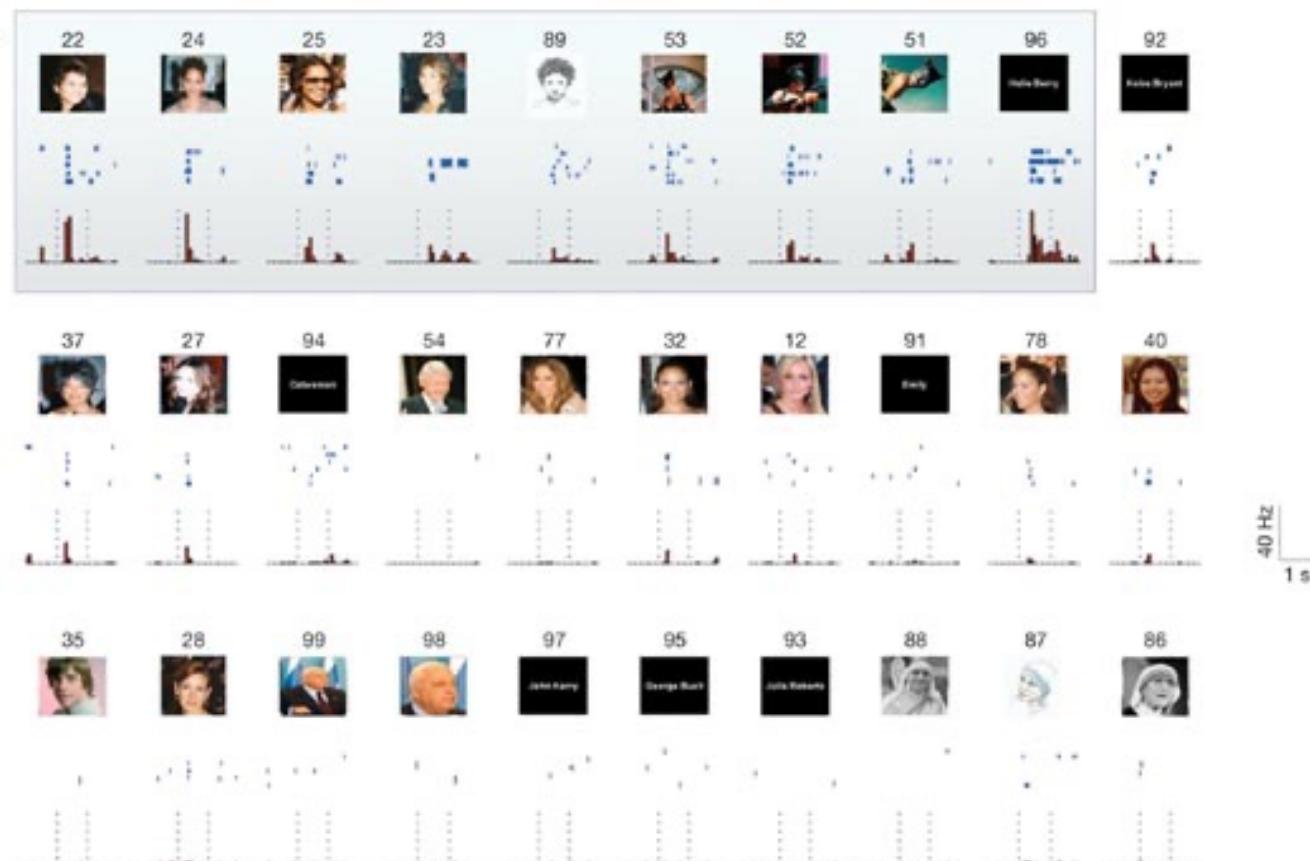
Prior to surgery, electrodes are sometimes inserted into/onto the cortex to find the epileptic focus.



Prior to surgery, electrodes are sometimes inserted into/onto the cortex to find the epileptic focus.

Science (and society) have benefitted greatly from research with these patients.

The “Halle Berry neuron”
Quiroga *et al.* 2005



Treatments

Prior to surgery, electrodes are sometimes inserted into/onto the cortex to find the epileptic focus.

The epileptic focus is much more likely to be found in the frontal or temporal lobes than other parts of the cortex.

→ Why?

→ L&M

