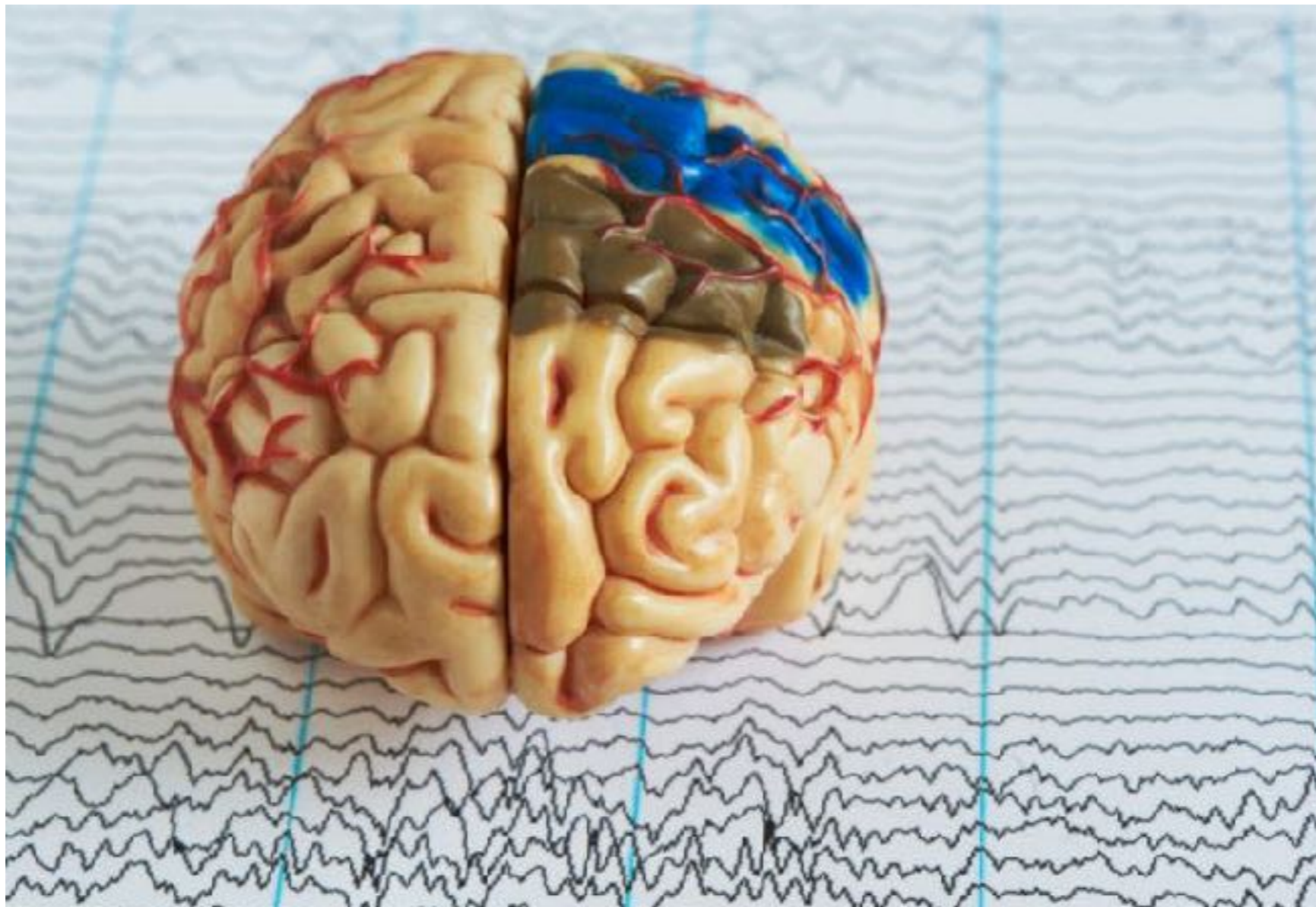


Seizures Classification

Semiology and Localization

Presented by: Ruaa Alsaeed



What's seizure?

- A seizure represents the uncontrolled, abnormal electrical activity of the brain that may cause changes in the level of consciousness, behavior, memory, or feelings.



Generalized vs Focal?



FOCAL
SEIZURE



GENERALIZED
SEIZURE

Epilepsy and Seizures

Partial seizure

= focal onset seizure

Simple Partial

= remains conscious

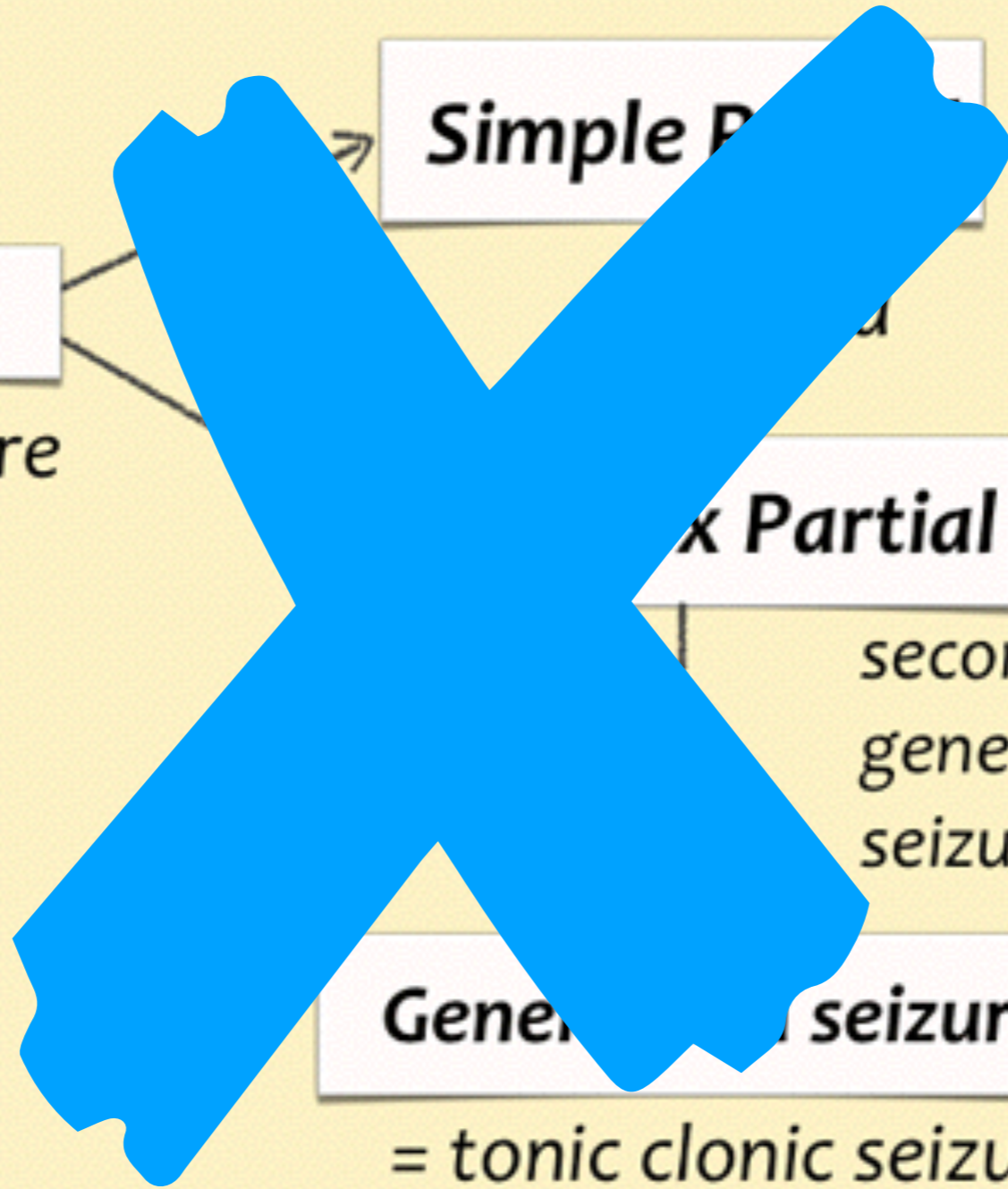
Complex Partial

= lose consciousness

secondarily
generalised
seizure

Generalised seizure

= tonic clonic seizure
with unconsciousness



**FOCAL
ONSET**

aware

impaired
awareness

**MOTOR
NON-MOTOR**

Focal to bilateral
tonic-clonic

**GENERALIZED
ONSET**

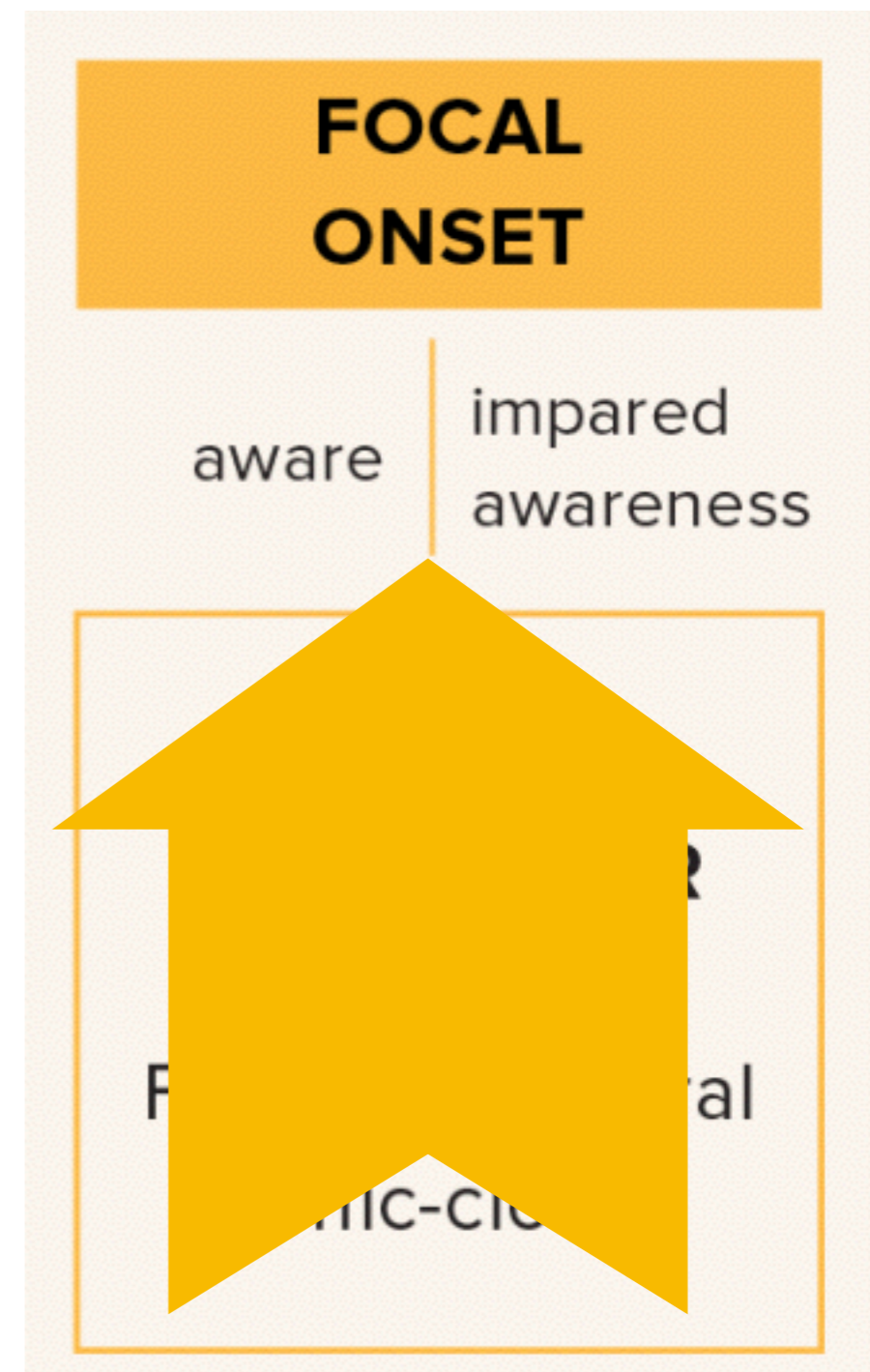
impaired awareness

MOTOR
tonic-clonic
other motor

NON-MOTOR
absence

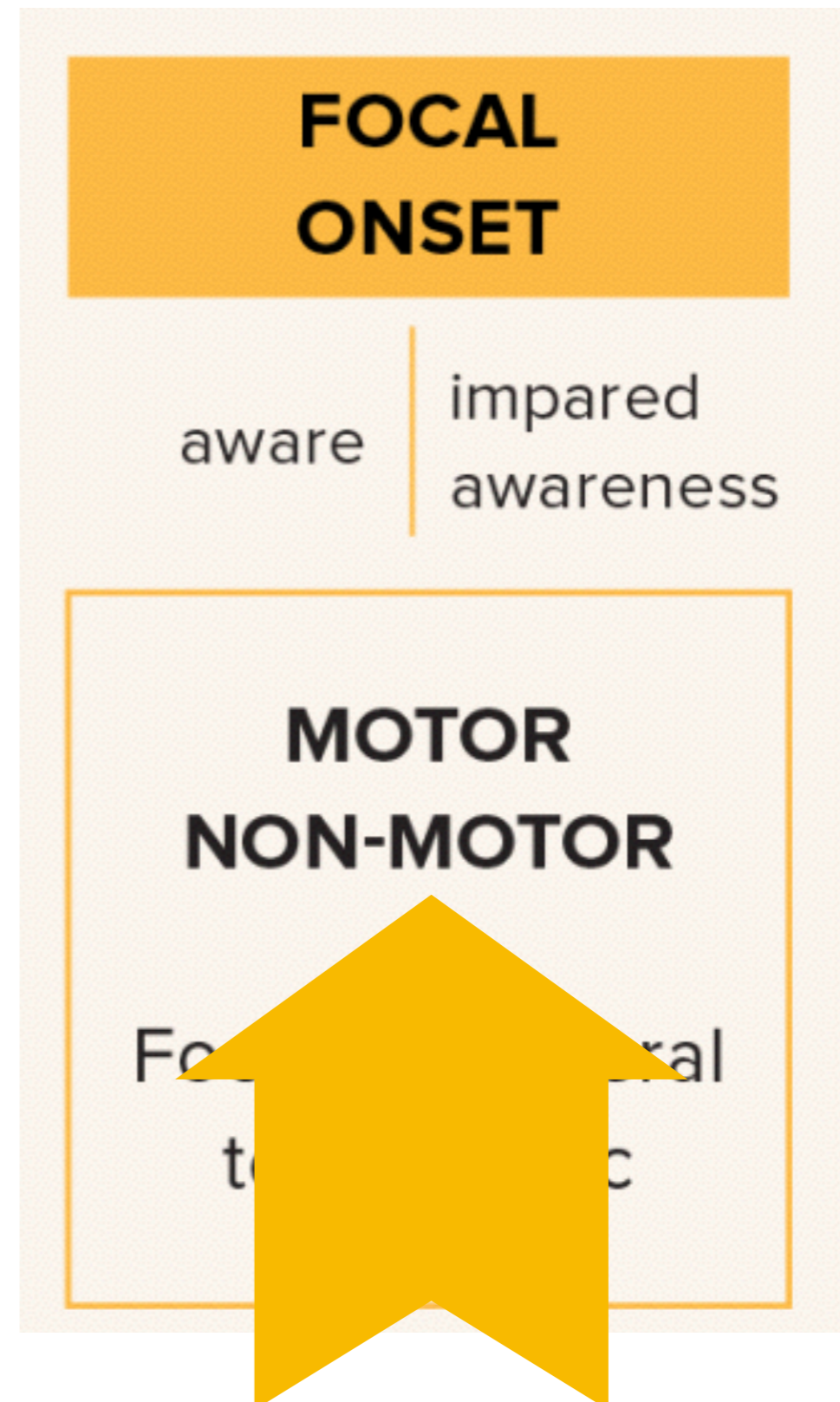
Impaired vs Preserved Awareness?

- **Impairment of awareness** was most commonly associated with bitemporal or left temporal seizure activity, likely due to the temporal lobe's widespread connectivity to cortical and subcortical structures. However, altered awareness can also be seen in frontal and parietal lobe seizures. In contrast, **awareness** is preserved in the majority of insulo-opercular seizures

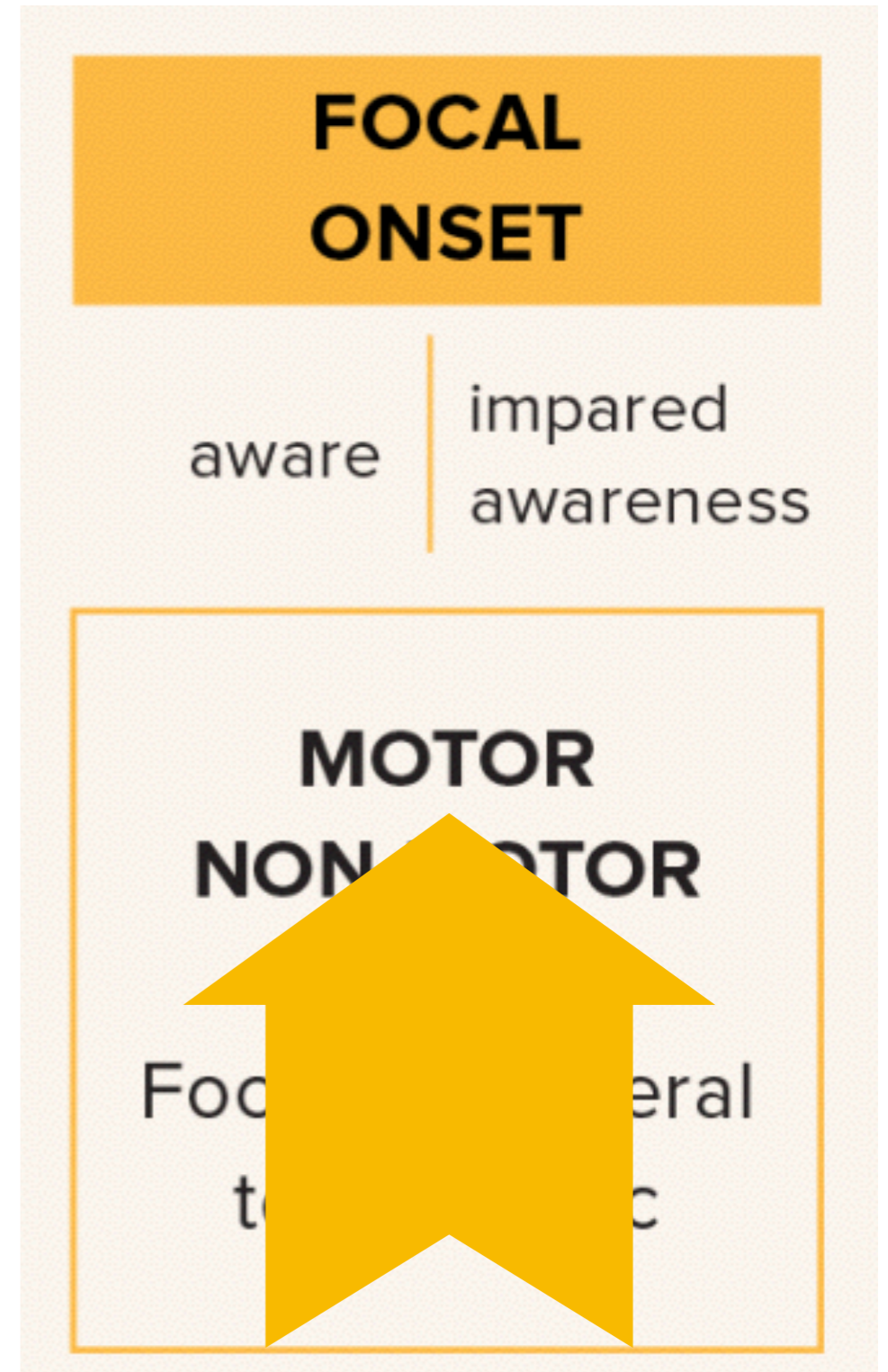


Motor vs Non-motor

- The second optional modifier of focal seizures in the 2017 classification is motor onset vs. non-motor onset. Like generalized seizures, focal motor seizures can be associated with a wide variety of motor manifestations. Simple motor features consist of movement around a single joint whereas complex motor features necessitate movement around multiple joints. In focal seizures, these will typically be restricted to particular regions of the body (e.g. lateralizing to one hemibody or localizing to a particular extremity), at least prior to bilateral spread.



Focal Motor Seizures



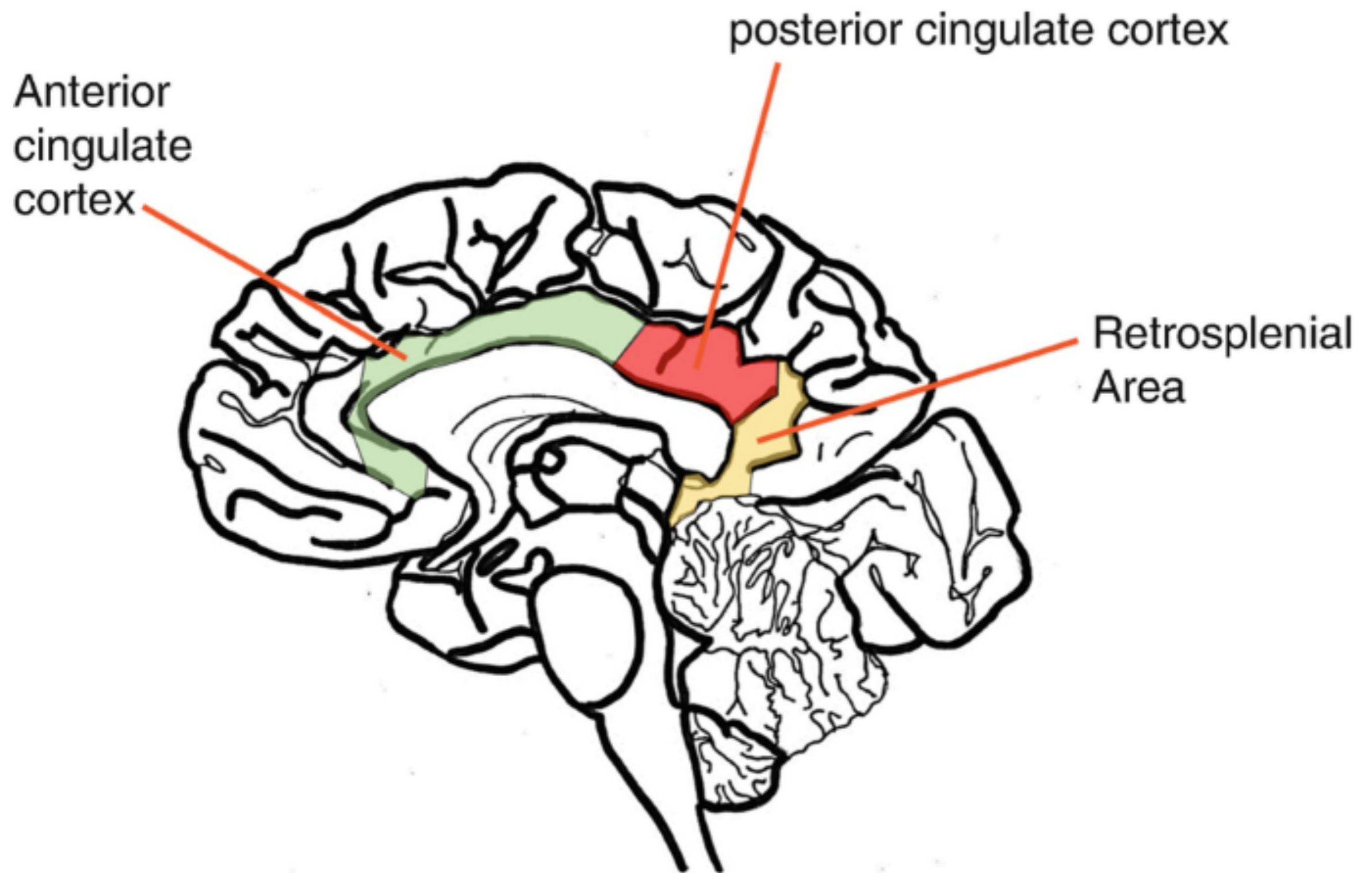
Classification of Motor Focal Seizures

- *Focal automatism seizures:*

Repetitive, non-rhythmic movements that could arise from:

- Temporal lobe (most common area): Sexual orgasmic automatisms
- Frontal lobe: typically of shorter duration and involve more proximal movements such as bicycling,
- Anterior cingulate or retrosplenial cortex: oroalimentary and manual automatism

Regarding lateralization of focal automatism seizures, unilateral automatisms are predominantly ipsilateral to the epileptogenic zone



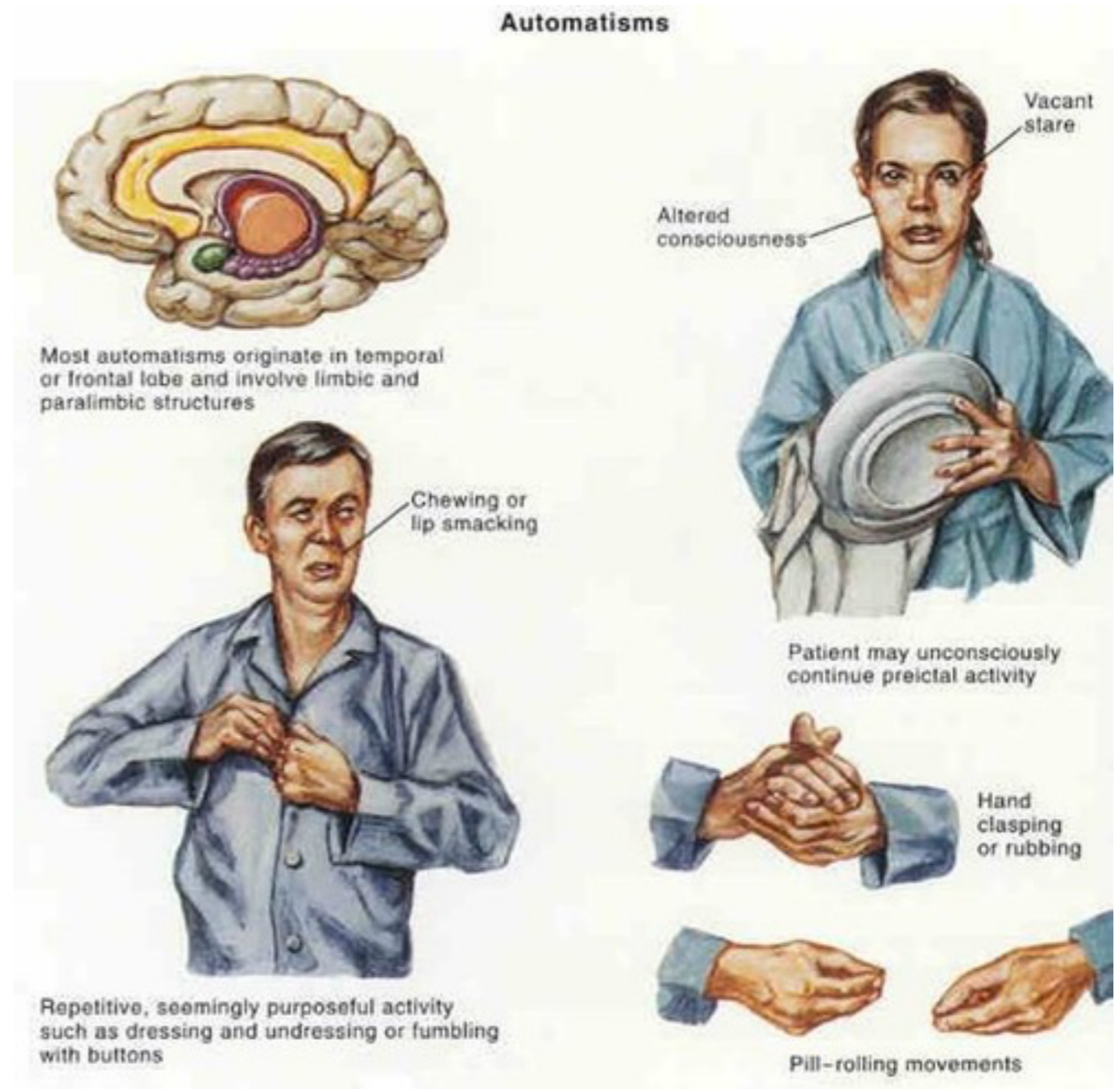
Anterior
cingulate
cortex

posterior cingulate cortex

Retrosplenial
Area

More About Focal Automatism

- Preservation of awareness during focal automatism seizures is strongly suggestive of **non-dominant mesial temporal epilepsy**, unless associated with aphasia, which implicates the dominant temporal lobe.
- Ipsilateral automatisms with contralateral dystonic posturing suggest **mesial temporal lobe epilepsy**, while ipsilateral automatisms with ipsilateral dystonic posturing suggest **neocortical temporal lobe epilepsy**



Classification of Motor Focal Seizures

- *Focal atonic seizures:*

- Atonic seizures involve a loss of tone, either axial or appendicular. Atonia as the primary ictal manifestation of focal seizures is rare, with most focal seizures involving atonia presenting with additional motor (61%) and/or sensory (50%) signs.
Atonic seizures usually arise from stimulation **primary and supplementary negative motor areas** with involvement of the temporal lobe in some types:
 - Temporal lobe: unilateral “sagging” (leaning or falling to one side) has also been reported in mesial temporal lobe epilepsy

Classification of Motor Focal Seizures

- *Focal clonic seizures:*

- Rhythmic, stereotyped muscle contractions, with approximately 2/3 being focal in onset. When focal, the symptogenic zone is usually the contralateral primary motor strip. Preservation of awareness at the onset of the clonus suggests an epileptogenic focus in close proximity to the **primary motor strip**.

These types of seizures can also arise from:

- Temporal lobe: in temporal lobe epilepsies, the face, frontal eye field, and hand areas tend to be involved earlier than the legs

- Frontal lobe: a typical evolution of fronto-central onset seizures includes distal clonus with Jacksonian march, usually with contralateral head version

- Insulo-orpeccular: facial clonic jerking involving contraction of mouth corner

Classification of Motor Focal Seizures

- *Focal epileptic spasms:*

- Typically characterized by abrupt onset flexion, extension or mixed flexion–extension of proximal and truncal muscles lasting 1–2 s; however, more subtle forms with only facial/eye movements and/or head nodding are also seen. They often occur in clusters, classically upon awakening. This type of seizure was considered generalized, however it was recently proven that 40-60% of these seizures are actually arise from focal lesions. Recognition of focal onset epileptic spasms is of particular importance, given their intractable nature, as identification of a structural etiology allows consideration of epilepsy surgery. Focal epileptic spasms can arise from a wide range of brain loci. **Frontal lobe** lesions are most commonly involved, followed by **temporal, parietal, occipital** and **insular** regions.

Classification of Motor Focal Seizures

- *Focal Hyperkinetic seizures:*

- Sometimes referred to as hypermotor, focal hyperkinetic seizures present with complex, sometimes violent movements of the trunk and proximal segment of limbs involving multiple articulations in different planes. They can resemble normal movements, such as pedaling or swimming, or more bizarre movements such as writhing or pelvic thrusting
- *Temporal lobe:* seizures during wakefulness, salivation, and bilateral drop of the corners of the mouth
- *Frontal lobe:* associated with emotional facial expressions (such as fear, laughing, or anger), bilateral forceful elbow flexion, bilateral forceful grasping, facial flushing, and bilateral facial contraction.

Classification of Motor Focal Seizures

- *Focal myoclonic seizures:*

Myoclonic seizures consist of short duration muscle contractions lasting less than 100 ms. While traditionally considered a generalized seizure type, they can be focal in origin, with multiple studies implicating the **superior frontal cortex** (primary motor cortex, premotor cortex or SSMA) as a potential area of epileptogenicity.

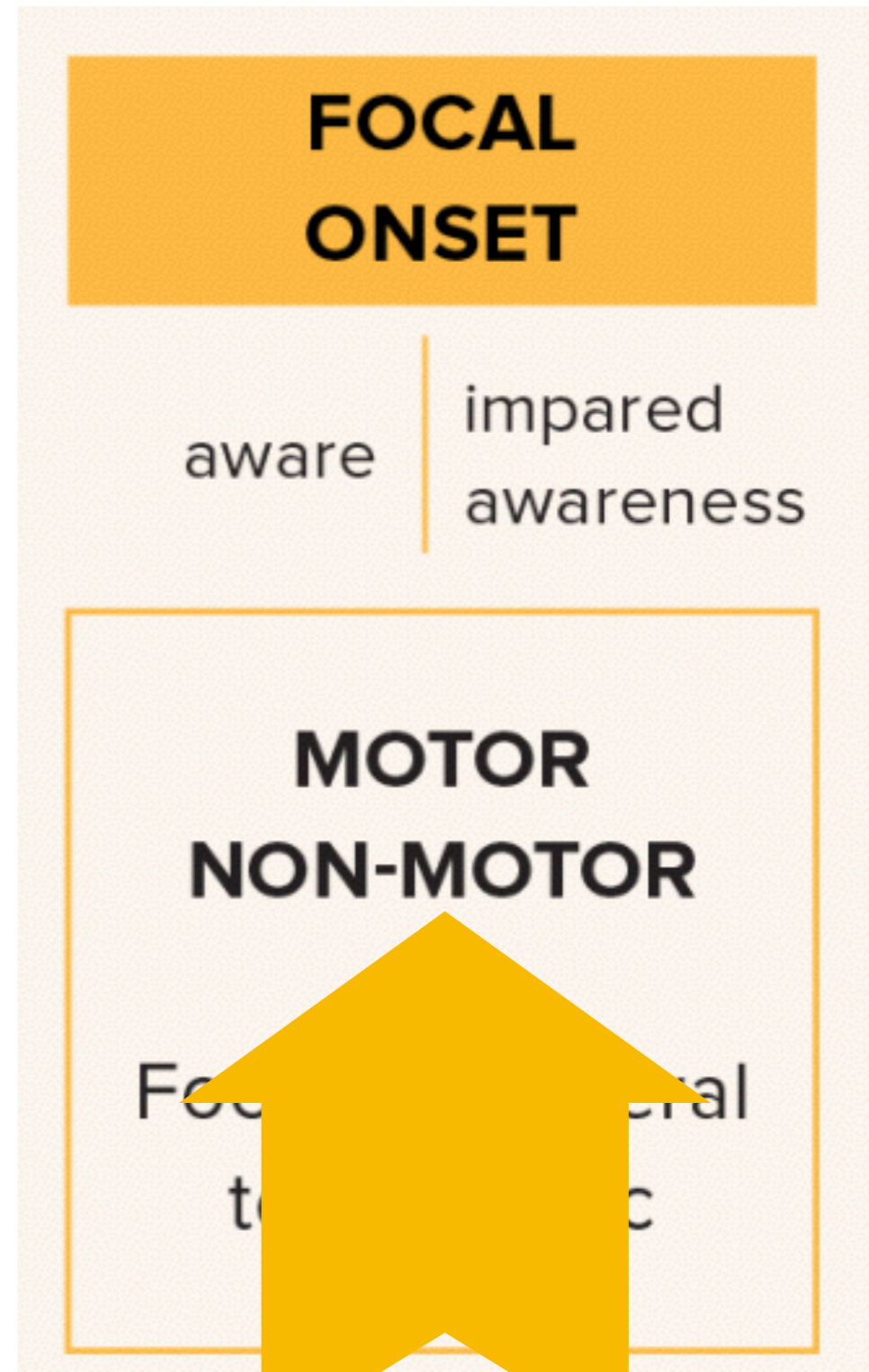


Classification of Motor Focal Seizures

- *Focal tonic seizures:*

- Tonic seizures consist of sustained muscle contractions that last for several seconds to minutes, preferentially affecting proximal muscle groups . Sometimes described as posturing, they can be unilateral, bilateral. Most focal tonic seizures arise from **frontal lobes**, usually precentral and premotor regions, but they can also arise from the **parieto-occipital**, or less commonly, **temporal lobes**. They manifest as:
- Versive seizures are a subset of tonic seizures consisting of involuntary, sustained, forceful turning of the head, eyes and/or trunk from midline, often associated with neck extension resulting in a sustained unnatural position. Versive seizures can be the initial manifestation in frontal lobe seizures, in which case the symptomogenic zone may be the contralateral **prefrontal eye fields or SSMA**.

Focal Non Motor Seizures



Classification of Non-Motor Focal Seizures

- *Focal non-motor autonomic seizures:*

Focal seizures are labeled as autonomic when the most prominent early feature involves objective autonomic manifestations such as tachycardia or retching/emesis. Seizures can affect a number of autonomic parameters, but cardiovascular phenomena seem to be the most prominent expression. Sympathetic responses typically predominate, causing tachycardia, tachypnea, hypertension, pupillary dilatation, diaphoresis, and facial flushing. It can also involve Pulmonary symptoms such as ictal coughing, hyperventilation, hypoventilation and apnea have also been tied to temporal lobe foci

These seizures tend to occur more frequently with **temporal** then extratemporal (primarily **frontal**) onset.

Urinary symptoms during a seizure, not to be confused with postictal incontinence, tend to present in generalized rather than focal seizures, however urinary urge can be seen with seizure foci in the frontal lobe

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Classification of Non-Motor Focal Seizures

- *Focal non-motor cognitive seizures:*

Cognitive seizures are characterized by transient alterations in thinking and higher cortical functions that are focused and prominent in comparison to other relatively unimpaired aspects of cognition. These can be deficits (such as receptive or expressive dysphasia or aphasia, anomia or alexia) or positive phenomena (such as forced thoughts). Common examples include feelings of déjà vu (the sense that something has already been seen), jamais vu (the sense of unfamiliarity at a familiar sight), illusions or hallucinations. Invasive monitoring and cortical stimulation studies often localize these phenomena to lateral and/or mesial **temporal** regions, including the hippocampus, amygdala, and entorhinal and perirhinal cortices

Classification of Non-Motor Focal Seizures

- *Focal non-motor emotional seizures:*

- These seizures present with prominent emotions such as fear, happiness or anger, or with the objective appearance of an affective state without the subjective emotions. Emotional seizures usually arise from the **temporal lobe and amygdala**.
- Gelastic and dacrystic seizures are interesting examples of emotional seizures. They are associated with hypothalamic hamartomas:
 - Gelastic seizure: bouts of uncontrolled laughing or giggling.
 - Dacrystic seizure: when a person makes a crying sound. They may also look like they are grimacing.



Classification of Non-Motor Focal Seizures

- *Focal visual seizures:*

- Up to 85% of patients with **occipital lobe** epilepsy have seizures that begin with visual hallucinations. These may present with flashing light(s), bright, dark or colored spots, or geometric shapes that may be stationary or move within the visual field. An emotional component of the visual seizure suggests temporal lobe involvement.



Thank you!

References:

- The 2017 ILAE Seizure Classification

