Physiology of Consciousness

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- Important
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- Note from Males' slides

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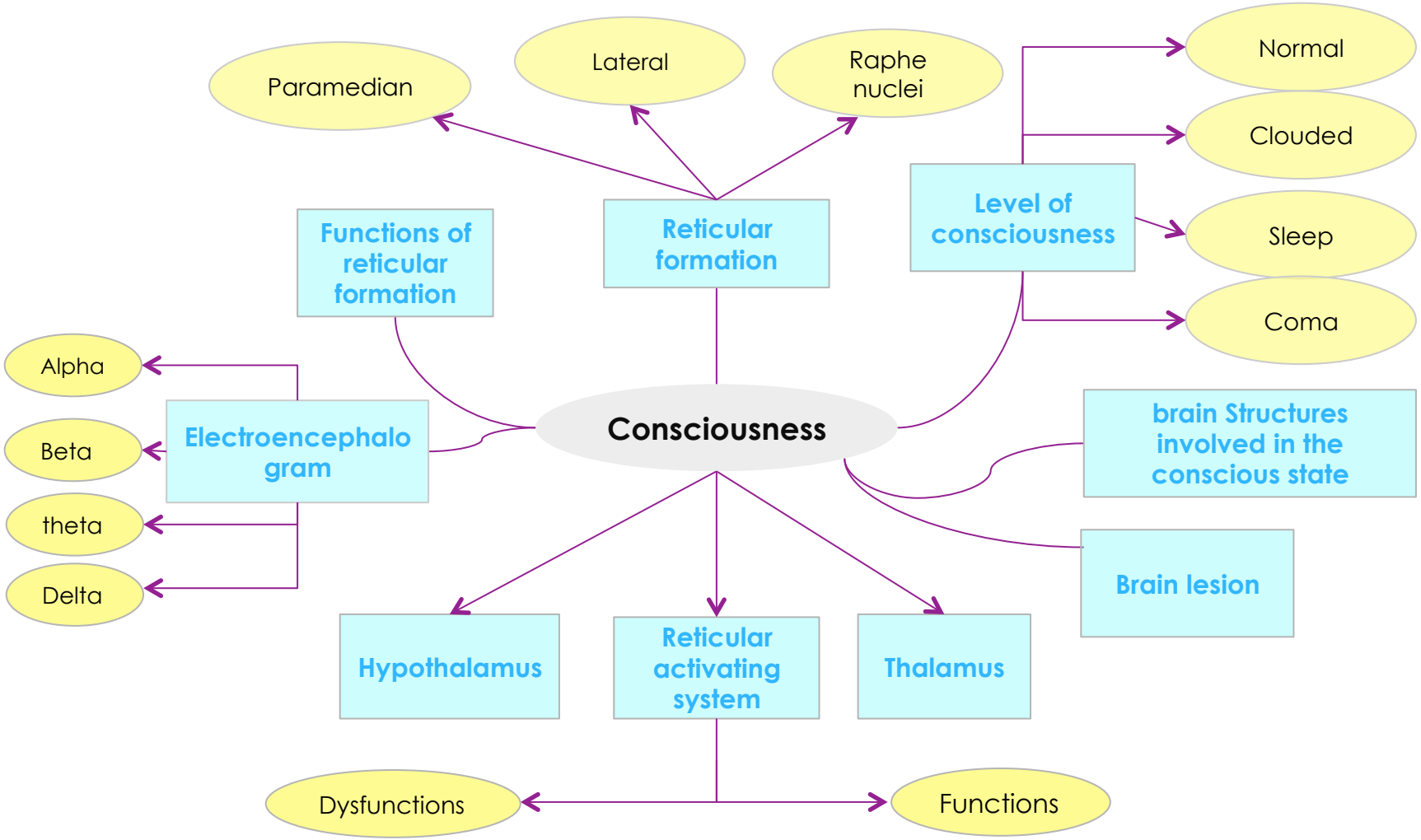
Recommended Videos!

Please check out this link before viewing the file to know if there are any additions/changes or corrections. The same link will be used for all of our work Physiology Edit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Mind Map

What Is Consciousness[1]?

- Consciousness has been defined by psychologists as our awareness of ourselves and our environment.
- Two awake states: relaxed awareness and awareness with concentrated attention
- It is a product of electrical activity of the brain

flat EEG = unconscious

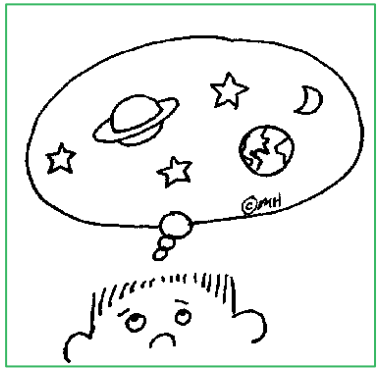
Level of Consciousness		
Normal Consciousness	State of normal arousal , being fully awake and aware of the self and surroundings	
Clouded Consciousness	Person conscious but mentally confused. E.g., in cases of **drug or alcohol intoxication , high fever** associated with malaria or septicemia , dementia	
Sleep	Person unconscious but is arousable (can be aroused)	
Coma	Person unconscious and not aroused	

1: الوعي

Level of Awareness in Consciousness

Controlled processes
require attention (and interfere with other functions)

Automatic Processes
require minimal attention.

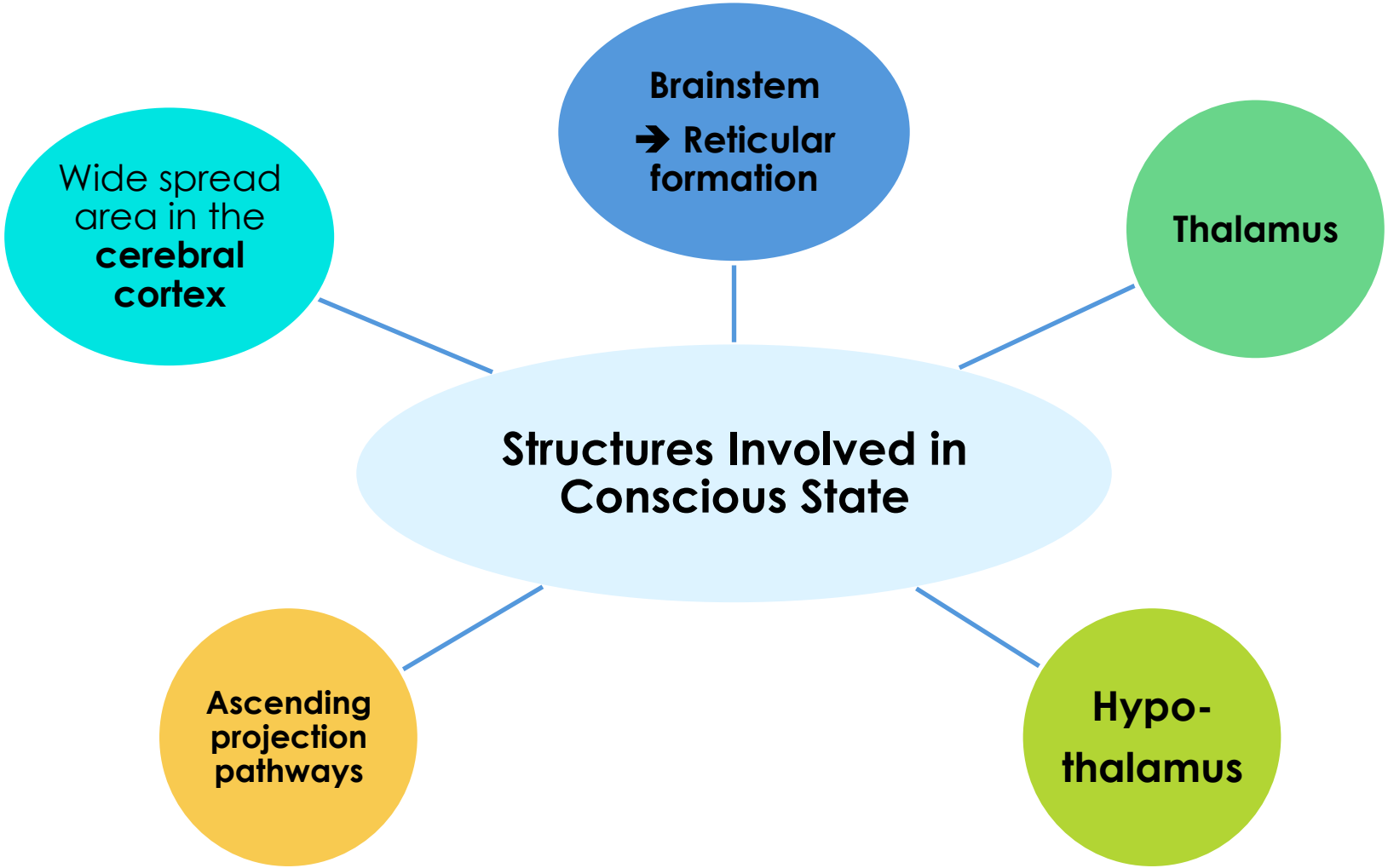


Daydreaming
Minimal or no awareness of the environment

Continuum[1] of Consciousness

refers to a broad range of experiences, from being sharply alert to being completely unaware and unresponsive.

1: a continuous sequence in which adjacent elements are not perceptibly different from each other.


Brainstem
➔ Reticular formation
Wide spread area in the **cerebral cortex**
Thalamus
Structures Involved in Conscious State
Ascending projection pathways
Hypo-thalamus

Reticular Formation

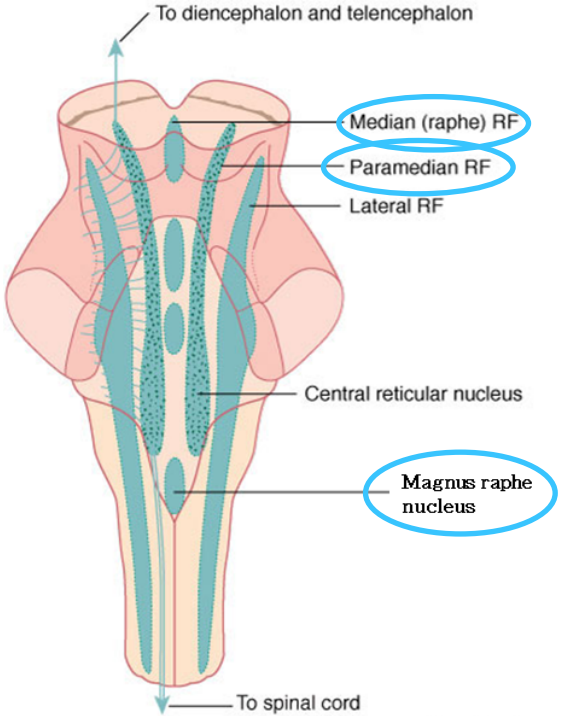
Set of interconnected nuclei that are located in the brainstem and the thalamus

✧Important in:

- ✓Behavioral arousal
- ✓Regulates many vital functions including the sleep/ awake cycle
- ✓Connect the brain stem to the cerebral cortex

✧It consist of 3 parts

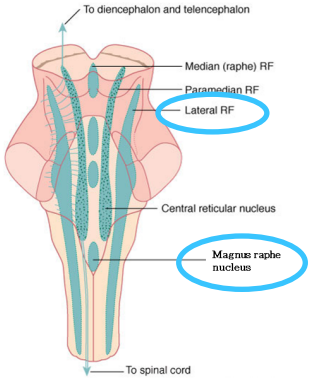
- ✓Lateral Reticular Formation
- ✓Paramedian Reticular Formation
- ✓Raphe nuclei (Median RF)

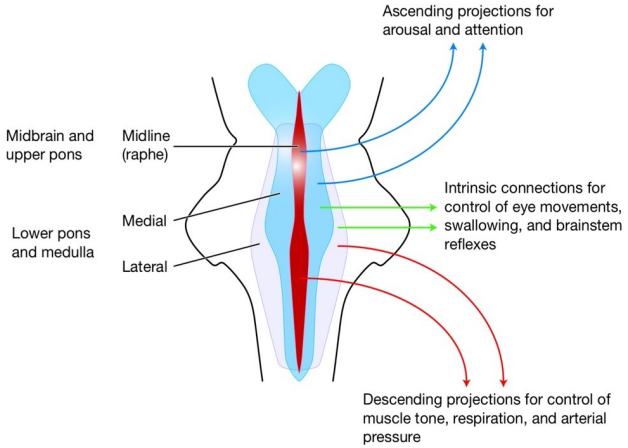


Reticular Formation Parts

✧ Lateral Reticular Formation : (Small Neurons)

Receives	From
Touch and pain	Ascending tracts
Vestibular information	Median vestibular nerve
Auditory information	Superior olivary nucleus
Visual information	Superior colliculus.
Olfactory information	Medial forebrain bundle





✧Raphe Nuclei (Median Reticular Formation) :

In the midline of the RF

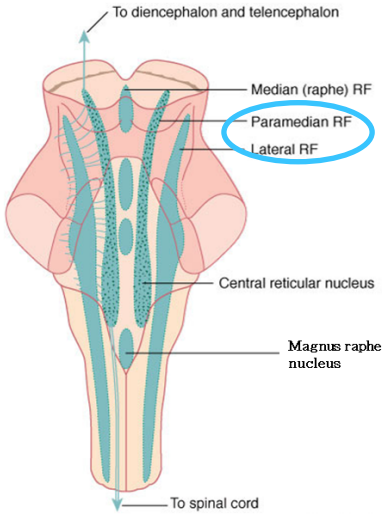
Contain serotonergic projections to the brain and spinal cord

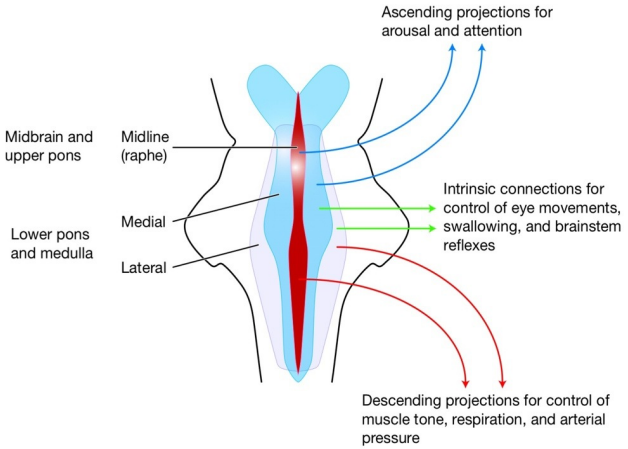
RECALL WHEN WE DISCUSSED SEROTONIN AND ITS ROLES IN SLEEP LECTURE!

Reticular Formation Parts cont.

✧Paramedian Reticular Formation: (Large Cells)

Receives	Contains	Projects onto
Signals from lateral Reticular formation	Noradrenergic (NA) neurons	Cerebral hemispheres.
	Dopaminergic (DA) neurons	
	Cholinergic (Chl) neurons	Thalamus





Functions of Reticular Formation

✧**Somatic motor control:**

Reticulospinal tracts

(spinal cord tract originating in the reticular formation in the brainstem and impinging on mo tor fibers arising in the spinal cord.)

✧**Cardiovascular control:**

The reticular formation includes the cardiac and vasomotor centers of the medulla oblongata.

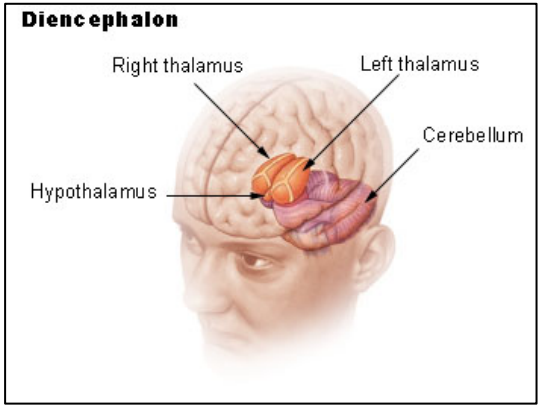
✧**Pain modulation:**

- Pain signals from the lower body➔ reticular formation➔ cerebral cortex.
- It is also the origin of the descending analgesic pathways.

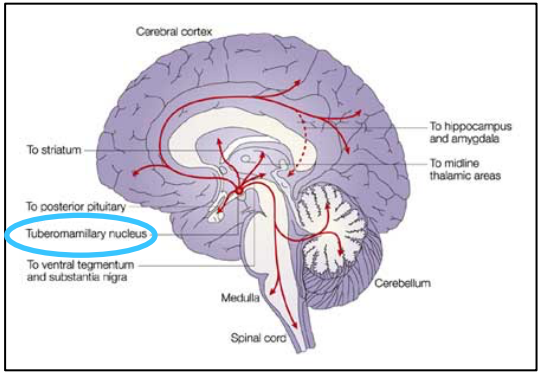
The nerve fibers in these pathways act in the spinal cord to block the transmission of some pain signals to the brain.

Thalamus and Hypothalamus

✧Located n the mid-part of the diencephalon



	Responsible for
Cholinergic projections from Thalamus	•Activation of the cerebral cortex •Regulation of flow of information from RF[1] to Cerebral cortex
Hypothalamus (Tuberomammillary nucleus in the hypothalamus projects to the cortex)	•Maintaining the awake state



1: Reticular Formation

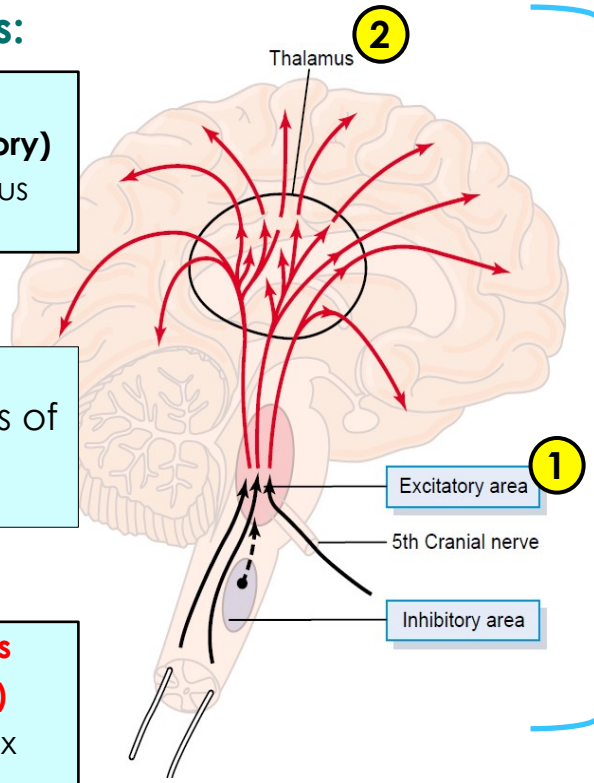
Reticular Activating System (RAS)

Reticular formations consists of (Excitatory + inhibitory) areas:

1. **Excitatory area (Bulboreticular Facilitory)**
   Sends excitatory signals into Thalamus

2. Thalamus excites almost all areas of the cortex

Bulboreticular Facilitory + thalamus
=Reticular Activating System (RAS)
is the system which keeps our cortex awake and conscious!

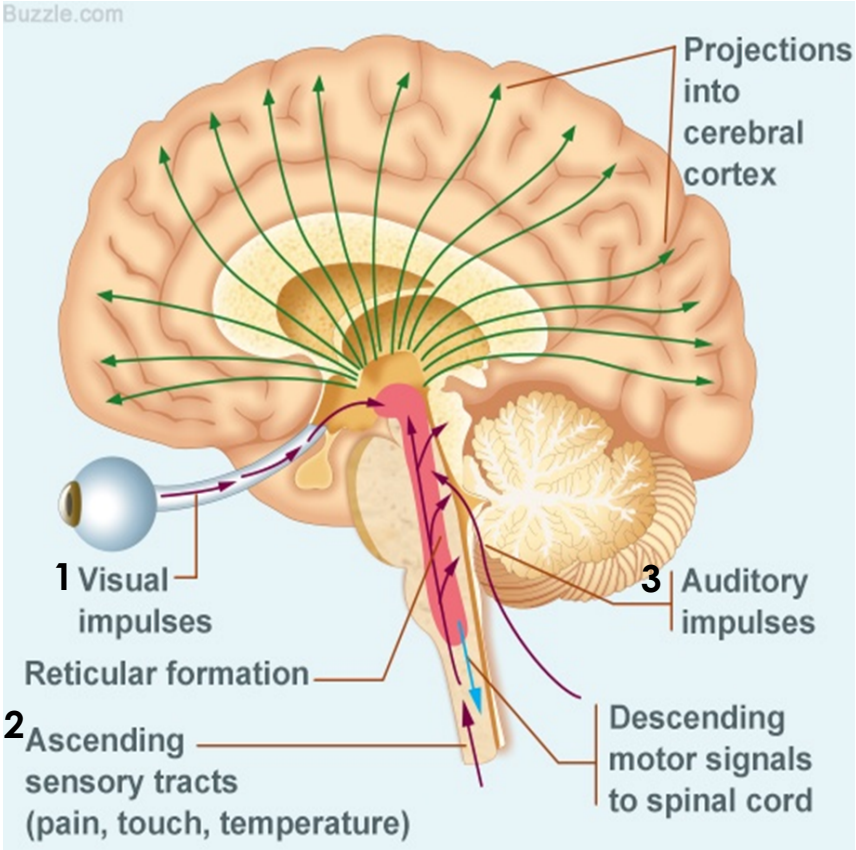


Anatomical Components of RAS

- Originate in the **upper brainstem** reticular core and project through synaptic relays in the **thalamic nuclei** to the **cerebral cortex.**

- Connecting the brainstem to the cortex through several neuronal circuits.

Sensory Inputs to RAS:



Functions of RAS:

1- Regulating sleep-wake transitions:

By suppressing ascending afferent activity to the cerebral cortex → sleep

2-Attention:

Mediate transitions from relaxed wakefulness to high attention.

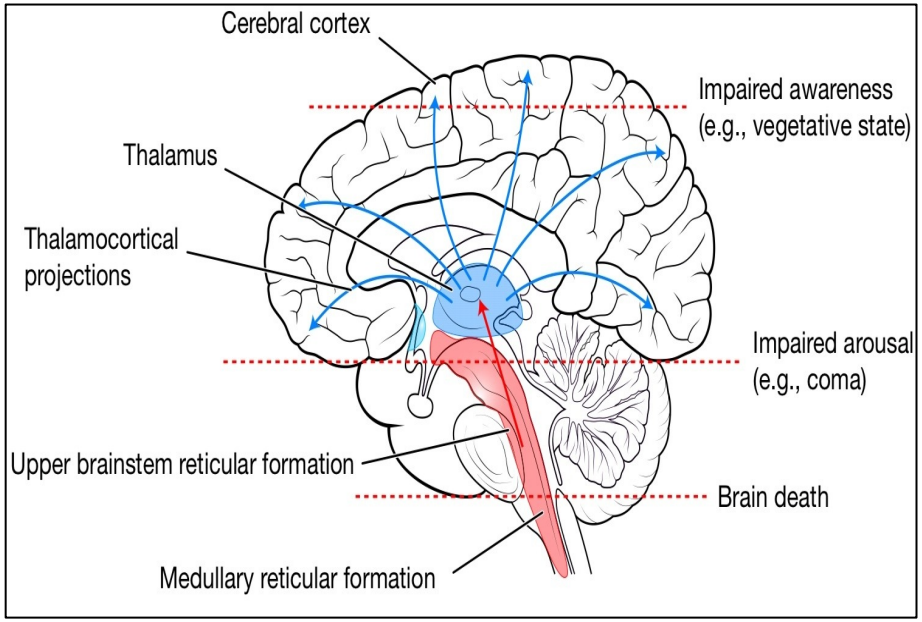
3-RAS and learning

*Is the center of balance for the other systems involved in **learning, self-control or inhibition, and motivation.**

*Provides the neural connections for **processing and learning of information**, **Selective attention** (to the correct task)

RAS system has been discussed in more details in males' slides,
The previous 2 slides was based on females' slides. WHICH WE THINK INSHA'ALLAH IS ENOUGH.

Brain Lesions:



- Bilateral lesions of thalamic intralaminar nuclei →I ethargic or drowsy
- Lesion in the mid-pons → unconsciousness
- Pons (uppers & middle) and midbrain are essential for wakefulness

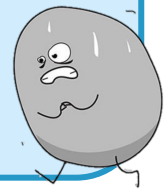
RAS Dysfunction:

If RAS is Depressed

- ✓ Under-aroused cortex.
- ✓ Difficulty in learning.
- ✓ Poor memory.
- ✓ Little self-control.
- ✓ Lack of consciousness or even coma.

If RAS is Excited (AS IN ADHD)

- ✓ Over aroused cortex.
- ✓ Hyper-vigilance (sensory sensitivity)
- ✓ Touching everything
- ✓ Talking too much
- ✓ Restless
- ✓ Hyperactive



Indices[1] of Level of Consciousness:

Appearance & Behavior :

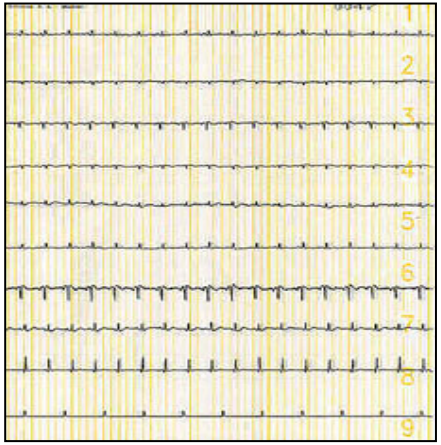
- ✧ Posture (sitting , standing)
- ✧ Open eyes
- ✧ Facial expression
- ✧ Responds to stimuli (including the examiner's questions about name, orientation in time & place &other general Qs like who is the president)

Vital signs :

- ✧ Pulse , BP, respiration , pupils , reflexes , particularly brainstem reflexes , etc)
- ✧ EEG → Each of these states (wakefulness , sleep , coma and death) has specific EEG patterns
- ✧ Evoked potentials (in cases of Brain Death).(s an electrical potential recorded from the nervous system following presentation of a stimulus ,detected by (EEG)or (EMG))

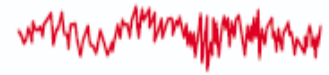
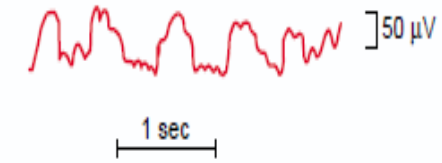
1: مؤشرات

Normal EEG (at normal magnification)



Brain Death (Flat EEG ,at very high magnification)

Electroencephalogram (EEG) Waves

Wave	Site of record	Situation to appear	Frequency	Notes	Waveform
Alpha	Parietal & occipital regions	Awake and relaxed+ eyes closed	10 to 12 cycles/sec		
Beta	Frontal lobes	Visual stimuli and mental activity	13 to 25 Cycles/sec		
Theta	Temporal & occipital Regions	Newborn	5 to 8 cycles/sec	In adults indicates severe emotional Stress	
Delta	Cerebral cortex	Sleep and in an awake infant	1 to 5 cycles/sec	In an awake adult indicates brain damage	

1-unconsciouness but aroused mean:
A. Normal conscious
B. Clouded conscious
C. sleep
D. coma

2-Reticular formation important in :
A. Cardiovascular control
B. Sleep / awake cycle
C. Habituation
D. All

3-consciouness mean when a person cant be aware of him self and surrounding
A. true
B. False

4-lateral reticular formation receives pain from:
A. Inferior colliculus
B.Medial forebrain bundle
C. Superior olivary nucleus
D. Ascending tracts

5- Bulboreticular Facilitory is :
A. Inhibitory area of the RF
B. Excitatory area of the RF
C. Paramedian Reticular Formation
D. Test t indicate the level of consciousness

6-which one of the following situations can lead to restless behaviour?
A. RAS dysfunction(excited)
B. RAS dysfunction(depressed)
C. bilateral lesions of thalamic intralaminar nuclei D. Cerebral cortex lesion

7-what would be the condition of patient has a Lesion in the mid-pons ?
A. Clouded consciousness
B. Talking too much
C. drowsy
D. unconscious

8-which of the following waves appearance in adults indicates severe emotional stress ?
A. Alpha
B. Beta
C. Theta
D. delta

1.C
2.D
3.B
4.D
5.B
6.A
7.D
8.C

MCQs

1-what are the levels of consciousness ?

1 -Normal when a person aware of the self and surroundings 2 -Clouded conscious but mentally confused 3 – sleep unconscious but can aroused 4- coma : unconscious and not aroused

2-what are the parts of reticular formation ?

. Lateral Reticular Formation ,Paramedian Reticular Formation and Raphe nuclei

3- where are descending analgesic pathways? functions ?

.in Reticular formation - to block transmission of some pain signals to the brain.

4- what are the functions of the RAS?

. Regulating sleep-wake transitions, Attention ,learning

5-how could you describe the situation of patient has a bilateral lesions of thalamic intralaminar nuclei ?

drowsy

6- list three indicators of consciousness level?

1. Facial expression
2. Responds to stimuli (including the examiner's questions)
3. EEG
4. Vital signs :Pulse , BP, respiration , pupils , reflexes , particularly brainstem reflexes

7- mention the alpha wave recording site and situation ?

parietal &occipital regions, Awake and relaxed+ eyes closed

THANK YOU FOR CHECKING OUR WORK!

BEST OF LUCK

Done By:

- Nada Alamri
- Amal Aseri
- Nouf Almasoud