

# MENTAL HEALTH & PSYCHIATRY

## NOTES

**FOURTH EDITION**

PRE-SUMMARIZED  
READY-TO-STUDY  
HIGH-YIELD NOTES

FOR THE TIME-POOR  
MEDICAL, PRE-MED,  
USMLE OR PA STUDENT



**121 PAGES**



## A Message From Our Team

Studying medicine or any health-related degree can be stressful; believe us, we know from experience! The human body is an incredibly complex organism, and finding a way to streamline your learning is crucial to succeeding in your exams and future profession. Our goal from the outset has been to create the greatest educational resource for the next generation of medical students, and to make them as affordable as possible.

In this fourth edition of our notes we have made a number of text corrections, formatting updates, and figure updates which we feel will enhance your study experience. We have also endeavoured to use only open-source images and/or provide attribution where possible.

**If you are new to us, here are a few things to help get the most out of your notes:**

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## Table Of Contents:

**What's included:** Ready-to-study summaries of human psychiatry and mental health in succinct and intuitive downloadable PDF documents. Once downloaded, you may choose to either print and bind them, or make annotations digitally on your iPad or tablet PC.

### Mental Health & Psychiatry Topics:

- HUMAN EMOTIONS
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## HUMAN EMOTIONS

## HUMAN EMOTIONS

### Emotion:

#### - Why does it Exist?

##### ○ **Critical To Survival:**

- Both the ability to Experience Emotion and to Recognise Other's Emotions
- Gut Reactions
- Recognising Danger, Friend/Foe
- Vital to Decision Making
- Important role in learning

#### - Theories of Emotion:

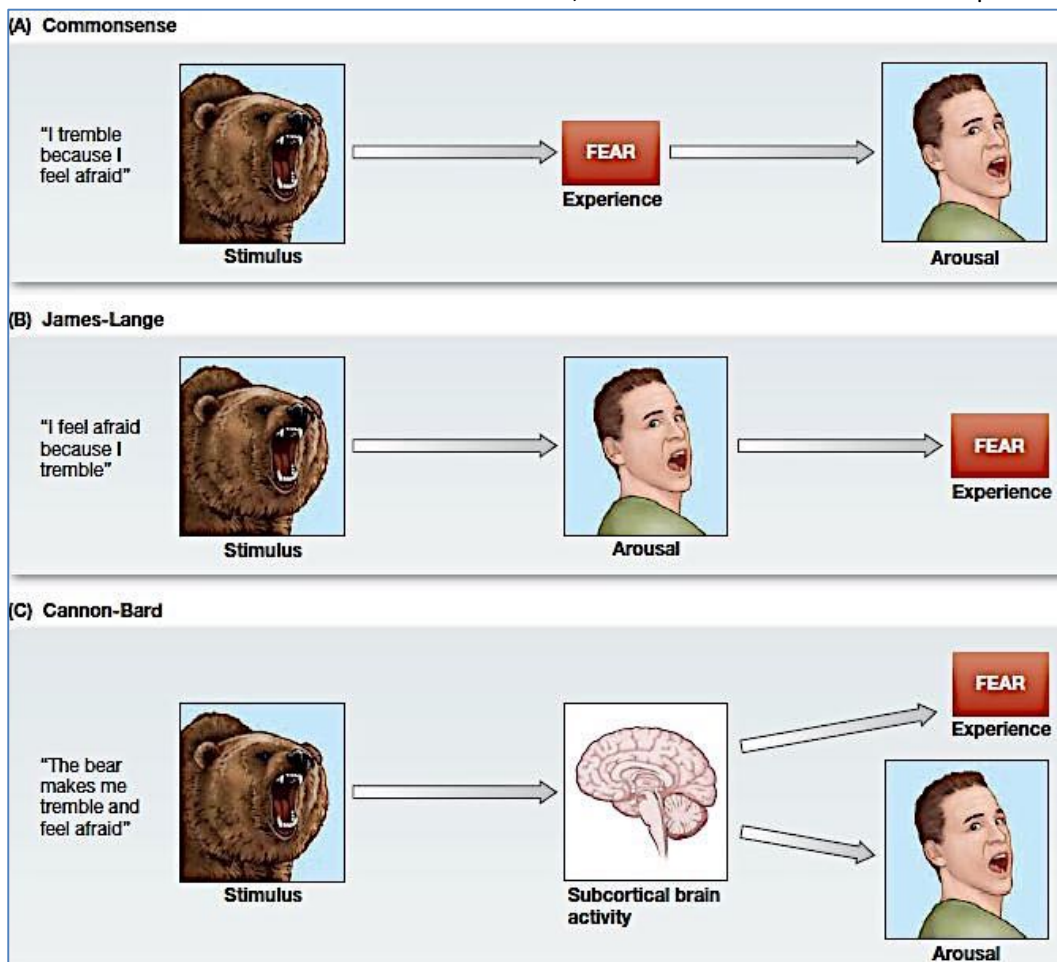
- A link exists between Physiological Responses to Stimuli & Effect of Emotion, but which comes first?

##### ▪ **Cannon-Bard Theory:**

- Conscious Awareness of Emotion comes first, then the Visceral Reactions

##### ▪ **James-Lange Theory:**

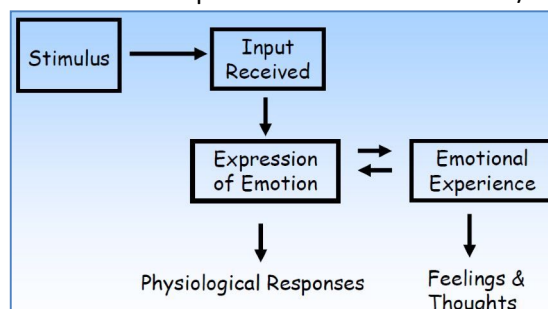
- Visceral Reactions comes first, then the Conscious Emotional Experience follows



[https://www.brainkart.com/article/The-Many-Facets-of-Emotion\\_29432/](https://www.brainkart.com/article/The-Many-Facets-of-Emotion_29432/)

##### ○ **Currently, the most Plausible Theory:**

- Visceral Reaction (Physiological Responses) comes first, causing the Emotional Experience (Feelings & Thoughts)
- However, the Emotional Experience can Influence and/or Perpetuate the Visceral Response



### 3 Phases/Components/Types of Emotion:

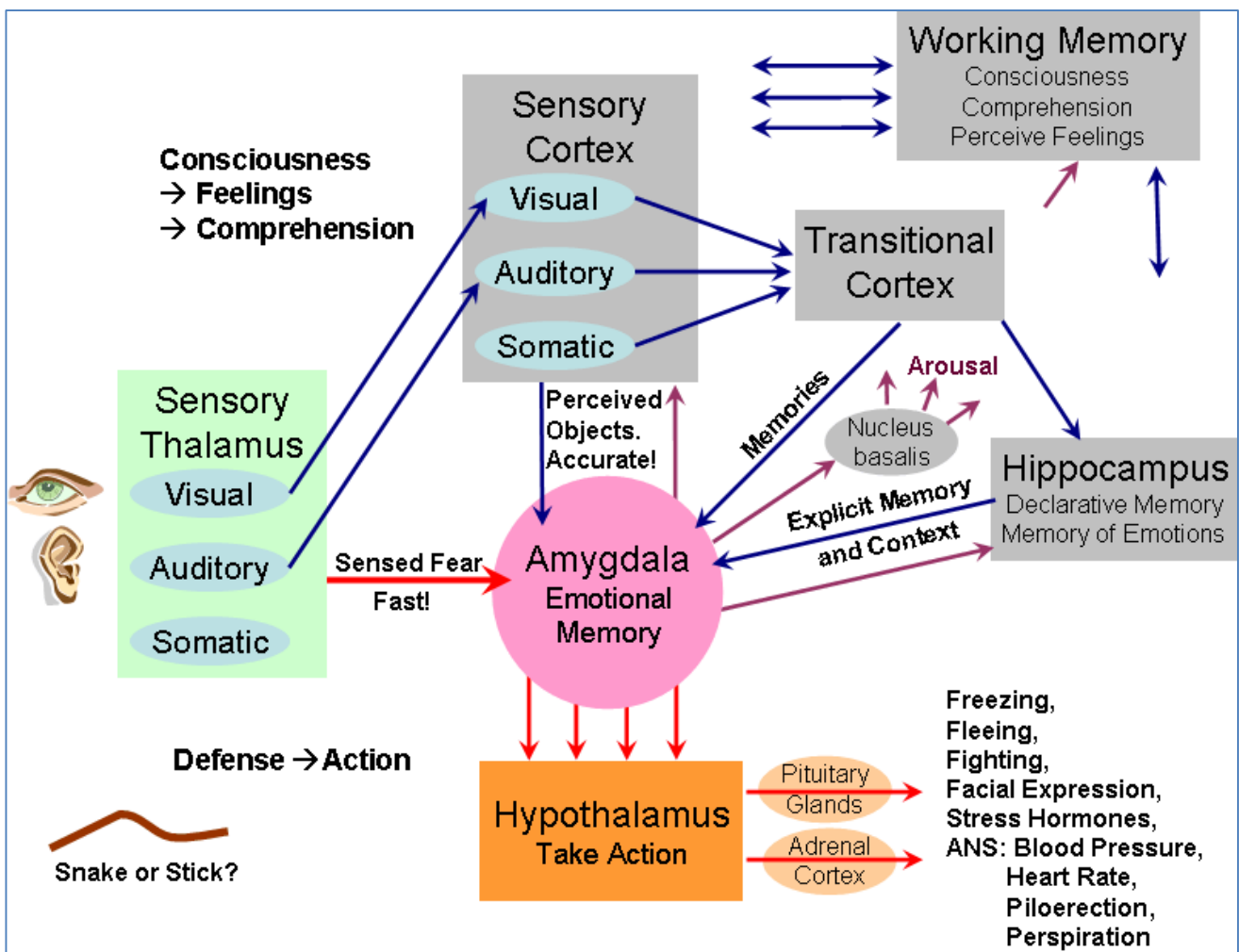
- **1: Primary Emotions:**
  - o "What is Felt 1<sup>st</sup>" – The 1<sup>st</sup> Instantaneous Emotion - (Usually the Simplest/Primitive Emotions)
  - o Generally independent of culture (Universal)
    - Joy
    - Sadness
    - Fear
    - Anger
    - Surprise
- **2: Secondary Emotions:**
  - o "What is Felt 2<sup>nd</sup>" – What the Primary Emotion Leads to – (Slightly more Complex Emotion)
  - o Generally a Combination of Primary Emotions + Context
    - Affection/Love
    - Lust
    - Contentment
    - Disgust
    - Envy
    - Guilt
- **3: Tertiary Emotions:**
  - o An Aggregate of Primary and/or Secondary Emotions – (The most Complex Emotions)
  - o Generally the result of a Decision, taking into account Many Factors
    - Satisfaction
    - Hope
    - Frustration
    - Gloom
    - Contempt

*A mixture of any two primary emotions may be called a dyad.*

[often felt] PRIMARY DYADS	[sometimes felt] SECONDARY DYADS	[seldom felt] TERTIARY DYADS	OPPOSITES
joy trust love	joy fear guilt	joy surprise delight	joy sadness conflict
trust fear submission	trust surprise curiosity	trust sadness sentimentality	trust disgust conflict
fear surprise alarm	fear sadness despair	fear disgust shame	fear anger conflict
surprise sadness disappointment	surprise disgust ?	surprise anger outrage	surprise anticipation conflict
sadness disgust remorse	sadness anger envy	sadness anticipation pessimism	
disgust anger contempt	disgust anticipation cynism	disgust joy morbidness	
anger anticipation aggression	anger joy pride	anger trust dominance	
anticipation joy optimism	anticipation trust fatalism	anticipation fear anxiety	

## Consciousness & Emotion:

- Emotional Experience is thought to underpin Consciousness (IE: Ability to “feel” is being “truly alive”)
- **Consciousness:**
  - o **Core Consciousness:**
    - Sense of ‘Here & Now’. “Feeling”
  - o **Extended Consciousness:**
    - Ability to Recall Past Experiences, Learn & Plan for the Future
- **Emotions affect the way we respond to stimuli:**
  - o People with ‘Alexithymia’ can’t feel emotions. They experience:
    - Difficulty linking a Stimuli to an Experience
    - Serious Difficulty with Decision-Making
    - Difficulty Understanding Emotions
    - Difficulty Describing Emotions
    - Minimal Imagination
    - Feeling ‘cold’/‘aloof’
- **Rational Brain Vs Emotional Brain:**
  - o Higher Cognitive Processing & Decision-Making relies on Co-Operation of the “Rational Brain” & the “Emotional Brain”
  - o Anatomically, the “Emotional Brain” is favoured (Higher number & organisation of Synaptic Connections)
  - o Relative Contributions of both “Rational” & “Emotional” Brains depend heavily on Context
    - Eg: Triage – Letting someone die to save another’s life
      - Saving the one that can be saved is consistent with the “Rational Brain”
      - However, letting someone die goes against the “Emotional Brain”



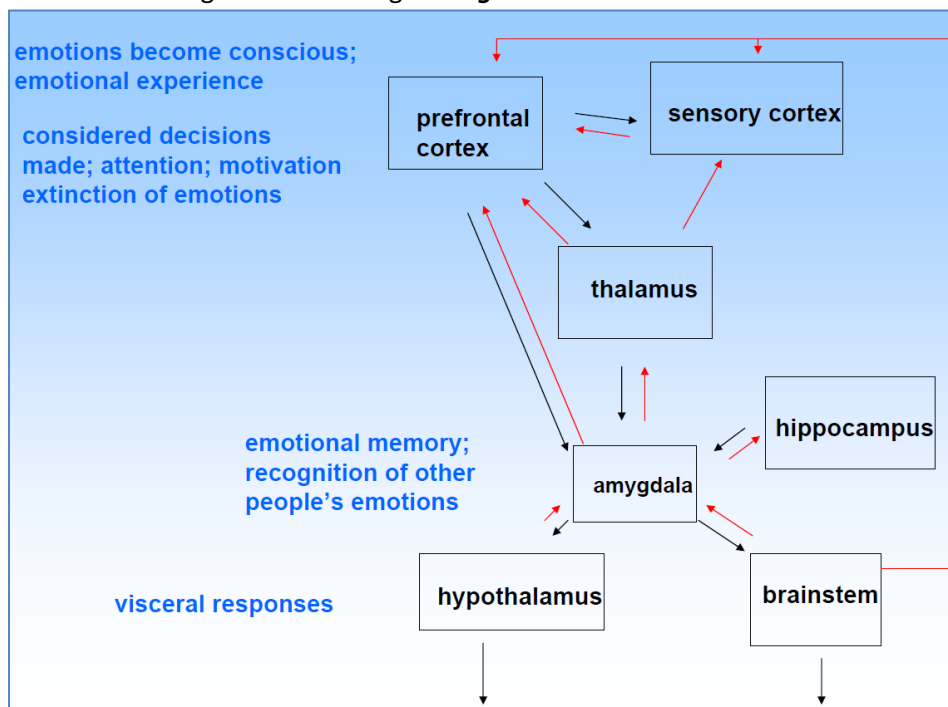
### Positive Vs Negative Emotion:

- Emotions are theoretically divided into Positive or Negative depending on general affect response

Kind of emotion	Positive emotions	Negative emotions
Related to object properties	<i>Interest</i> , curiosity, enthusiasm	<i>Indifference</i> , habituation, boredom
	<i>Attraction</i> , desire, admiration	<i>Aversion</i> , disgust, revulsion
	<i>Surprise</i> , amusement	<i>Alarm</i> , panic
Future appraisal	<i>Hope</i> , excitement	<i>Fear</i> , anxiety, dread
Event-related	<i>Gratitude</i> , thankfulness	<i>Anger</i> , rage
	<i>Joy</i> , elation, triumph, jubilation	<i>Sorrow</i> , grief
	<i>Patience</i>	<i>Frustration</i> , restlessness
	<i>Contentment</i>	<i>Discontentment</i> , disappointment
Self-appraisal	<i>Humility</i> , modesty	<i>Pride</i> , arrogance
Social	Charity	Avarice, greed, miserliness, envy, jealousy
	Sympathy	Cruelty
Cathected	<i>Love</i>	<i>Hate</i>

### Brain Regions Involved in Recognition, Induction & Regulation of Emotions:

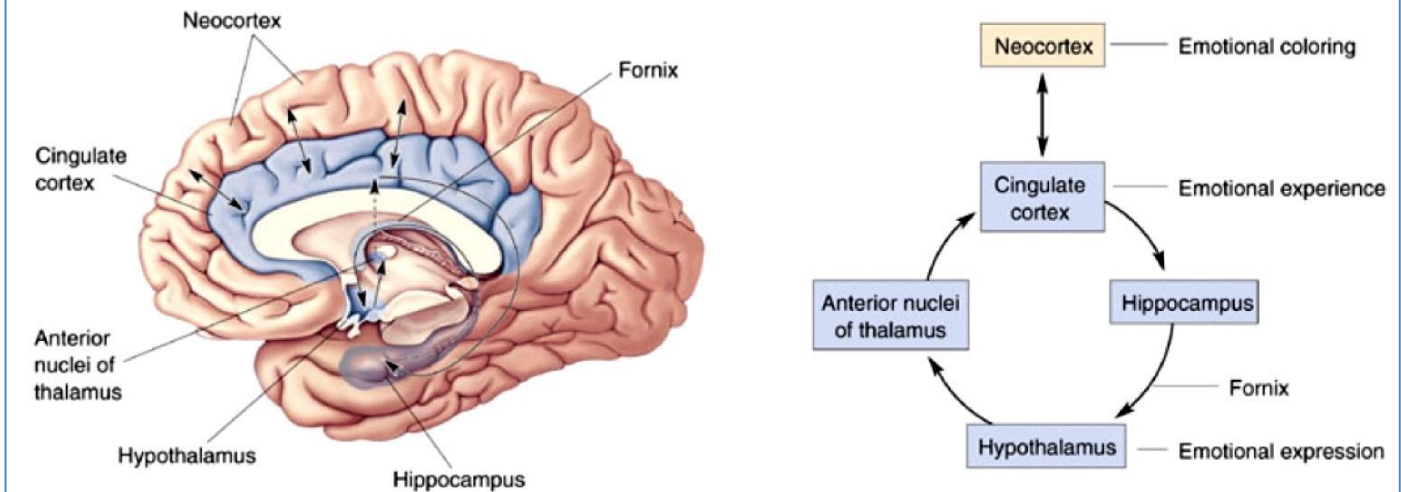
- **Thalamus:**
  - o **Funnels Sensory info** to **Amygdala**, and the **Cerebral & Cingulate Cortices**
  - o Important in Fact-Based (**Explicit**) **Memory**
- **Cingulate Gyrus:**
  - o Regulates **Attention**
  - o Emotional '**Colouring**'
- **Ventromedial Prefrontal Cortex:**
  - o Conscious **Recognition of Emotions**
- **Cerebral Hemispheres:**
  - o R-Brain → More Associated with Negative Emotions
  - o L-Brain → More Associated with Positive Emotions
- **Sensory Cortices & Association Areas:**
  - o Recognition of Stimuli
  - o Sensory Cortices: (Visual, Auditory, Olfactory, Gustatory, Tactile)
  - o Sensory Association Areas: (Novel Vs Familiar)
- **Insula:**
  - o Involved with Recognition & Feeling of **Disgust**



### The Papez Circuit:

- **1: Thalamus** relays Sensory Input to Cingulate Cortex
- **2: Cingulate Cortex** - gives you the Emotional Experience
  - also relays to the **Neocortex**, which gives Context/Colouring to the Emotion
  - also relays to the **Hippocampus** →
- **3: Hippocampus** Relays to the Hypothalamus – Causes the Emotional Expression (Visceral Response)

The Papez circuit. Papez believed that the experience of emotion was determined by activity in the cingulate cortex and, less directly, other cortical areas. Emotional expression was thought to be governed by the hypothalamus. The cingulate cortex projects to the hippocampus, and the hippocampus projects to the hypothalamus by way of the bundle of axons called the fornix. Hypothalamic effects reach the cortex via a relay in the anterior thalamic nuclei.



Source: Unattributable

### The Limbic System:

#### - **\*\*\*Amygdala\*\*\*:**

- #1 Structure involved in Emotion → The “Heart” of the Limbic System
- “The Fight/Flight Centre”
- Linked to all but 8 areas of the Cortex → ∴ Thought to be #1 integrator of Cognitive & Emotional Info
- **Afferents (Receives Input From...):**
  - **Brainstem** – inputs associated with Physical States (BP/HR/etc)
  - **Hypothalamus** - inputs associated with Physical States (BP/HR/etc)
  - **Thalamus** – Sensory Info
  - **Hippocampus** – inputs associated with Explicit Memory
  - **Cortex** – Sensory Inputs & Decisions related to Perceived Threats
- **Efferents (Sends Output to...):**
  - **Brainstem** – influences Visceral Fear-Driven, Fight/Flight Responses
  - **Hypothalamus** – Influence on Memory & Aggression
  - **Thalamus** – Influences processing of new sensory info
  - **Hippocampus** – Fear is an important driver for learning & memory
  - **Pre-Frontal Cortex** – Fear is important in Decision Making & Cognition
- **Regulates:**
  - Fear & Aggression
  - Vigilance & Attention
  - Recognition of Emotion (in Self & Others)
  - Emotional Contribution to Memory (Emotional Implicit Memory)

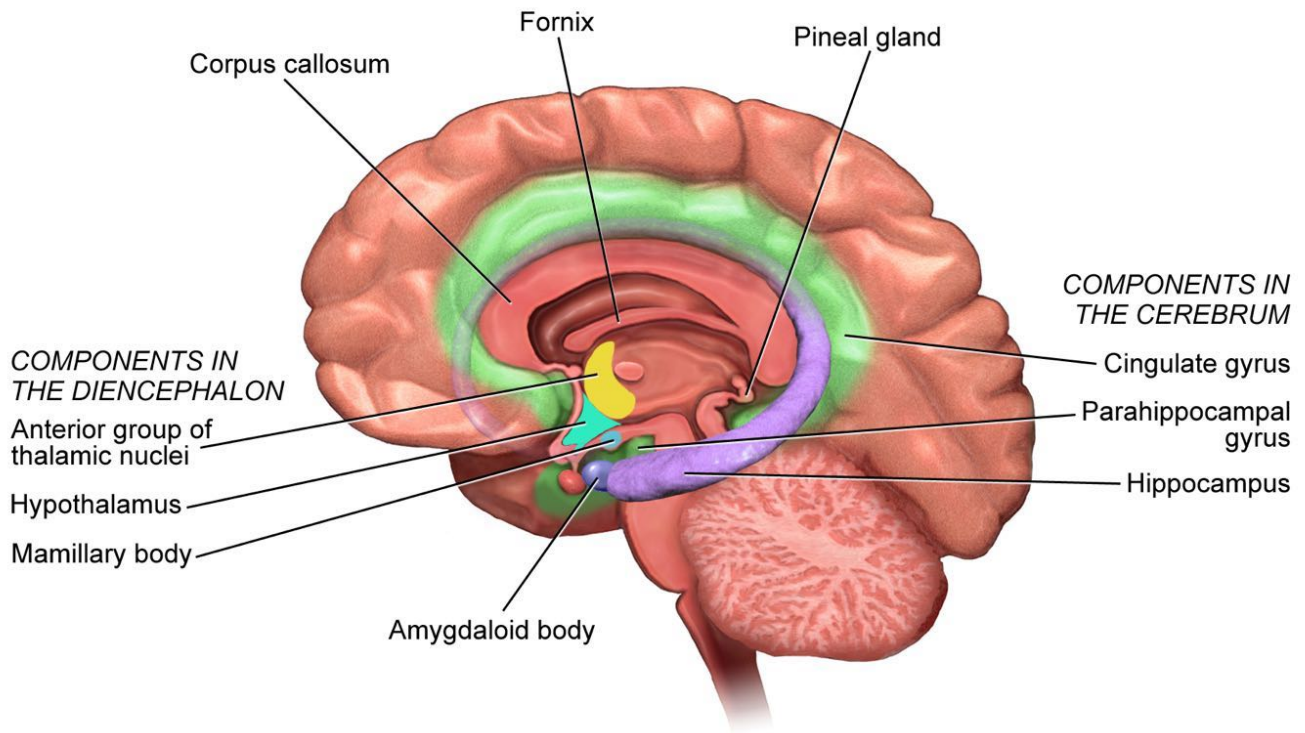
#### - **Hypothalamus:**

- **Visceral Responses** to Emotion
- **Aggression**
- **Sex Drive**

#### - **Brain Stem:**

- **Visceral Responses** to Emotion

# The Limbic System



Blausen.com staff (2014). "Medical gallery of Blausen Medical 2014". WikiJournal of Medicine 1 (2). via Wikimedia Commons

## **Neurotransmitters & Emotion:**

### **- \*Noradrenaline: (A Target for Antidepressants):**

- **Activated By:**
  - Novel, Unexpected Stimuli
- **Released By:**
  - **Locus Coeruleus** (A Nucleus In the Pons involved with physiological responses to stress & panic)
- **Regulates:**
  - Mood/Arousal
  - Anxiety
  - Pain
  - Sleep/Wake Cycles
  - Motor Activity

### **- \*Serotonin: (A Target for Antidepressants):**

- **Activated By:**
  - General activity/arousal
- **Released By:**
  - Raphe Nuclei (A group of Nuclei In the brainstem)
- **Regulates:**
  - Mood
  - Emotions
  - Sleep/Wake Cycles
  - Dominance/Aggression
  - Anxiety

### **- \*Dopamine:**

- **Activated By:**
  - Pleasurable Activities
- **Released By:**
  - Ventral Tegmental Area (VTA)
  - Substantia Nigra
- **Regulates:**
  - *Somehow* plays a role in Regulation of Perception of Emotion
  - Involved in Reward Centre

### **- Glutamate & GABA:**

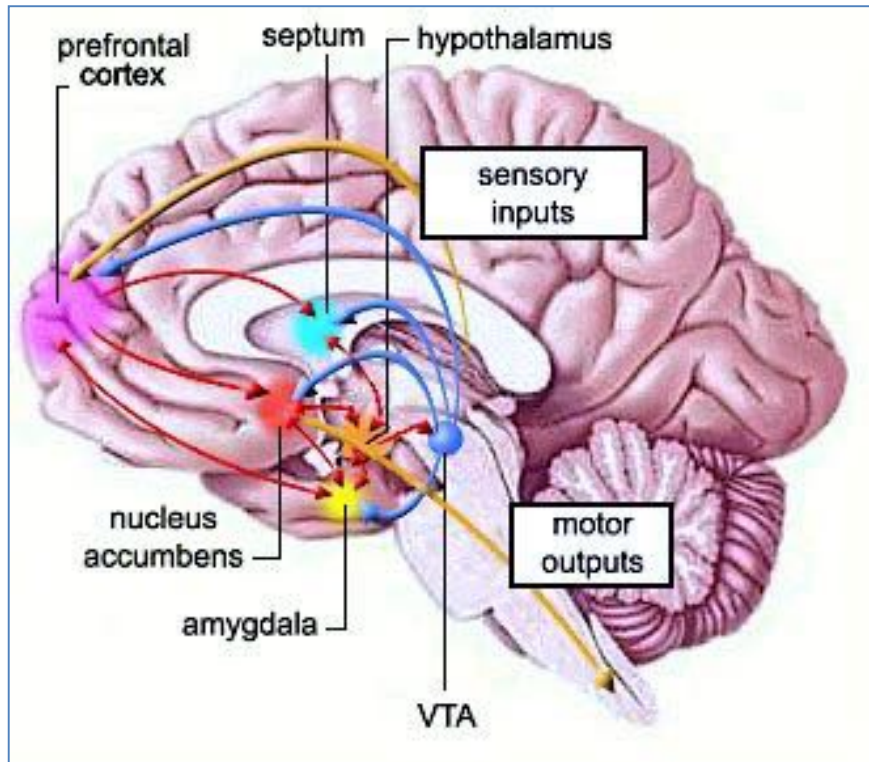
- Reduces Anxiety

### **- Acetylcholine:**

- **Released By:**
  - Basal & Septal Nuclei of Meynert
- **Regulates:**
  - Cognitive Processing
  - Arousal & Attention

### Primary Emotional Circuits:

- Pleasure & Reward: The 'Reward Circuit':
  - Brain Structures Involved:
    - *\*Ventral Tegmental Area (VTA)*
    - *\*Nucleus Accumbens*
    - Pre-Frontal Cortex
    - Amygdala
    - Thalamus
  - Neurotransmitters Involved:
    - *\*Dopamine* - VTA & Nucleus Accumbens



[https://thebrain.mcgill.ca/flash/a/a\\_03/a\\_03\\_cr/a\\_03\\_cr\\_que/a\\_03\\_cr\\_que.html](https://thebrain.mcgill.ca/flash/a/a_03/a_03_cr/a_03_cr_que/a_03_cr_que.html)

- **The 'Fear Circuit':**

○ **Brain Structures Involved:**

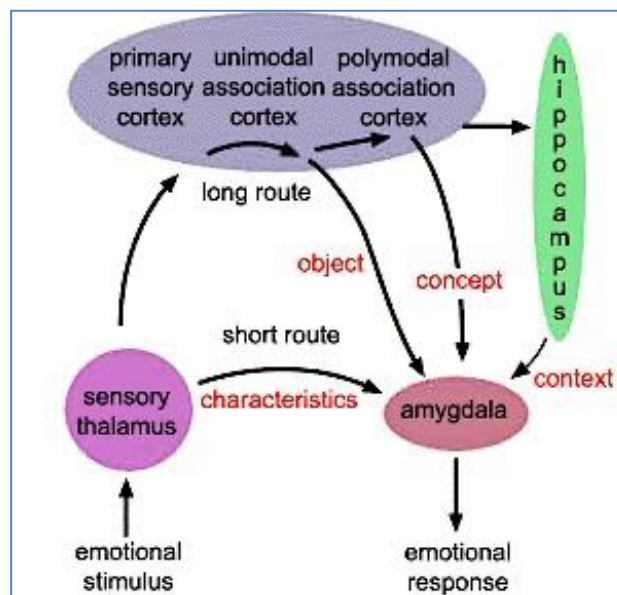
- **Thalamus →**
  - Amygdala
- **Thalamus →**
  - Primary Sensory Cortex
  - Association Cortices

○ **Long & Short Pathways:**

- **Long:**
  - Info processed by higher brain centres & Hippocampus
  - Results in a more complex response
- **Short:**
  - Info sent straight to Amygdala
  - Results in a basic response (Recoil from stimulus/Freeze)
  - **Advantage = No cortical processing means quicker reaction times → ↑ Survival**

○ **Process of Fear:**

- 1: Sensory Info enters brain → Thalamus
- 2: Thalamus Sends info to Amygdala (Via Long/Short Route)
- 3: Amygdala activates Visceral Responses through Hypothalamus
- 4: Amygdala Activates Ventromedial Pre-Frontal Cortex (Allows conscious recognition of the Emotion)
- 5: Visual Cortex also inform Prefrontal Cortex about the Threat



[https://thebrain.mcgill.ca/flash/a/a\\_04/a\\_04\\_cr/a\\_04\\_cr\\_peu/a\\_04\\_cr\\_peu.html](https://thebrain.mcgill.ca/flash/a/a_04/a_04_cr/a_04_cr_peu/a_04_cr_peu.html)

- **Anger/Aggression Circuit:**

○ **Affective Aggression Vs Predatory Aggression:**

- Predatory aggression is related to feeding behaviour & isn't accompanied by sympathetic physiological response with which affective aggression is associated

○ **Associated Structures:**

- Cerebral Cortex
- **Amygdala**
- **Hypothalamus**
- Periaqueductal Grey-Matter (PAG)
- Ventral Tegmental Area (VTA)
- IE: "Aggression is controlled by a neural pathway from the Amygdala through the Hypothalamus, PAG & VTA"

○ **Neurotransmitter:**

- Serotonin

○ **Possible Hormonal Link:**

- Adenosine

## PERSONALITY THEORIES

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### What is Personality?

- "Qualities of an individual that are shown in their way of behaving in a wide variety of circumstances
- IE: A mental picture of someone's mind that allows us to predict the way they behave

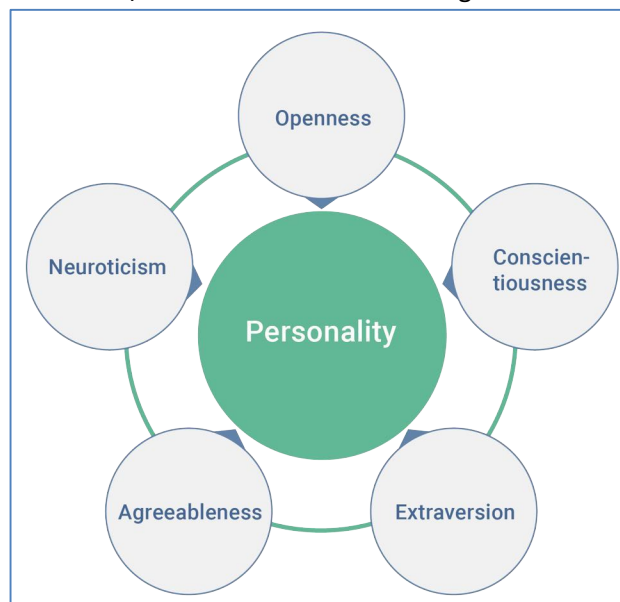
### Personality Theories:

#### - Trait Theory:

- **Synopsis:**
  - People can be described in terms of enduring *underlying qualities*
  - These qualities are thought to be:
    - Independent
    - Stable
    - Have a Neurological & Biological Basis
- **"State" Vs "Trait":**
  - State = How you are right now
  - Trait = How you tend to be over your whole life
- **Traits include:**

Moody	Sociable	Reserved
Rigid	Easygoing	Careful
Pessimistic	Aggressive	Peaceful
Passive	Optimistic	Reliable
Thoughtful	Anxious	Impulsive

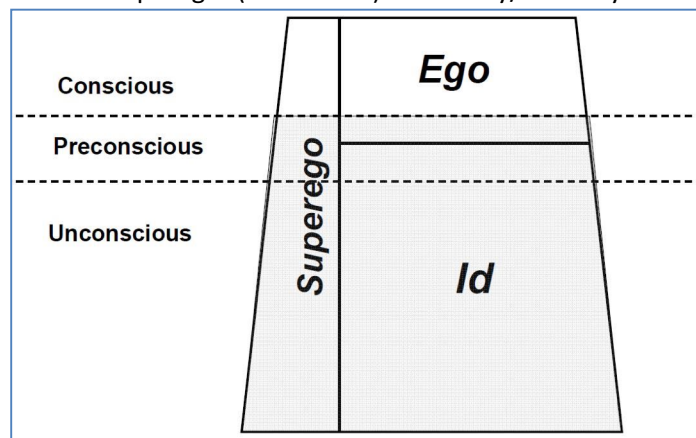
- **Hans Eysenk's Version:**
  - Introversion Vs Extraversion
  - Neurotic Vs Emotionally Stable
  - Psychotic Vs Impulse Control
- **The "5 Factor Theory":**
  - Neuroticism (Worried, Highly Strung)
  - Extraversion (Sociable, Affectionate)
  - Openness (Independent, Creative)
  - Agreeableness (Good-Natured, Trusting)
  - Conscientiousness (Reliable, Organised)
- **How is it Measured?**
  - Self-Report Questionnaires – Identify stable, enduring personality traits
    - Objective
    - Lots of Yes/No Questions about Feelings & Behaviour



- **Psychoanalytic & Developmental Theories:**

○ **Synopsis:**

- Personality is a compromise between **Instinctive Biological Urges** Vs **Social Prohibitions**
- Consists of the **3 Freudian** aspects:
  - The “Id” (“It”) Desire
  - The “Ego” (“I/me”) Choice
  - The “Superego” (“Over me”) Reality/Morality



- Consists of the **5 Stages of Desire** (or ‘Libido’):
  - Oral Stage
  - Anal Stage
  - Phallic Stage
  - Latency
  - Genital Stage

**Note: Personality Problems** result from failure to resolve conflicts between ‘Desire’ & ‘External Constraints’
- Involves the concept of **Defences**: (Keeping intolerable fears/desires out of consciousness)
  - Denial
  - Repression
  - Projection
  - Rationalisation
  - Etc
- Involves the concept of **Unconscious Re-Enactment**:
  - One’s thoughts/feelings about **Past Relationships** (Eg: With parents) get re-enacted in **Present-Day Relationships** (Eg: With partners)
- Involves the **Bowlby & Attachment Theory**:
  - “The primary instinct isn’t sexual, rather the desire for ***closeness, comfort & protection***”
  - “Personality can be traced back to the ***Mother-Child Relationship***”
  - “Your childhood attachment influences the way you conduct relationships as an adult
- **How is it Measured?**
  - Aim: To Identify Unconscious Wishes, Fears & Defences:
    - Detailed Biographical History
    - Projective Tests
    - Dreams
    - Transference (Feelings from early childhood relationships are “transferred” to present day relationships)

- **Social-Learning Theory:**

○ **Synopsis:**

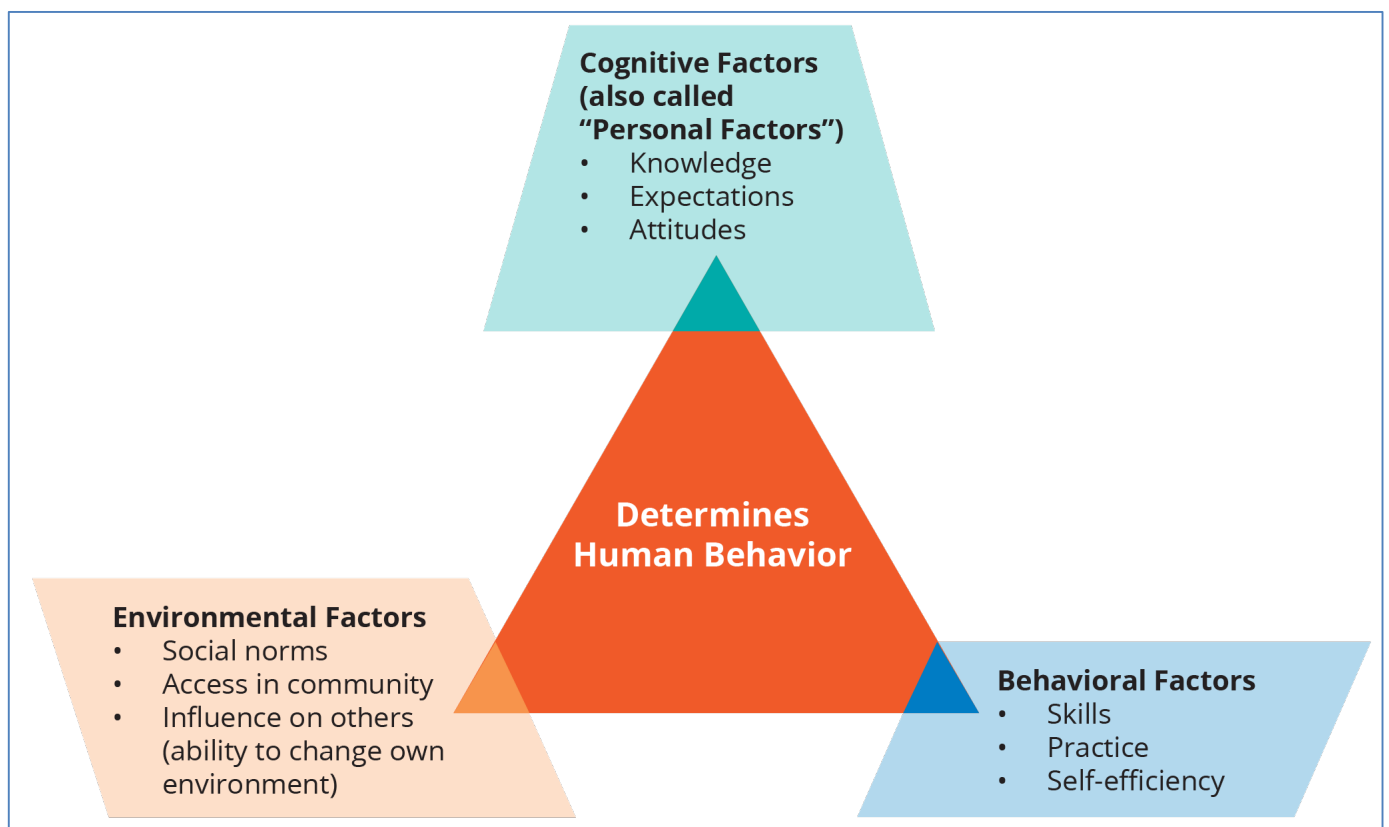
- Behaviour is driven by:
  - **Reward & Punishment**
  - **Beliefs & Expectations**
- We learn from Direct & Indirect Experience (observing others)
  - Observational Learning
  - Social Rewards for Behaviour
  - Self-Efficacy – Comes from experiences of success & social reinforcement
- Encompasses the '**Locus of Control**' theory:
  - Internal Locus – you are responsible for your feelings/actions/destiny
  - External Locus – the actions of others are the reason for your feelings/actions/etc

○ **Where Beliefs & Expectations Come From:**

- Experience (Reward & Punishment)
- How people have treated us (Past & Present)
- Social Role (Race/Class/Gender/Stigma)

○ **How is it Measured?**

- Clinical Interview - Subject is asked to clarify his/her:
  - Beliefs
  - Behaviour Patterns
  - Expectations about themselves

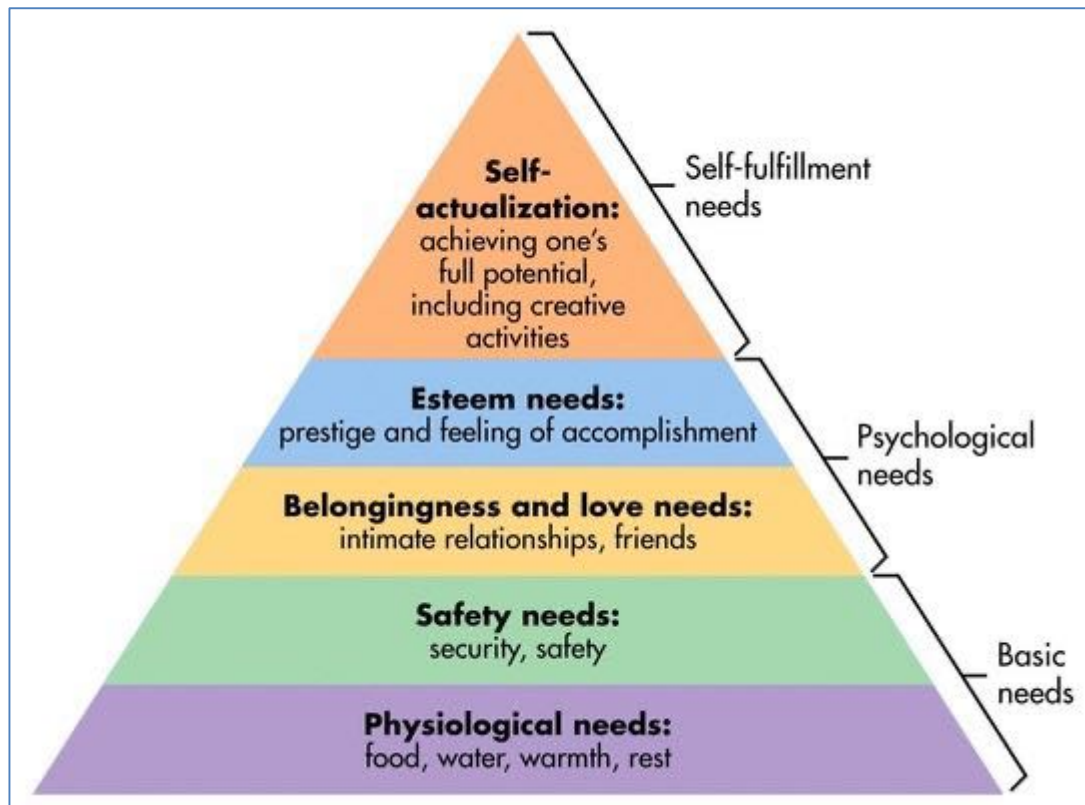


- **Humanistic Theory:**

○ **Synopsis:**

- Concerned with:
  - Present & Future (Not Past)
  - The Person's Motivation
  - The Person's Potential (Not their deficits/flaws)
  - The Person's Individuality (Uniqueness)
- "Everyone has the capacity to fulfil their own potential"
- Concerned with **The Hierarchy of Needs:**
  - Note: one can only achieve the 'Self Actualisation Need' (IE: Fulfilment) after they meet the first 4 needs

- **Aim:** to understand a person's experience & self-concept



○ **How is it Measured?**

▪ **How: Clinical Interview:**

- Person's self-description
- Observation of Non-verbal Communication
- Empathy

## **THINKING & LANGUAGE**

## THINKING & LANGUAGE

### Communication:

- **What is it?**
  - o The exchange of ideas between 2 or more people
  - o Involves *Transmission* and *Response/Feedback*
  - o Encompasses Verbal & Non-Verbal elements
  - o Note: Communication doesn't necessarily require speech or language (think how babies communicate)
- **Importance of Communication:**
  - o Share Thoughts/Feelings
  - o Express Identity
  - o Build Relationships
  - o Conduct Business
  - o Teach & Learn
- **Aspects of Communication:**
  - o **Language (Expressive & Receptive)**
  - o **Speech**
  - o **Voice**
  - o **Fluency**

### Language:

- **What is it?**
  - o The *Coding* of meaning into an arbitrary system of symbols, words, sentences & texts in order to Communicate (Convey ideas & feelings)
- **4 Components of Language:**
  - o **Form:**
    - **1: Phonology** (The sounds used to make words)
      - 'Phoneme' – Consonant/Vowel SOUNDS that carry meaning (F,M,C – Fan, Man, Can)
    - **2: Morphology** (Proper use of prefixes/suffixes/plural/tense – past, present & future)
      - 'Free Morphemes' – Stand alone as a word (Eg: Ball, run, yellow, was, the)
      - 'Bound Morphemes' – grammatical units attached to words (Eg: Ing, ed, ly, s, ation)
    - **3: Syntax** (Proper Word Order – Noun→Verb→Object→Adverb)
  - o **Content:**
    - **4: Semantics** (Meaning – Linguistic representation of objects/ideas/feelings/etc)
- **Note: Morphology + Syntax = Grammar**

### Speech:

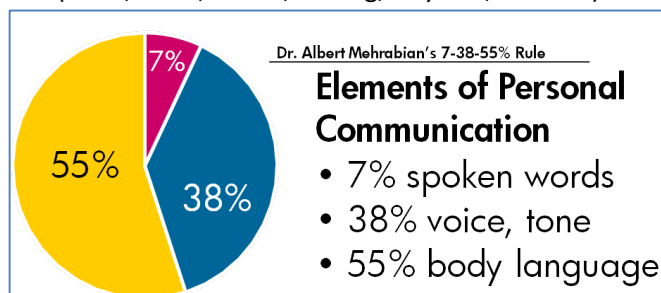
- **What is it?:**
  - o The way the sounds of the words are produced
- **3 Components of Speech:**
  - o **1: Phonemes** – Consonant/Vowel SOUNDS that carry meaning (F,M,C – Fan, Man, Can)
  - o **2: Syllables** - Groups of phonemes with core Vowel SOUNDS (ba-by; mu-ffin; en-vel-o-pe)
  - o **3: Prosody** - Rhythm of spoken language (Pitch, stress, intonation, intensity & duration of sounds)
- **Fluency:**
  - o The 'flow' of speech (Rate/Timing/Rhythm)

### Voice:

- **What is it?:**
  - o Production of Sound using:
    - The Respiratory System (Moving air)
    - The Larynx (Vibration)
    - The Vocal Tract (resonance)
- **Voice Characteristics:**
  - o Pitch
  - o Loudness
  - o Quality, Tone

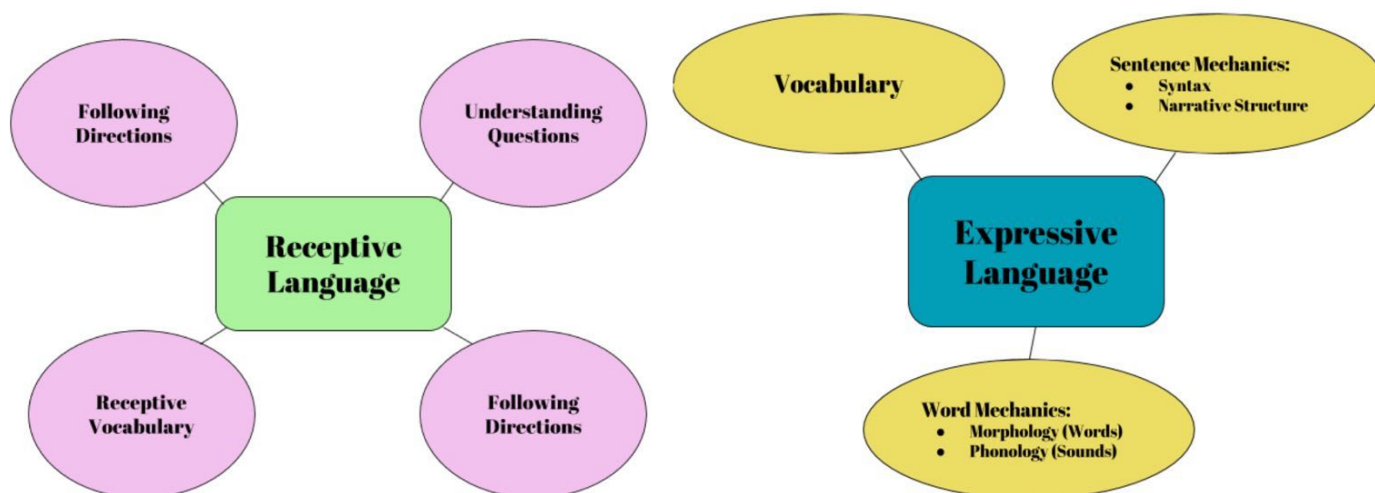
## Modes of Communication & Language:

- **Verbal Vs Non-Verbal:**
  - **Verbal/Written:**
    - Pragmatics (Refers to language *use* rather than structure)
      - Context, Conversational Rules/Conventions, Cultural Rules/Conventions, Politeness, Bluntness, Literal or Non-literal
    - Language
    - Speech
    - Voice
    - Fluency
  - **Non-Verbal:**
    - Body language
    - Facial expression
    - Gestures
    - Intonation (Pitch, Tone, Stress, Timing, Rhythm, Volume)



## Process of Communication:

- **Speech:**
  - Linguistic Encoding – Encode meaning into words/sentences
  - Translation of Linguistic Code into a Motor Plan → Sequenced & Coordinated movement of:
    - Respiratory Muscles (For Airflow through larynx)
    - Laryngeal Muscles (Phonation & Voice)
    - Tongue, Lips, Palate & Jaw (Articulation)
- **Hearing & Comprehension:**
  - Transduction of Sound Waves into Electrical Impulses & Interpretation of Meaning by the Brain
- **Language:**
  - **Receptive Language:**
    - Understanding & Comprehension of Language we hear (or Read)
  - **Expressive Language:**
    - The *Production* of language (Usually Spoken; Sometimes Written)



## **Stages in Development of Communication Skills in Children:**

- **Infants (6-12 months):**
  - **Speech Development:**
    - Babbling (repetition of syllables – No Meaning)
  - **Language Development:**
    - Understand 3-50 words/phrases
- **Toddlers (1-2 yrs):**
  - **Speech Development:**
    - First Words
    - Develop a Vocab of up to 200 words
  - **Language Development:**
    - Understand 50-300 words
    - Use of Words to Communicate Needs
    - Request Information (Expressive Language) & Answer Questions (Receptive Language)
- **Toddler (2-3yrs):**
  - **Speech Development:**
    - Develop a Vocab of up to 1000 words
    - Master the 'Early 8' Speech Sounds: (M, P, B, W, D, N, Y, H)
  - **Language Development:**
    - Understand Directions
    - Listens to stories
    - Understand Specific Questions (Who/what/where/why)
    - Maintain & Extend Conversations
- **Early Childhood (3-5yrs):**
  - **Speech Development:**
    - Develop a Vocab of over 2000 words
    - Master the 'Middle 8' speech sounds: (ng, k, g, t, f, v, ch, j)
  - **Language Development:**
    - Understand up to 10,000 words
    - Develop Complex Sentence Structure
    - Learn Polite forms of Language Use (Pragmatics)
- **Primary School Years (5-12yrs):**
  - **Speech Development:**
    - Vocab becomes more abstract
    - Master the 'Late 8' speech sounds: (sh, zh, s, z, l, r)
    - Master Multisyllabic words (Eg: Hospital, spaghetti)
    - Master Consonant Clusters (Eg: Skr)
    - Speech should be Error-Free by 8 yrs
  - **Language Development:**
    - Understand more complex & abstract forms of language:  
IE: Stories, Explanations, Jokes, Riddles, Instructing
- **High School Years (13-18 yrs):**
  - **Speech Development:**
    - Vocab exceeds 10,000 words
  - **Language Development:**
    - Understand even more Complex & Abstract forms of language:  
IE: Argumentation, Persuasion, Debate, Satire (irony, sarcasm & ridicule)
    - Able to use complex, literate language for Academic Writing

### **Common Origins/Causes of Communication Defects:**

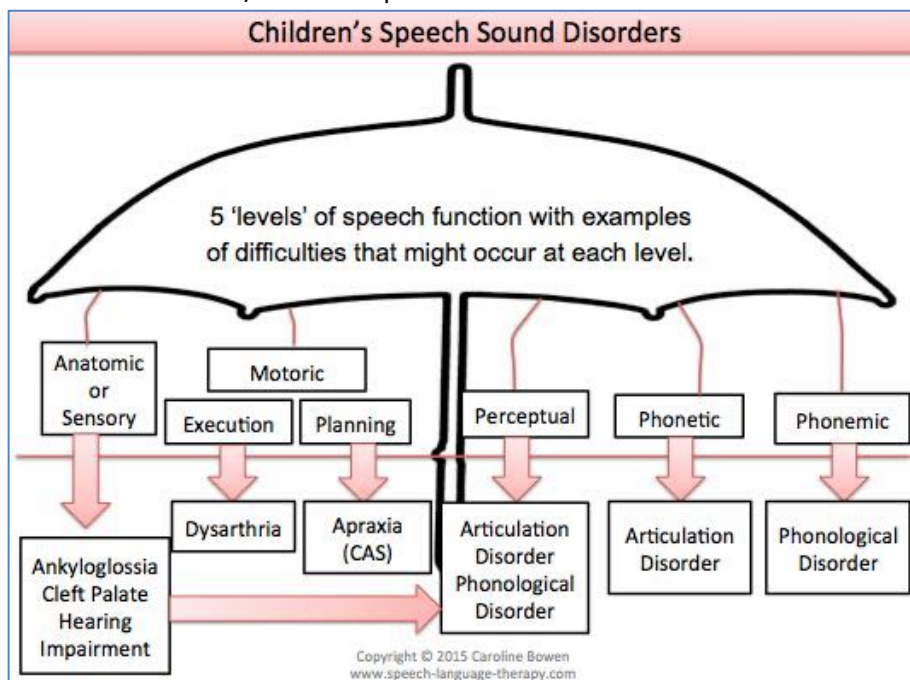
- **Acquired:**
  - **Due to:**
    - Hearing Impairment
    - Head injury
    - Meningitis
- **Congenital:**
  - **Due to:**
    - Cleft Lip/Palate
    - Craniofacial Abnormalities
    - Syndromes (Eg: Down's)
    - Intellectual Disability
- **Developmental:**
  - **Due to:**
    - Parental Neglect
    - Social Deprivation

### **Types of Communication Deficits:**

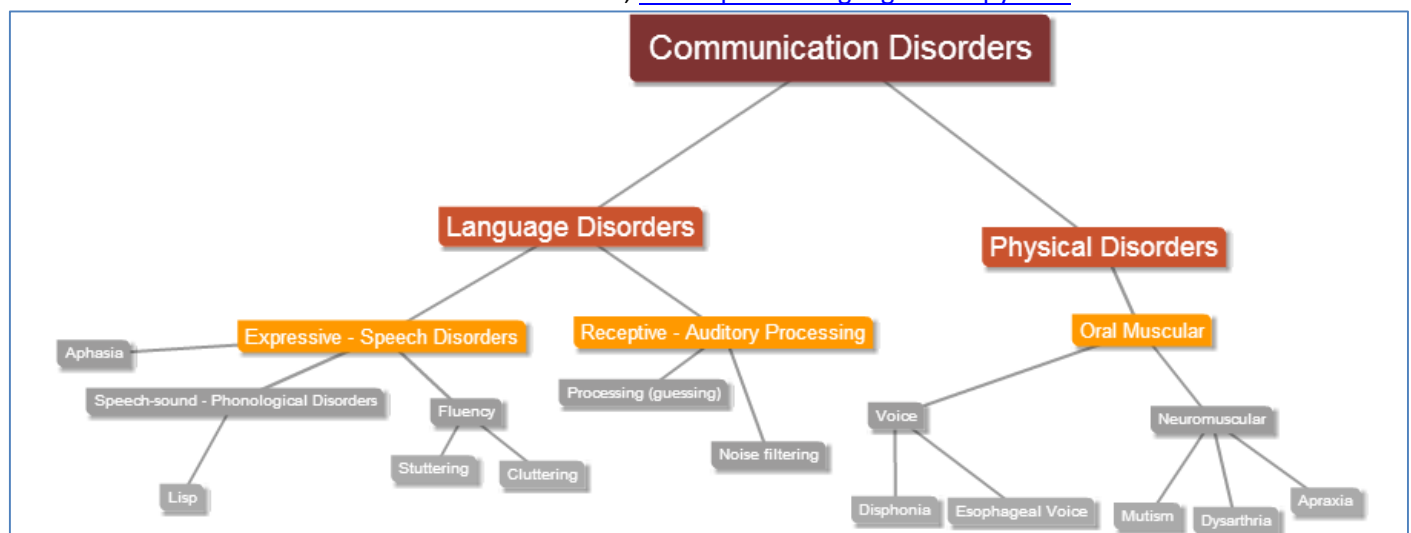
- **Receptive Language Delay:**
  - Poor understanding of words/questions/comments
  - Can't follow simple instructions
  - Can't comprehend a conversation/joke/story
  - Rely on context, rather than what is said
- **Expressive Language Impairments:**
  - Limited Vocab or Word-Finding Difficulties
  - Omission of Grammatical Morphemes (Eg: "He swimming beach" – missing 'is', 'at' & 'the')
  - Confused Word Order
  - Difficulty conversing
  - Difficulty constructing a text (story/essay/explanation/arguments) (Oral/Written)
- **Pragmatic Impairments:**
  - Mismatch between context & what is being communicated (Eg: A stranger tells you all about his personal problems while waiting for the bus)
  - Problems with Conversation Management (Eg: Irrelevant to the topic, ignore questions, interrupt)
  - Problems with Non-Verbal Communication (Eg: Eye contact; Poor interpretation of facial expression)
- **Speech Impairments:**
  - Difficulty producing a sound (Vowel/Consonant) accurately
    - Eg: 'th' for 's'/'z'
    - Eg: 'w' for 'r'
  - Imprecise speech (Slurred, Disrupted Rhythm, Effortful)
  - Omission of Syllables (Eg: 'puter' for 'Computer')
- **Voice Impairments:**
  - Quality Issues (Hoarseness/breathiness)
  - No Voice
  - Pitch too high/low
  - Pitch Breaks (Eg: 'Blowouts')
- **Fluency Impairments:**
  - Non-Fluency (Hesitations, unusual rhythm/intonation, slow)
  - Stuttering:
    - Repetitions
    - Prolongations
    - Blocks

## Red Flags in Speech & Language Development:

- **Speech Impairment:**
  - Omission of sounds from beginning/middle of words @ >2yrs
  - Unusual sounds @ >2yrs
  - Unintelligible (impossible to understand) even to family members @ >3yrs
  - Any speech errors @ >5yrs
- **Language Impairment:**
  - **Early Years:**
    - Not attending to sounds @ >4mths
    - Not responding to naming of familiar objects @ >18mths
    - Not Speaking by 2yrs
    - No simple sentences by 2.5yrs
  - **Preschool:**
    - Persistent poor grammar @ <4yrs
    - Not listening to/comprehending simple picture-book stories @ <4yrs
    - Poor social skills/behaviour problems @ <4yrs
  - **School Age:**
    - Can't provide explanations @ <5yrs
    - Unable to stay on topic
    - Learning difficulties at school
    - Poor social skills/behaviour problems

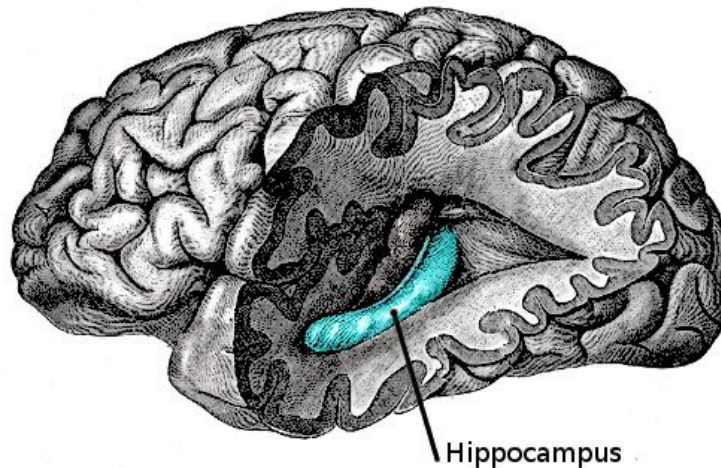


Source: Caroline Bowen; [www.speech-language-therapy.com](http://www.speech-language-therapy.com)



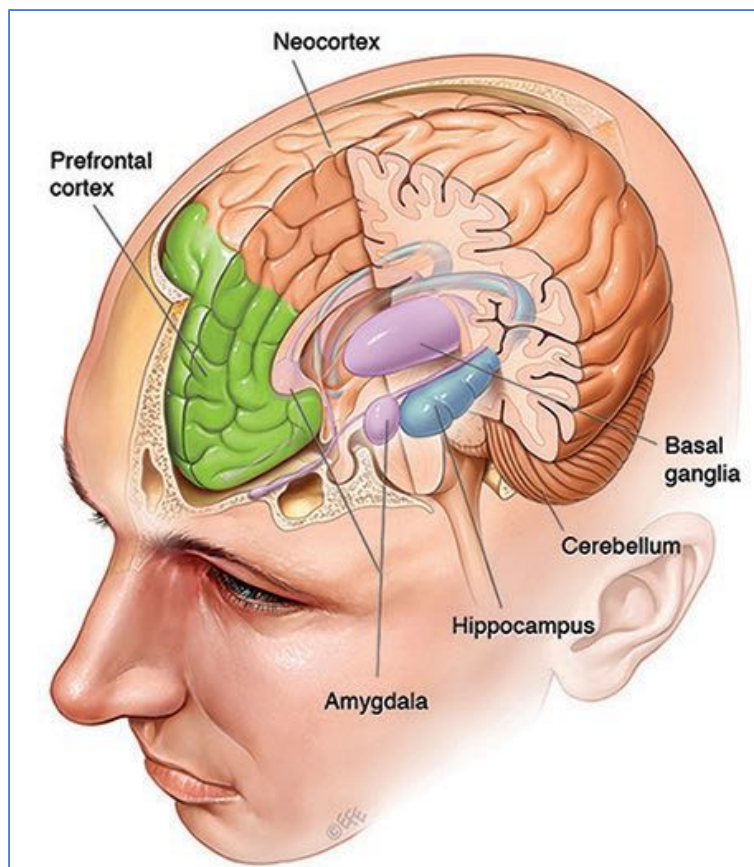
## NEUROBIOLOGY OF MEMORY

## NEUROBIOLOGY OF MEMORY



### Process of Memory Creation:

1. **External Stimuli:**
  - a. Sensory input bombards the brain & is sent to Cerebral Cortex
2. **Temporary Storage (Cerebral Cortex):**
  - a. Sorts & Evaluates the Information
  - b. Depending which inputs you focus on, determines what info is sent to Short Term Memory
    - i. Input not focussed on is Forgotten
3. **Short Term Memory:**
  - a. In Medial Temporal Lobe (Hippocampus, Amygdala & Surrounding Cortical Areas)
  - b. Excitement/Rehearsal/Association/Emotion → Transfer to Long Term Memory
    - i. Input not subjected to the above is Forgotten
4. **Long Term Memory:**
  - a. Requires: ACh – for Declarative; or Dopamine – for Non-Declarative
    - i. Declarative – Stored in ≈ Prefrontal Cortex
    - ii. Non-Declarative – Stored in ≈ Premotor Cortex



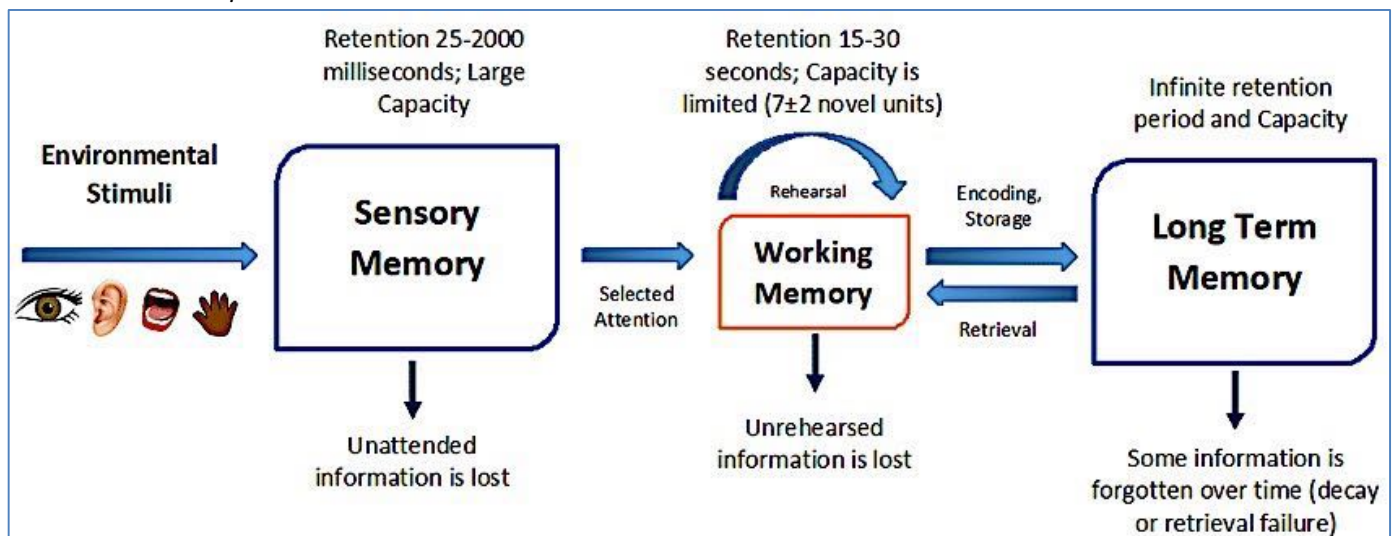
*The parts of the brain involved in memory (Illustration by Levent Efe); <https://qbi.uq.edu.au/brain-basics/memory/where-are-memories-stored>*

### Sensory Memory:

- **Iconic (Visual) Memory:**
  - o Visual signal held briefly in memory
  - o <0.5 sec
    - Eg: Blurring of fast moving objects into 1 object – Fan Blade
- **Echoic (Aural) Memory:**
  - o Auditory signal held briefly in memory
  - o ~3 sec
    - Eg: Listening to a lecturer & writing down what they're saying
- **Haptic (Tactile) Memory:**
  - o Tactile signals held briefly in memory
  - o ~10 sec
    - Eg: Feeling the bumps on the 'F' & 'J' keys while typing

### Working Memory:

- Note: Often Grouped with STM
- **Temporary Retention, Integration (With other brain areas) & Manipulation of Sensory Info...**  
**TO FACILITATE A RESPONSE**
  - o Eg: Crossing the Road:
    - 1: Look Left – Remember position of cars
    - 2: Look Right
    - 3: Look Left Again – Compare position of cars to the initial look → Is it safe to cross??
- **Associated with Prefrontal Cortex:**
  - o Closely tied to STM
- **Neurotransmitter:**
  - o *Dopamine*



Noushad, Babu & Khurshid, Faraz. (2019). Facilitating student learning: An instructional design perspective for health professions educators. 8. 69-74: 10.15171/rdme.2019.014:

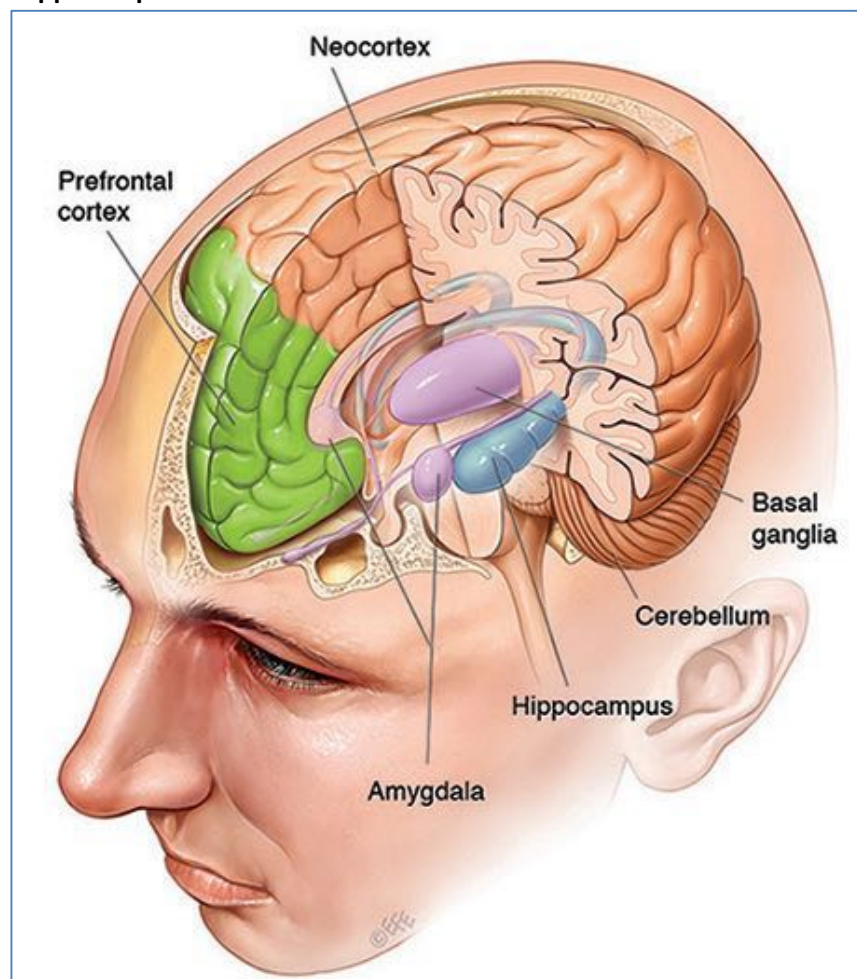
### Short-Term Memory (STM) / (Working Memory):

- **Based in Hippocampus**
  - o However, small links are established with Cortex (Visual/Auditory/Olfactory/Gustatory)
  - o These Links are made by Changes to Neuron Signalling that don't require protein synthesis (Quicker)
- **Lasts Seconds → Several Hours MAX** (AKA: "Crammers" Memory)
  - o IE: Changes to Neurons are **Transient** (Temporary)
- **Limited to ≈7-8 "Chunks" of Info**
- **Amnesia** ≈ Damage to Connection between STM & LTM
- **Properties:**
  - o Is Conscious
  - o Is Active
  - o Has a Limited Capacity (≈7 'element' limit)
  - o Is Short-Lived (≈9-12 Seconds unless rehearsed)

- **3 Components:**

- **1: Phonological Loop:**
  - Holds Verbal Material
  - Involves Left Parietal Lobe
  - 'Chunking' allows more to be packed into each 'Element'
  - Info is Short-Lived (Surface-learned) unless **Rehearsed**:
    - Maintenance Rehearsal
    - Elaborative Rehearsal
    - Integrated with previous info
    - Previous info is Accommodated
  - Rehearsal transfers info from Surface to **Deep Learning**
  - Info Stored here is Disrupted by Verbal Activity (Eg: Speaking)
- **2: Visuospatial Sketchpad:**
  - Holds Spatial Information (Usually conveyed by Vision)
  - The 'Mind's Eye'
  - Involves Right Parietal Lobe
  - Info Stored here is Disrupted by Spatial Activity (Eg: Pointing)
- **3: Central Executive:**
  - The 'Boss' of the Phonological Loop & Visuospatial Sketchpad
  - The 'Core' of the Working Memory System
  - Involves the Frontal Lobes of the Brain
    - Frontal Lobe Damage → 'Dysexecutive Syndrome' – loss of the ability to Plan, Make Decisions & Solve Problems
    - Eg: Cook who could remember recipes & cooking techniques but couldn't prepare a meal

**Note: Hippocampus sits in the Medial walls of the 'Horns' of the Lateral Ventricle**



*The parts of the brain involved in memory (Illustration by Levent Efe); <https://qbi.uq.edu.au/brain-basics/memory/where-are-memories-stored>*

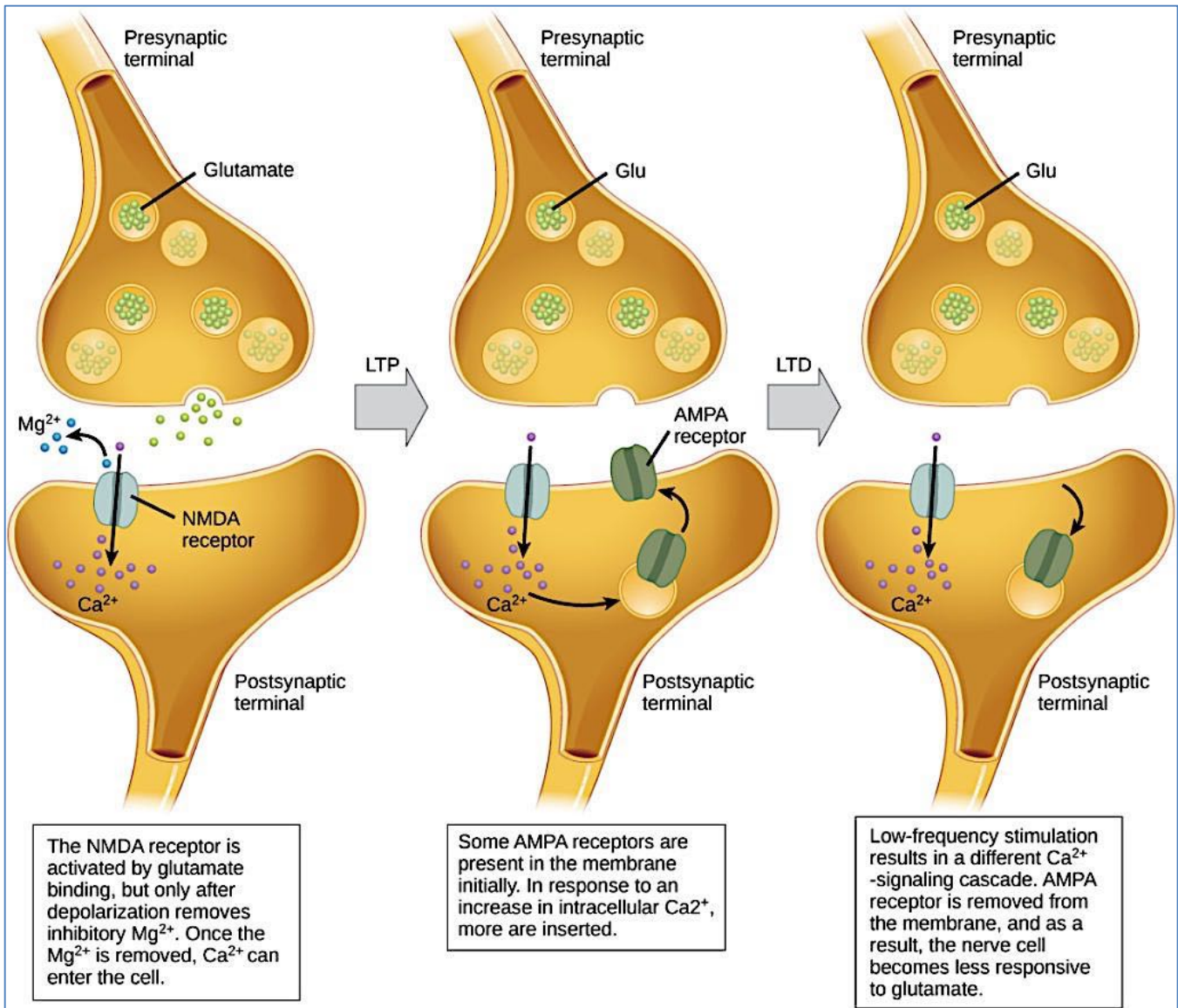
## Long Term Memory:

- **Entry into LTM depends on the Level of Processing:**
  - o Info from Working Memory that has been 'Encoded'/'Rehearsed'/'Integrated'/'Accommodated' enters Long-Term Memory
  - o Info becomes organised & therefore easier to retrieve
  - o Understanding = Systematic Arrangement of Knowledge
- **Consolidation (Creating Long-Term Memories):**
  - o Requires Structural Changes @ the Synapse
  - o Takes Time – (Hence why concussion victims can't remember events directly preceding the incident because those memories were still being 'formed')
- **LTM's Stored In:**
  - o \*Hippocampus
  - o Para-Hippocampal Regions & Amygdala (Medial Temporal Lobe)
  - o Thalamus + Hypothalamus
  - o Areas of Cerebral Cortex
- **'Primacy Effect':** Words at the start of a list are recalled better than those in the middle
  - Words are transferred to Long-Term Memory
- **'Recency Effect':** Words at the end of a list are recalled better than those in the middle
  - Words are held in Working-Memory
- **Requires Remodelling the Neuron/Synapse via "Long Term Potentiation" & "Long Term Depression"**

## Long-Term Potentiation (LTP):

- **Definition:** "A Long-Lasting Post-Synaptic Depolarisation, induced through Repetitive Stimulation & Summation of Excitatory Post-Synaptic Potentials"
  - o Simply – "A Persistent Increase in Synaptic Strength"
- **Calcium, The #1 Mediator of LTP:**
  - o NMDA-mediated  $\text{Ca}^+$  Influx → Activation of **Enzymes** that cause:
    - ↑Neurotransmitter Release
    - Or Changes in Post-Synaptic Receptors
- **The #1 Neurotransmitter:**
  - o **Glutamate** → binds to **NMDA** and/or **AMPA** Receptors
    - **NMDA Receptors:**
      - Act as **Coincidence Detectors** (Simultaneous Signals)
      - IE: Detects coupling of occurrences
      - Is essentially a Ligand(Glutamate)-Gated  $\text{Ca}^+$  Channel
      - Has a Voltage-Dependant  $\text{Mg}^+$ -Block → Acts as a Voltage-Gate
      - Therefore, NMDA Receptor is Ligand & Voltage-Gated
    - **AMPA Receptors:**
      - Is a Ligand-Gated  $\text{Na}^+$  Channel
      - When Glutamate Binds → Channel Opens → Depolarisation → AP
      - Action Potential 'Kicks' out the  $\text{Mg}^+$  Block on the NMDA Receptor
- **3 Phases of LTP:**
  - o **1: Induction** - (Synaptic Plasticity)
    - **Alleviating of the NMDA-Receptor's  $\text{Mg}^+$  Block**
      - This may be done by:
        - o AMPA-Receptor mediated Action Potential
        - o Metabotropic-Receptor linked to Ion-Channel → AP
  - o **2: Expression** - (Synaptic Augmentation)
    - **NMDA-Mediated  $\text{Ca}^+$  Influx** → Activation of Enzymes that:
      - 1: Modify Proteins in Post-Synaptic Terminal or ↑in Pre-Synaptic Neurotransmitter Release → Strengthens response to subsequent Stimuli
      - 2: Activation of Genes in Post-Synaptic Neuron's Nucleus → Synthesis of Synaptic Proteins → ↑Synaptic Strength

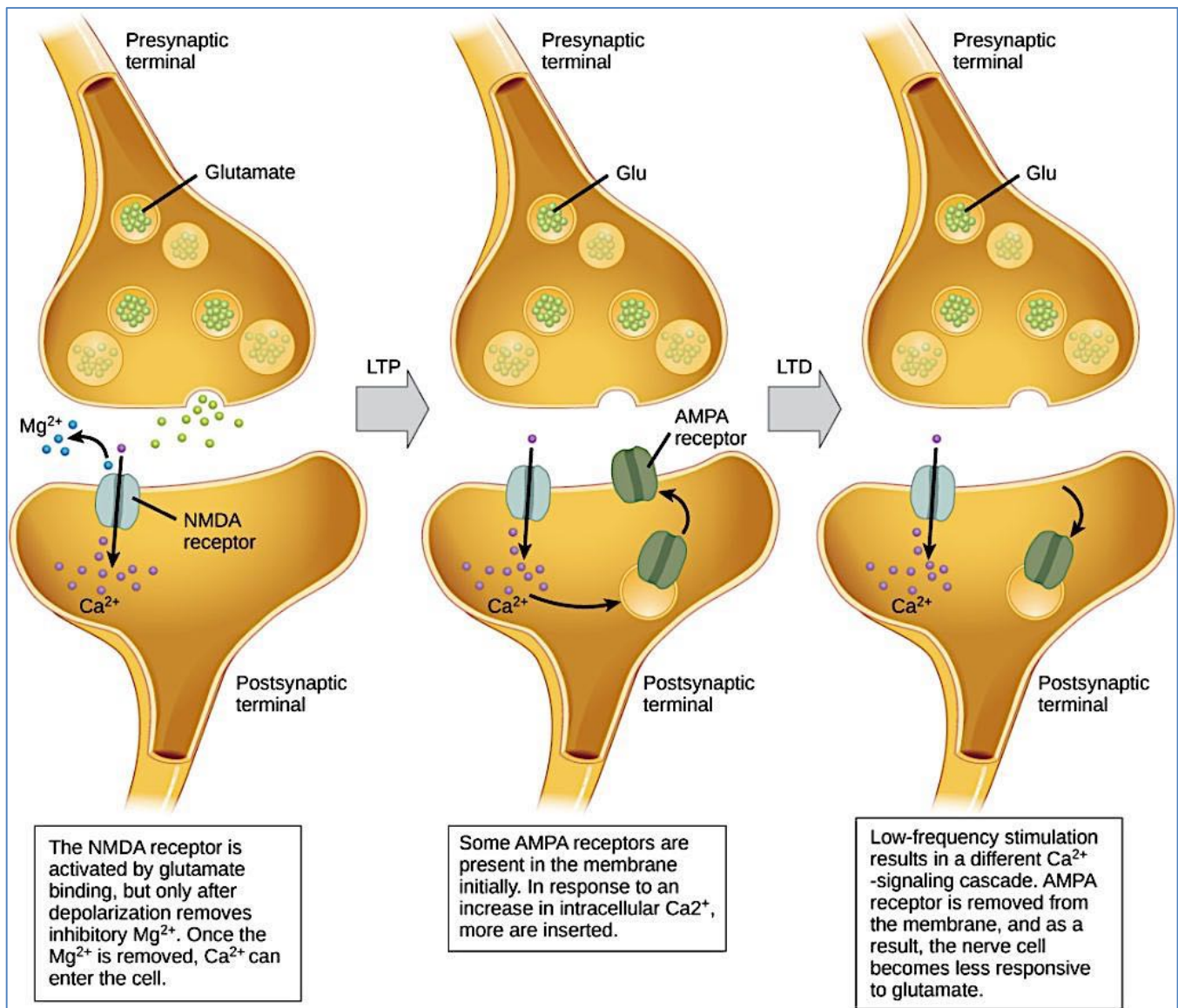
- **3: Maintenance** - (Long Term Loss/Continuation of LTP)
  - **Rise in mRNA Levels** → Augmented Synthesis of Proteins linked to Memory
    - This ↑ in Protein Synthesis is regulated by a (+)Transcription Factor: “cAMP Response Element Binding” protein (CREB)
    - This perpetual ↑ Protein-Synthesis → Long-Lasting ↑ Synaptic Strength that is believed to underlie memory



OpenStax. Located at: <http://cnx.org/contents/185cbf87-c72e-48f5-b51e-f14f21b5eabd@10.8>. License: CC BY: Attribution. License Terms: Access for free at <https://openstax.org/books/biology-2e/pages/1-introduction>

### Long Term Depression (LTD):

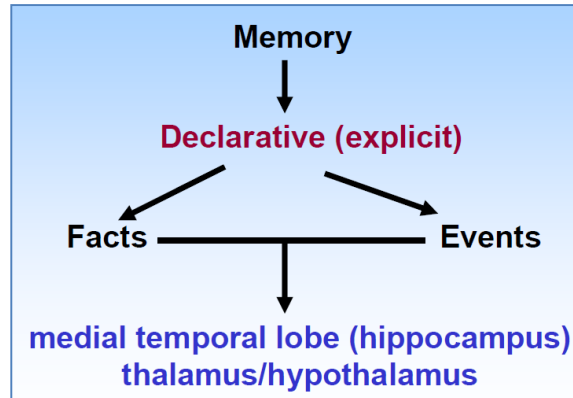
- **Definition:** "The Weakening of a Neuronal Synapse that lasts from hours-days"
- **Calcium, The #1 Mediator of LTP:**
  - o NMDA-mediated  $\text{Ca}^{2+}$  Influx  $\rightarrow$  Activation of **Phosphatases** that cause:
    - De-phosphorylation of AMPA-Receptors
      - $\rightarrow$  In Hippocampus  $\rightarrow$  AMPA Dephosphorylation  $\rightarrow$   $\downarrow$  Amplitude of Post-Synaptic Potential to the Normal Level (Prior to LTP)
      - $\rightarrow$  Can also remove receptors from post-synaptic membrane & place them in reserve
- **Results From:**
  - o Strong Synaptic Stimulation (Cerebellum)...Or
  - o Persistent Weak Synaptic Stimulation (Hippocampus)
- **Function in:**
  - o **Overall:**
    - Plays a role in modulating impact of formed memories to prevent overload
  - o **Hippocampus:**
    - Thought to return LTP'd synapses back to a normal level so they will be available to store new information
  - o **Cerebellum:**
    - Thought to promote Motor Learning



## 2 Types of Long-Term Memory:

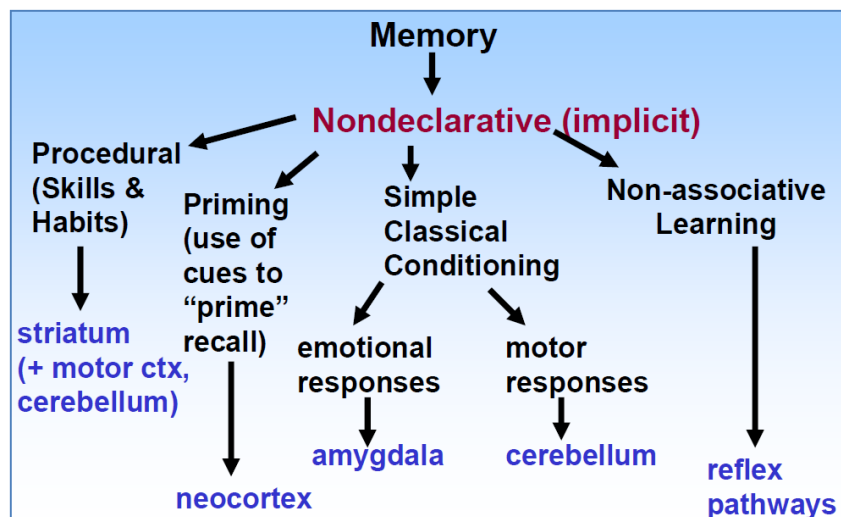
### - 1: Declarative (EXPLICIT):

- **Brain Regions:**
  - Hippocampus
  - Para-Hippocampal Regions (Medial Temporal Lobe)
  - Areas of Cerebral Cortex
  - Thalamus + Hypothalamus
- **Learning “WHAT”:**
  - Facts/Words/Ideas/Concepts/Events



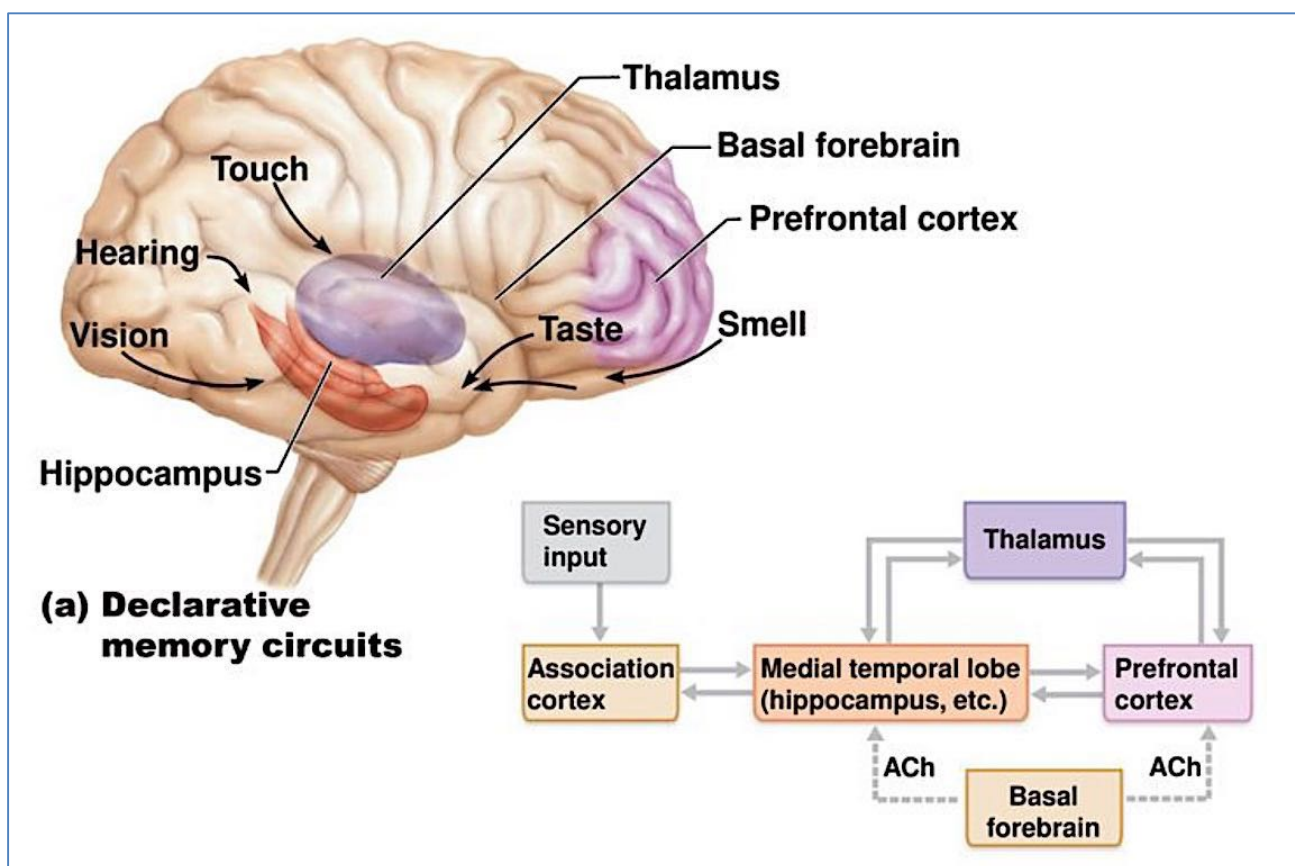
### - 2: Non-Declarative (IMPLICIT):

- Learning “HOW”: - How to do things/How to recognise things
  - **Procedural:**
    - Walking
    - Driving a car
    - Doing Algebra
    - How to get Home
  - **Priming (Anticipation):** - IE: The use of a trigger to pull out a memory
    - Ache in gut if you get a letter from Tax Office – Due to Previous Association
    - Reaction to seeing your Partner
  - **Classically-Conditioned:**
    - **Emotional:**
      - Eg: Fear when seeing a Shark
      - Eg: Ringing Bell → Dog Salivates
    - **Motor**
  - **Non-Associative:**
    - Isolated events not linked to anything



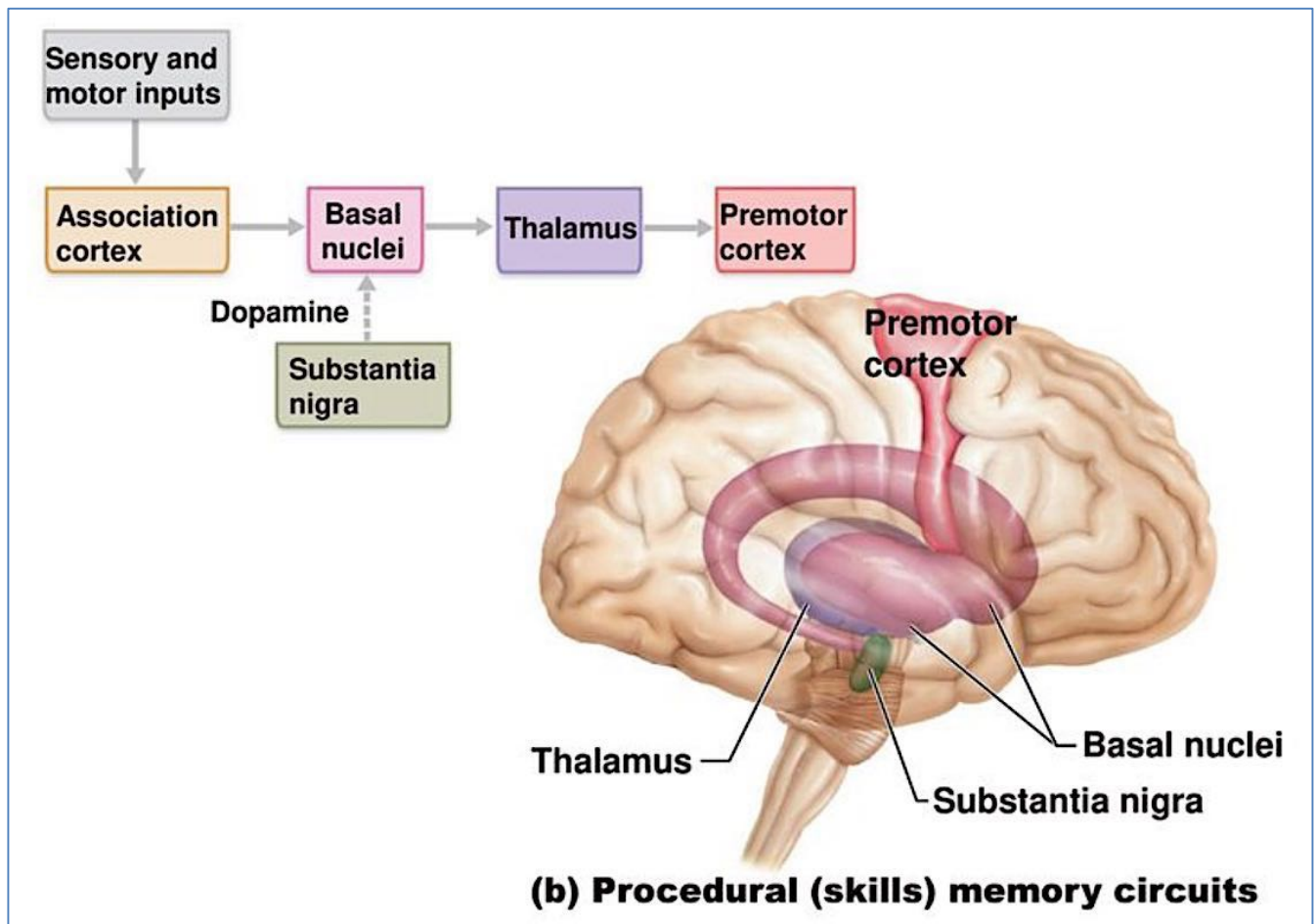
### Circuit of Declarative Memory:

1. **Outside Stimuli:**
  - a. Afferent Sensory Info → Sensory Nerves → Spinal Cord → Medulla → Brain (Somatosensory Cortex)
2. **Somato-Sensory Cortex:**
  - a. Sensory Info is Sorted & Evaluated
  - b. Whatever is the main focus of your attention is Prioritised → Sent to Short-Term Memory In Medial Temporal Lobe (Hippocampus, Amygdala & Surrounding Cortical Areas)
3. **Medial Temporal Lobe Areas:**
  - a. Role: Memory Consolidation & Retrieval Via Communication with Thalamus & **Prefrontal Cortex**
  - b. **Basal Forebrain:**
    - i. Primes the Medial-Temporal Lobe & Prefrontal Cortex with **Acetylcholine** → **Triggers LTP in Hippocampus**
    - ii. → Enables **Long-Term Memory Formation**  
(Note: Loss of ACh input in Alzheimer's → ↓ Memory Formation & Retrieval)
4. **Feedback to Association Cortices:**
  - a. Facilitates **Retrieval of Memories**



### Circuit of Non-Declarative (Procedural) Memory:

1. **Sensory & Motor Input:**
  - a. Afferent Sensory-Motor Info → Spinal Cord → Medulla → Brain (Association Cortices)
2. **Association Cortices:**
  - a. (Somatosensory/Visual/Auditory/etc)
  - b. Relay Sensory-Motor Inputs to the Basal Nuclei
3. **Basal Nuclei:**
  - a. Relays Sensory-Motor Inputs through the Thalamus to the Premotor Cortex
  - b. **Substantia-Nigra:**
    - i. Releases **Dopamine** onto Basal Nuclei → primes this circuit  
(Note: Loss of Dopamine Input – IE: Parkinson's – Interferes with Procedural Memory)
4. **Premotor Cortex:**
  - a. Plans & Organises learned Actions



## Common Memory Disorders:

- Alzheimer's:
  - **What?:**
    - Progressive memory loss ("Mild Cognitive Impairment"), Dementia & overwhelming Retrograde & Anterograde Amnesia
    - No real diagnostic tests
  - **Genetic Aetiology:** (Autosomal Dominant)
    - Amyloid Precursor-Protein Gene
    - Presenilin 1 Gene
    - Presenilin 2 Gene
  - **Symptoms Due To:**
    - Loss of ACh Innervation onto Prefrontal Cortex & Medial-Temporal Lobe (hippocampus) by Basal Forebrain
  - **Affects:**
    - Basal Forebrain Cholinergic System (IE: Loss of ACh innervation)
    - Striatum (Caudate & Putamen) – Part of Basal Ganglia
    - Thalamus
    - Cerebellum
  - **Inability to:**
    - Define simple words
    - Understand use of common items
    - Comprehend numbers
      - **IE: A Loss in Declarative Memory**
  - **Emotional Disturbances:**
    - Confusion
    - Agitation
    - Delusion
    - Paranoia
- Amnesia:
  - Typically Declarative Memory Loss (Therefore Hippocampal Damage)
  - Commonly caused by Temporal Lobe Damage (Hippocampus and/or Thalamus)
    - **Note: L-Hippocampus** = Language
    - **R-Hippocampus** = Spatial Memory
  - Anterograde:
    - - Inability to form new memories from time of Injury/Damage **Onwards**
    - Non-Declarative Memory is Unaffected
  - Retrograde:
    - - Inability to recall memories from time of Injury/Damage **Backwards**
- Korsakoff:
  - Anterograde & Retrograde Amnesia
  - Caused by severe Thiamine Deficiency (Alcoholics & severe Malnutrition)
  - → Loss of connection between Temporal Lobes (Hippocampus) & Frontal Cortex
- Seven 'Sins of Memory' – (Types of Memory Deficits):
  - **1: Transience** – Memory 'Fade'
  - **2: Absent-Mindedness** – Brushing teeth when already brushed them
  - **3: Blocking** – When a memory is on the 'Tip of the tongue'
  - **4: Misattribution** – Where you Misremember where you saw/heard something, or even if
  - **5: Suggestibility** - Where someone suggests that you saw/heard something (when you didn't) and you 'remember' seeing/hearing it
  - **6: Bias (Negative Bias)** - Tend to recall only the Negative Things
  - **7: Persistence** - Remember a *Single Failure* rather than multiple successes (Eg: Post Exam Briefings)
  - **8: Confabulation** - When you elaborate on a memory

## FAB (FRONTAL ASSESSMENT BATTERY)

### 1. Similarities (conceptualisation)

**"In what way are they alike?"**

**A banana and an orange** (If incorrect, provide answer as fruit but do not prompt for others)

**A table and a chair**

**A tulip, a rose, and a daisy**

Score: Only category responses (fruit, furniture, flowers) are considered correct  
Three correct: 3, Two correct: 2, One correct: 1, None correct: 0

### 2. Lexical fluency (mental flexibility)

**"Say as many words as you can beginning with the letter 'S', any words except surnames or proper nouns".** (The time allowed is 60 seconds).

Score: Word repetitions or variations (shoe, shoemaker), surnames, or proper nouns are not counted  
More than nine words: 3, Six to nine words: 2, Three to five words: 1, Less than three words: 0

### 3. Motor Series (programming)

**"Look carefully at what I'm doing".** (Perform alone three times with left hand, the series "fist-edge-palm". **" Now with your right hand do the same, first with me, then alone."**  
(Perform the series three times with the patient) **"Now do it on your own".**

Score: Patient performs six correct consecutive series alone: 3  
Patient performs at least three correct consecutive series alone: 2  
Patient fails alone, but performs three correct consecutive series with the examiner: 1  
Patient cannot perform three consecutive series, even with the examiner: 0

### 4. Conflicting Instructions (sensitivity to interference)

**"Tap twice when I tap once"** (Demonstrate with a series of three trials: 1-1-1).

**"Tap once when I tap twice"** (Demonstrate with a series of three trials: 2-2-2).

(Perform the following series: 1-1-2-1-2-2-2-1-1-2).

Score: No error: 3, One or two errors: 2, More than two errors: 1, Patient taps like the examiner at least four consecutive times: 0

### 5. Go-No Go (inhibitory control)

**"Tap once when I tap once"** (Demonstrate a series of three trials: 1-1-1).

**"Do not tap when I tap twice"** (Demonstrate a series of three trials: 2-2-2).

(Perform the following series: 1-1-2-1-2-2-2-1-1-2).

Score: No error: 3, One or two errors: 2, More than two errors: 1, Patient taps like the examiner at least four consecutive times: 0

### 6. Prehension behaviour (environmental autonomy)

(Place the patient's hand palm up on his/her knees. Without saying anything or looking at the patient, bring your hands close to the patient's hands and touch the palms of both the patient's hands, to see if he/she will spontaneously take them. If the patient takes your hands, try again after asking him/her)

**"Now, do not take my hand".**

Score: Patient does not take the examiner's hands: 3  
Patient hesitates and asks what he/she has to do: 2  
Patient takes the hands without hesitation: 1  
Patient takes the examiner's hands even after told not to do so: 0

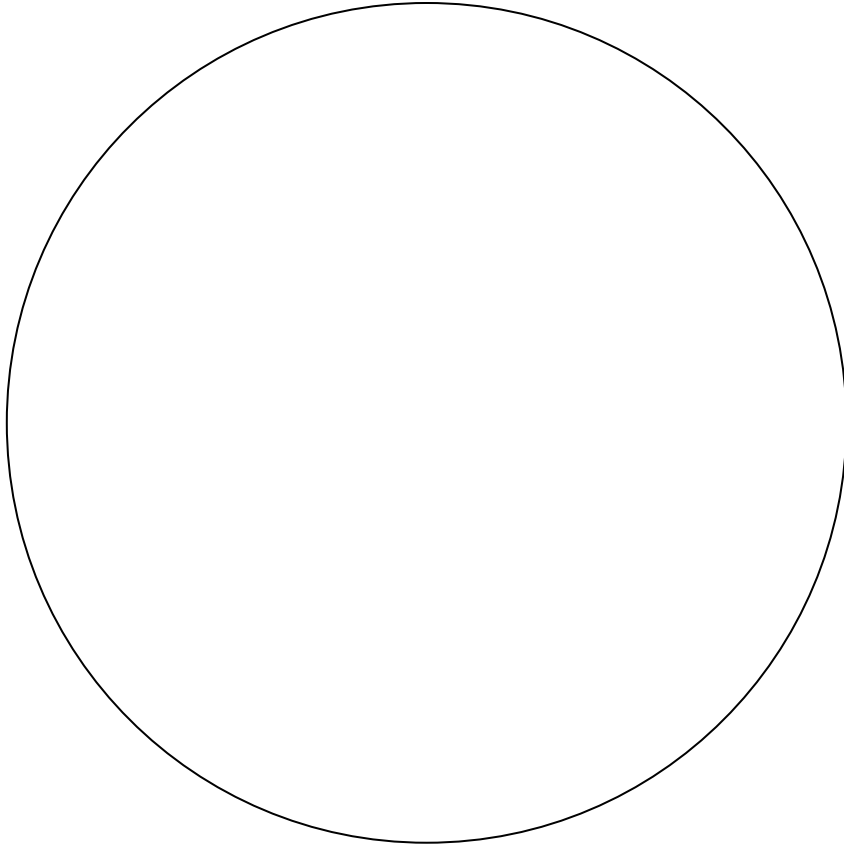
Cut off for normal performance = 15

Total Score

## CLOCK DRAWING TASK

---

**“Draw in the numbers of a clock face below”.  
“Now draw in the hands that show the time as ‘ten past eleven’.”**



### **Scoring**

**10:** normal drawing, number and hands in approximately correct positions, hour hand distinctly different from minute hand.

**9:** Slight errors in placement of hands, or one missing number on clock face.

**8:** More noticeable errors in placement of hour and minute hand (off by one number), number spacing showing gaps.

**7:** Placement of hands significantly off course (more than one number), very inappropriate spacing of numbers (eg, all on one side).

**6:** Inappropriate use of clock hands (digital display or circling of numbers despite repeated instructions), crowding of numbers at one end of the clock, or reversal of numbers.

**5:** Perseverative or otherwise inappropriate arrangement of numbers (eg, numbers indicated by dots), hands may be represented but do not clearly point to a number.

**4:** Numbers absent, written outside of clock or in distorted sequence, integrity of clock face is missing, hands not clearly represented or drawn outside of clock.

**3:** Numbers and clock face no longer connected in the drawing, hands not recognisably present.

**2:** Drawing reveals some evidence of instructions received but representation of clock is only vague, inappropriate spatial arrangement of numbers.

**1:** Irrelevant, uninterpretable figure or no attempt.

**8 – 10: Normal**

**1 – 7: Abnormal**

## End of Sample

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