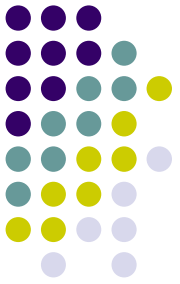


Maximizing Your Brain Power

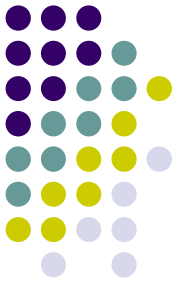


OSHER LIFELONG LEARNING INSTITUTE (OLLI) at NYU
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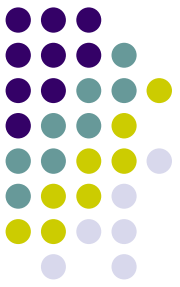
Judith G. Leventhal, Ph.D. and Leo J. Shea III, Ph.D.

Overview

- Functions mediated by the brain.
- Brain changes with aging.
- Brain Structures.

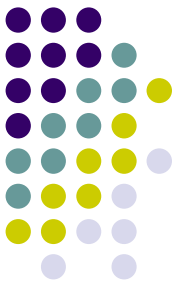


Functions Mediated by the Brain

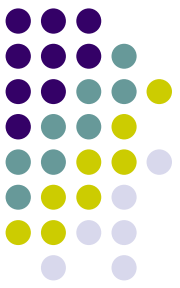


- Intelligence.
- Attention.
- Processing Speed.
- Memory.
- Perceptual-Motor.
- Visual-Perceptual.
- Visual-Spatial.

Functions Mediated by the Brain

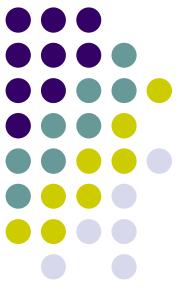


- Language and communications.
- Executive functions:
 - Organizational.
 - Planning.
 - Sequencing.
 - Multitasking.
- Critical thinking/problem solving.
- Emotional/social.



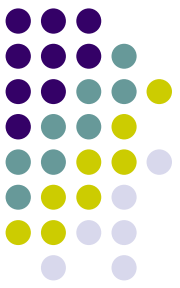
Brain Changes with Aging

- We continue to generate new brain cells throughout our lives.
- The connection between brain cells can grow stronger or weaker.
- Stimulation of brain cells can sprout new connections.
- We can stem the loss of brain cells.
- Memory and the rate of information processing starts to noticeably decline in our forties but we can do something about it.



Brain Changes with Aging

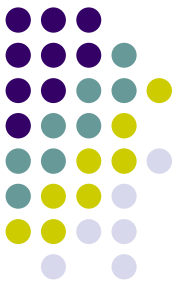
- It may take longer but we can learn more. Our vocabulary and ability to problem solve and perform new tasks can actually expand with age.
- Broader perspective and understand things in a broader context.
- Importance of exercising one's brain.



Brain Changes with Aging

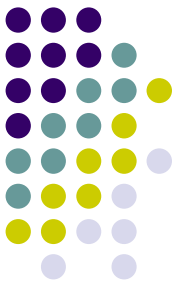
- Long-term study on autopsy: Those with greater education were less likely to exhibit signs of dementia even their brains showed evidence of the disease.
- Yaakov Stern's research: Stimulating your brain creates alternative networks for thinking through your problems and retrieving memories.

Brain Changes with Aging



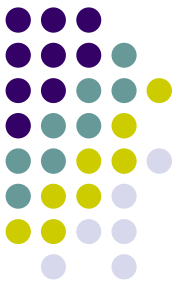
- Changes in chemical and electro-chemical interactions in addition to structural changes.
- The rate of change may be hastened or slowed by lifestyle factors (i.e., smoking, exercise, weight, diet, education, environment, sleep, stress, health, genetic factors, etc.)

Structural and Physical Changes with Aging



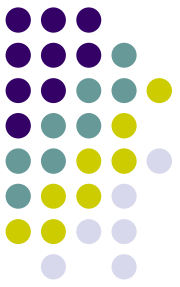
- Normal breakdown of Myelin (nerve insulator and covering that speeds up information processing). This begins in middle and late adulthood.
- Overall brain mass decreases by 10 percent by the time you reach your eighties.
- Greatest amount of cell decay is in the frontal lobes.

Structural and Physical Changes with Aging



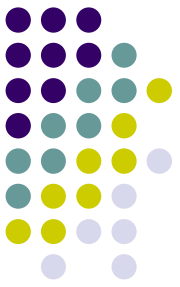
- Twisting of nerve fibers (neurofibrillary tangles) and hardening of nerve fibers (plaques) more prevalent.
- Brains blood supply declines.
- Waste products accumulate in cell bodies.
- Brain tissue less elastic or less sponge like.
- Parts of hippocampus (major memory structure in the brain) deteriorate and communication between hemispheres less effective.

Structural and Physical Changes with Aging



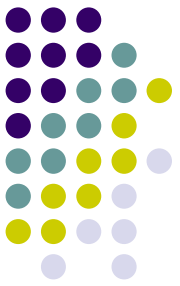
- The number of connections between nerves (synapses) decreases with age.
- Body metabolism slows down as a result of normal biochemical changes.

Functional Changes with Aging



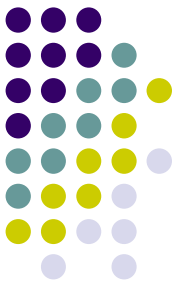
- Functions affected include intelligence, processing speed, attention, memory, language and comprehension.
- Memory changes are associated with inconsistent coding of information and retrieval strategies.
- Attention more likely to wander.
- Cannot rely on passive attention.
- Cognitive processing has slowed.

Functional Changes with Aging



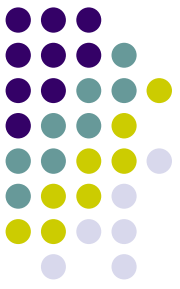
- Ability to judge visual spatial relationships is less reliable.
- Strategies used in the past may no longer work.
- May actually remember things more clearly because taking the time to process more slowly.

Functional Changes with Aging



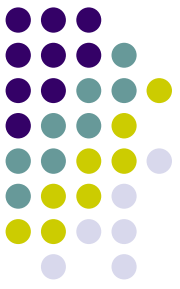
- Sensory and perceptual abilities begin to dull and it takes more time to remember and recall information.
- Become more susceptible to distraction but information that is recalled tends to be accurate. Memory is not declining; it's just getting more accurate.

Functional Changes with Aging



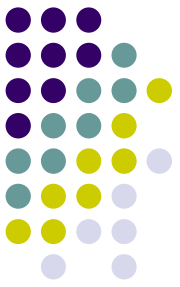
- Slower processing may result in seeing nuances and subtleties not noticed before:
 - Slower reaction time.
 - Reduced speed of information processing.
 - Reduced dexterity.
 - Increased time to complete tasks.

Functional Changes with Aging



- More internal data to bring into our working memory for comparison.
- Long-term memory unchanged.
- Short-term memory tends to slow down.
- Requires more effort to move information from working memory to long-term memory.
- New learning takes more effort.
- Sensory systems less acute.

Maximizing Your Brain Power

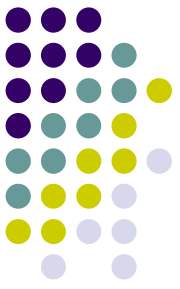


- Enhancing cognitive functioning.
- Enhancing emotional functioning.
- Enhancing interpersonal functioning.
- Enhancing behavioral functioning.



Left Hemisphere

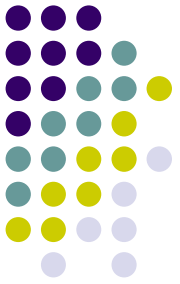
- Responsible for speech, math, reading and writing.
- Mediates motor functions on the right side of body.
- “Broca’s area”: Responsible for the production of fluent speech.



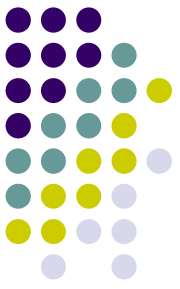
Right Hemisphere

- Mediates visuospatial skills.
- Mediates attention.
- Mediates the regulation of emotions.
- Mediates motor functions on the left side of body.

Corpus Callosum

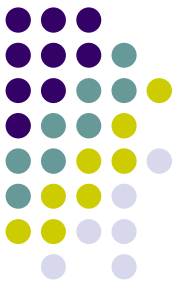


- Connects the left and right hemispheres allowing for communication between them.



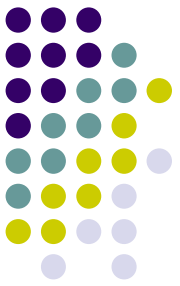
The Four Lobes: Frontal

- Functions of the Frontal Lobe:
 - Initiation and inhibition of behaviors.
 - Decision-making and problem-solving (Executive functions).
 - Abstract reasoning.
 - Awareness and motivation.
 - Language expression and speech production.
 - Judgment and social behaviors.



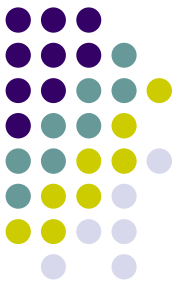
The Four Lobes: Frontal

- Functions of the Frontal Lobe:
 - Mediation of emotion.
 - Attention and concentration.
 - Movement and integration of motor functions with other senses.



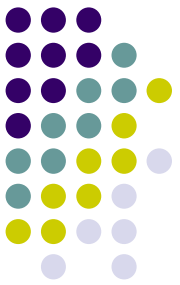
The Four Lobes: Temporal

- Functions of the Temporal Lobe:
 - Memory.
 - Comprehension of language.
 - “Wernicke’s area”: Comprehension of speech.
 - Music appreciation.



The Four Lobes: Parietal

- Functions of the Parietal Lobe:
 - Pain and touch sensation.
 - Tactile discrimination and recognition (anterior part).
 - Processing of spatial information and comprehension of visual-spatial relationships (right parietal lobe).
 - Understanding facial expressions (right parietal lobe).



The Four Lobes: Parietal

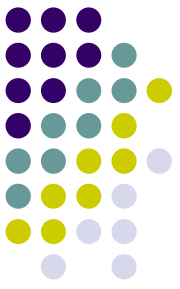
- Functions of the Parietal Lobes:
 - Understanding tones in speech (right parietal lobe).
 - Attention (posterior part).
 - Reading, writing, arithmetic and performance of learned information (left parietal lobe).
 - Speech integration.
 - Visual perception.



The Four Lobes: Parietal

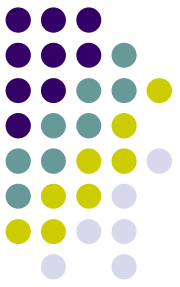
- Problems with the Parietal Lobe:
 - Damage to left parietal lobe can result in “Gerstmann’s Syndrome”: Right-left confusion, difficulty with writing (agraphia) and mathematics (acalculia). Can produce language disorders and inability to perceive objects normally.
 - Damage to right parietal lobe can result in contralateral neglect.
 - Bi-lateral damage can cause a visual attention and motor syndrome involving ocular apraxia, simultanagnosia, and optic ataxia.

The Four Lobes: Occipital



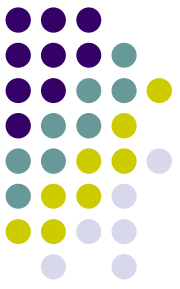
- Functions of the Occipital Lobe:
 - Visual input and perception.
 - Reading perception.
 - Retinal sensors convey stimuli to the visual cortex, which receives raw sensory information from the retina.
 - Cells are arranged as a spatial map of retinal field.

The Four Lobes: Occipital

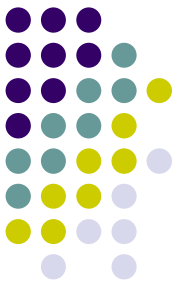


- Problems with the Occipital Lobe:
 - If damaged, can result in homonomous vision loss from “field cuts” in each eye. Lesions can cause visual hallucinations. Lesions are associated with color agnosia, movement agnosia, agraphia and alexia.
 - Not particularly vulnerable to injury because of their location at the back of the brain.

Cognitive Domains



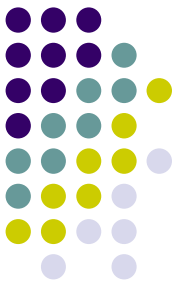
- Attention.
- Sensory and motor functioning (visual-spatial processing).
- Memory.
- Executive functioning (planning, decision making, impulse control, problem solving).
- Language communication.



Memory

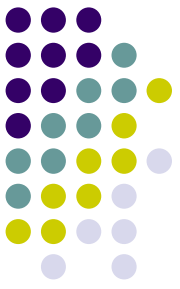
- Rote memory.
- Semantic memory:
 - Who, what and why (verbal and visual).
 - Memory for facts and concepts.
 - Declines late in the aging process.
- Episodic memory:
 - When and where.
 - Mediated from frontal lobes.
 - Shows decline with age.

Memory

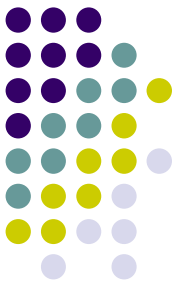


- Procedural memory:
 - How to do something.
 - Memory for physical skills such as swimming and biking.
 - Remains unaffected in normal aging.
- State dependent memory:
 - You are more likely to remember information if you are in the same state as when you encoded it (e.g., walk back into a room to remember what you were looking for).
- Word Retrieval: Common difficulty in the aging process.

Memory



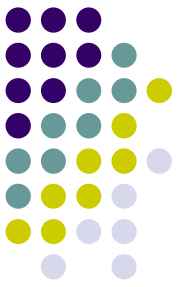
- Encoding strategies:
 - Rehearsal: Repetition of information.
 - Elaboration:
 - Make information as detailed as possible.
 - Involve multiple sense and multiple areas of the brain to maximize brain stimulation.
 - Association: Anchor information of an existing memory.



Enhancing Memory

- Retrieval strategies:
 - Recreate the state you were in when the memory was encoded.
 - Utilize associations.
 - Recognition.
 - Talk about what you are trying to remember.

Memory Changes with Aging



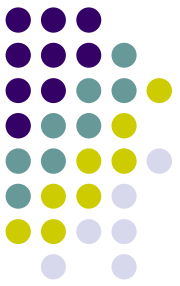
- Possible explanations:
 - Lifestyle changes.
 - Medical conditions.
 - Emotional factors.
 - Less-receptive senses.
 - Less attentive/more distractible.
 - More reliance on internal information rather than from the environment.
 - Must actively engage in the learning process and develop strategies.

Effects of Aging on Attention



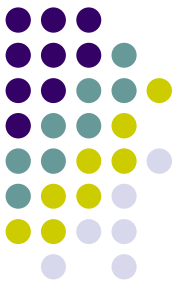
- Changes in attention occur with age.
- Increasing difficulty distinguishing between irrelevant and relevant information.
- As a result have increasing difficulty focusing on the necessary information.
- As a result are susceptible to becoming distracted.
- Speed of processing slows.
- Accuracy may be comprised.

Language



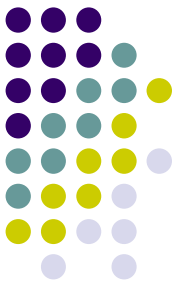
- Expressive and receptive abilities:
 - Verbal expression.
 - Verbal interpretation.

Sensorimotor



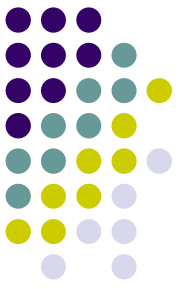
- Incoming information:
 - Where it is.
 - What it is.
 - What is the response?

Structures of the Limbic System



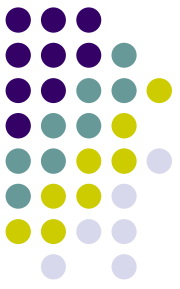
- Amygdala: Involved in aggression, jealousy, and fear.
- Cingulate gyrus: Autonomic functions regulating heart rate, blood pressure as well as cognitive and attentional processing.
- Fornicate gyrus: Region encompassing the cingulate, hippocampus, and parahippocampal gyrus.
- Hippocampus: Required for the formation of long-term memories.

Structures of the Limbic System



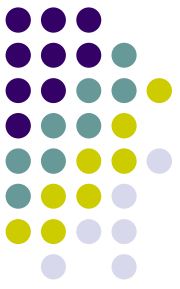
- Thalamus: Regulates arousal, awareness, level of activity and sleep/wakefulness (relay station for sensory input).
- Hypothalamus: Regulates the autonomic nervous system via hormone production and release. Affects and regulates blood pressure, heart rate, hunger, thirst, sexual arousal and the sleep/wake cycle.
- Mammillary body: Important for the formation of memory.

Structures of the Limbic System



- Nucleus accumbens: Involved in reward, pleasure and addiction.
- Orbitofrontal cortex: Required for decision making.
- Parahippocampal gyrus: Plays a role in the formation of spatial memory.

Structures of the Limbic System



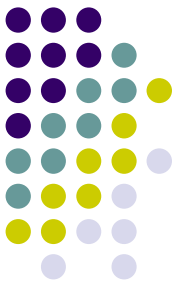
- Hypothalamus:
 - Translates our emotional state into physical feelings of relaxation or tension.
 - Front part of hypothalamus sends calming signals through the parasympathetic nervous system.
 - The back half of the hypothalamus sends fear signals through the sympathetic nervous system. Responsible for the “flight-fight response”.
 - Correlation between deep limbic system activity and depression and the shutdown of the prefrontal cortex, especially on the left.

Functions of the Limbic System



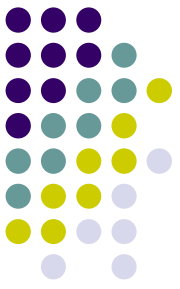
- Sets your emotional tone and environment:
 - Less active = more positive.
 - More active = more negative.
 - Depression that can lead to disruption in bonding and social isolation.
- Filters external events through internal states.
- Places emotional value on events.

Functions of the Limbic System



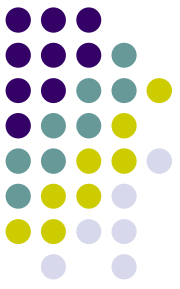
- Stores emotional memories:
 - Stores both positive and negative.
 - Memories help to set the emotional tone of our mind.
 - Positive experiences lead to positive memories lead to positive emotional tone.
 - Negative experiences lead to negative memories lead to negative emotional tone.
 - Emotional memories influence the emotional tag we attribute to day-to-day events.

Functions of the Limbic System



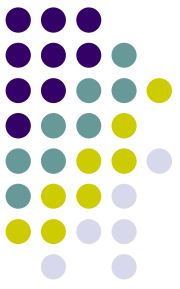
- Modulates motivation and drive:
 - Over activity leads to lowered drive that may be reflected in depression.
- Mediates appetite:
 - Hypothalamus.
 - Regulates internal milieu.
- Mediates sleep cycles:
 - Hypothalamus.
 - Regulates internal milieu.

Functions of the Limbic System



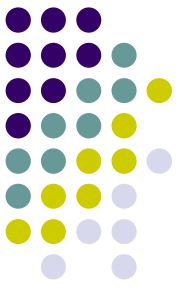
- Promotes emotional attachment:
 - Deep limbic structures.
 - Damaged structures interfere with bonding.
 - Affects ability to connect to others.
 - Ability to connect affects your mood.
 - Events that may disrupt attachment include maternal withdrawal, death, divorce and empty nest syndrome.

Functions of the Limbic System



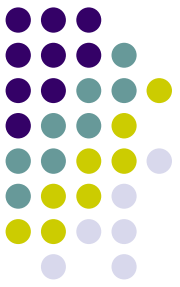
- Mediates sense of smell:
 - Direct connections between nose (sensory organ) and brain. No relay station (Thalamus).
 - Accounts for the powerful impact the sense of smell has on our mood and feeling state.
- Modulates sex drive:
 - Bonding, smells and sexuality are connected.
 - Over activity results in decreased sexual interest. Promotes bonding.

Problems with the Limbic System



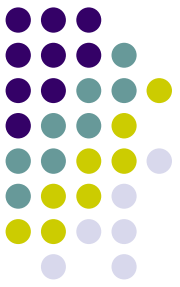
- Moodiness, depression and irritability.
- Negative perceptions and interpretations.
- Decreased motivation.
- Flooding of negative emotions.
- Appetite and sleep problems.
- Changes in sexual responsiveness.
- Social isolation.
- Low energy.

Enhancing Limbic System Functioning



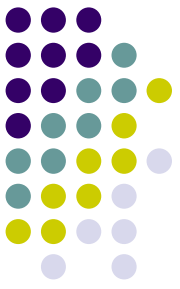
- Dispute automatic negative thoughts. Negative thoughts release chemicals that stimulate the limbic system that in turn have an impact on your physical state and how your body feels:
 - Muscle tension.
 - Increased heart rate.
 - Lightheadedness.
 - Increased perspiration.

Enhancing Limbic System Functioning



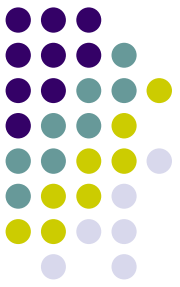
- Positive thoughts cool down the limbic system.
- Positive thoughts have an effect on your physical state:
 - Muscles relax
 - Breathing more regular.
 - Heart rate decreases.

Enhancing Limbic System Functioning



- Dispute automatic thoughts. Examples of negative and positive thoughts include:
 - Always/never thinking.
 - Focusing on the negative.
 - Predicting the worst outcome (fortune telling).
 - Mind reading.
 - Thinking with your feelings (accepting feelings as fact).
 - Guilt assumption (should position).
 - Negative labeling of yourself and others.
 - Personalizing (investing neutral events with personal meaning).
 - Blaming others (assuming a passive stance).

Enhancing Limbic System Functioning



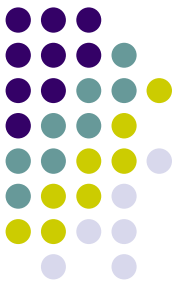
- Surround yourself with people who provide positive bonding.
- Spend time with people who elicit positive feelings.
- Recognizing the importance of physical touch and contact:
 - Studies show that massage increases immune system functioning.
- Build a library of positive memories.

Enhancing Limbic System Functioning



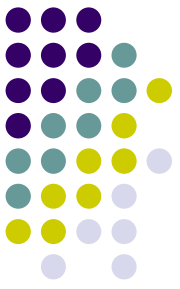
- Make the most of your relationships:
 - Take responsibility for your role in a relationship.
 - Don't take relationships for granted.
 - Protect your relationship.
 - Assume the best in your partner.
 - Keep the relationship fresh.
 - Notice the positive.
 - Communicate clearly.
 - Maintain and protect trust.
 - Deal with difficult issues.
 - Make time for each other.

Enhancing Limbic System Functioning



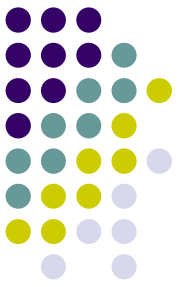
- Surround yourself with great smells:
 - Aromatherapy.
 - Lavender reduces stress and enhances sleep.
 - Cinnamon is considered an aphrodisiac.
- Good diet:
 - A good balance of fats and carbohydrates.
 - Protein snacks.

Enhancing Limbic System Functioning



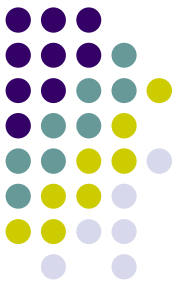
- Exercise:
 - Limbic system has endorphin receptors.
 - Physical exercise increases blood flow to the brain. This has a positive effect on the limbic system.
 - Exercise increases natural amino acid tryptophan in brain. Tryptophan is the precursor to serotonin, the neurotransmitter low in many people who are depressed (others are dopamine and norepinephrine). Depression, lethargy, mental fuzziness and trouble focusing are associated with low levels of norepinephrine and dopamine.

Structures of the Basal Ganglia



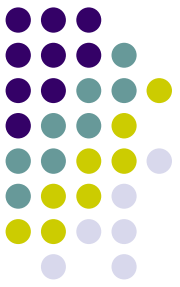
- Caudate.
- Putamen.
- Nucleus accumbens.
- Globus pallidus.
- Substantia nigra.
- Subthalamic nucleus.
- Claustrum.
- Amygdala.

Structures of the Basal Ganglia



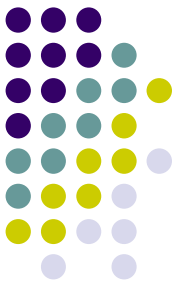
- Structures that surround the limbic system.
- Integrates feelings, thoughts and movements (tremble when nervous).
- Forms a circuit with the cortex.
- Important in the regulation of movement.

Structures of the Basal Ganglia



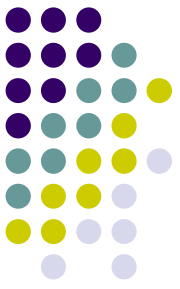
- Although there are many different neurotransmitters used within the basal ganglia (principally Ach, GABA, and dopamine), the overall effect on thalamus is inhibitory. The function of the basal ganglia is often described in terms of a “brake hypothesis”.

Functions of the Basal Ganglia



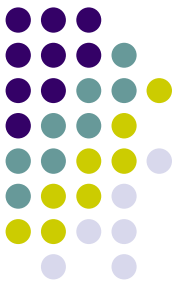
- To sit still, you must put the brakes on all movements except those reflexes that maintain an upright posture.
- To move, you must apply a brake to some postural reflexes, and release the brake on voluntary movement.
- In such a complicated system, it is apparent that small disturbances can throw the whole system out of whack, often in unpredictable ways. The deficits tend to fall into one of two categories: the presence of extraneous unwanted movements or an absence or difficulty with intended movements.

Functions of the Basal Ganglia



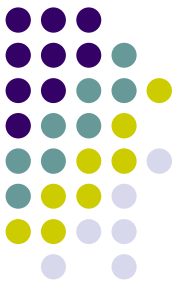
- Involved in habit learning.
- Amygdala responsible for emotional integration of sensory input and memories:
 - Overactive basal ganglia: Tends to freeze in stressful situations.
 - Overactive basal ganglia: May be reflected in increased energy and drive.
 - Under active basal ganglia: Tends to move to action in stressful situations (e.g., ADD).

Functions of the Basal Ganglia



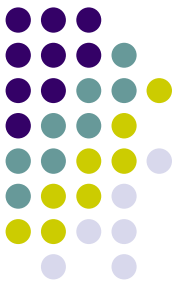
- Shifts, smoothes, inhibits or suppresses motor behavior.
- Sets the body's idle speed or anxiety level:
 - Overactive basal ganglia associated with anxiety, tension, increased awareness and heightened fear.
 - Under active basal ganglia associated with problems with motivation, energy and ability to activate oneself.

Functions of the Basal Ganglia



- Modulates or enhances motivation.
- Mediates pleasure and ecstasy:
 - Intense love releases dopamine in the basal ganglia (a cocaine-like effect) and intense activity in the right and left basal ganglia.

Problems with the Basal Ganglia



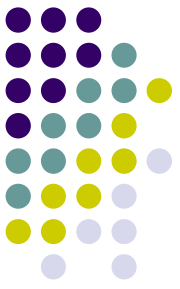
- Basal ganglia is involved in motor control and movement.
- Numerous brain disorders can be associated basal ganglia dysfunction, including Parkinson's disease, Huntington's disease, progressive supranuclear palsy, corticobasal degeneration, multiple system atrophy, Wilson's disease and dystonia.

Problems with the Basal Ganglia



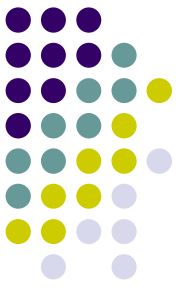
- Any insult to the brain can potentially damage the basal ganglia including strokes, metabolic abnormalities, liver disease, multiple sclerosis, infections, tumors, drug overdoses or side effects and head trauma.
- Symptoms vary and may include tremor, slowing of movements, difficulty walking, rigidity, involuntary movements, muscle spasms, increased muscle tone, and tics.

Problems with the Basal Ganglia



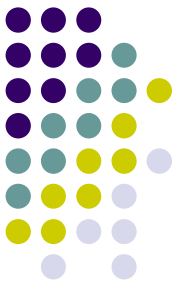
- When the basal ganglia are damaged, control over functions such as speech and movement may be impaired. Difficulties with starting movement, sustaining movement and stopping movement are all possible when this area is injured.
- Prognosis depends on the cause of the dysfunction. Some causes are reversible, others require lifelong treatment.

Problems with the Basal Ganglia



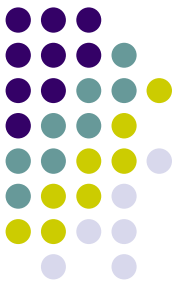
- Parkinson's disease:
 - The three symptoms usually associated with Parkinson's are tremor, rigidity and bradykinesia.
 - The tremor is most apparent at rest. Rigidity is a result of simultaneous contraction of flexors and extensors, which tend to lock up the limbs. Bradykinesia, or "slow movement", is a difficulty initiating voluntary movement, as though the brake cannot be released.

Problems with the Basal Ganglia



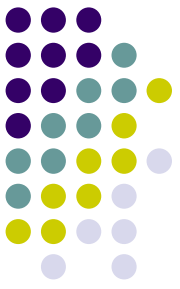
- Huntington's disease:
 - Also called chorea, this is a hereditary disease of unwanted movements. It results from degeneration of the caudate and putamen and produces continuous dance-like movements of the face and limbs. A related disorder is hemiballismus, flailing movements of one arm and leg, which is caused by damage (i.e., stroke) of the subthalamic nucleus.

Problems with the Basal Ganglia



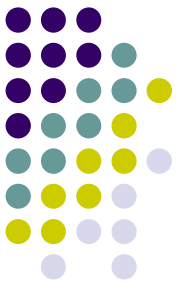
- Tourette's syndrome
 - Scientists have learned that symptoms of Tourette's Syndrome likely arise from dysfunction in the basal ganglia. A University of Michigan study has measured the number of neurons (nerve cells) in the basal ganglia and identified an area of it called the ventral striatum as being involved in Tourette's syndrome. However, researchers don't yet know how these findings are linked to symptoms of Tourette's syndrome and why the tick symptoms usually peak in early adolescence. The research was presented at the 2004 Society for Neuroscience annual meeting.

Problems with the Basal Ganglia



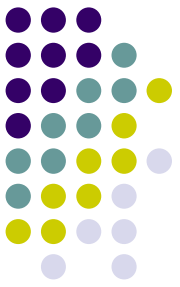
- Anxiety and nervousness.
- Panic attacks.
- Physical sensations of anxiety.
- Tendency to predict the worst.
- Conflict avoidance: Tendency to be frozen by conflict and therefore avoid it potentially having negative impact on one's life.
- Muscle tension.

Problems with the Basal Ganglia



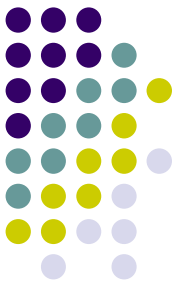
- Tremors.
- Fine motor problems: Overactive basal ganglia can result in increased muscle tone and tremors.
- Headaches: Increased muscle tension can result in headaches. People with resistant headaches have intense focal activity in the basal ganglia. Depakote and Tegretol decreases the over activity in the brain.

Problems with the Basal Ganglia



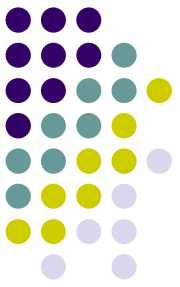
- Low/excessive motivation: Motivation tends to be low in dopamine, deficient states and in increased serotonin states.
 - Heightened dopamine or basal ganglia states may cause increased or even excessive motivation (workaholics).

Problems with the Basal Ganglia



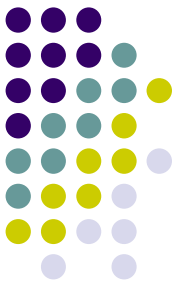
- Overactive basal ganglia: Body's idle is revved-up resulting in feeling of being anxious, nervous, tense and pessimistic. Can result in panic attacks that are associated with increased focal activity in the right basal ganglia.

Problems with the Basal Ganglia



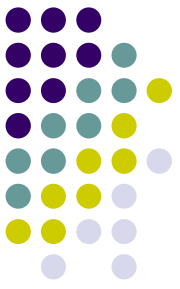
- PTSD is associated with increased activity in the left basal ganglia.
- Startle reaction.
- Predict the worst, automatic negative thoughts, pessimistic resulting in anxiety and constant stress, lowers immune system and increases risk of illness.

Enhancing Basal Ganglia Functioning



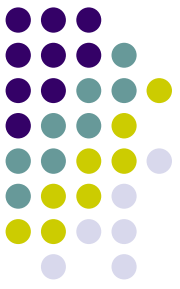
- Write down what is causing anxiety.
- Write down automatic negative thoughts and identify them as such.
- Dispute the negative thoughts. Thoughts are not facts.
- Use relaxation techniques such as guided imagery, deep breathing.
- Use essential oils.
- Take B Vitamins.

Enhancing Basal Ganglia Functioning



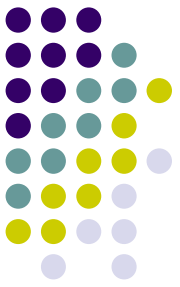
- Try to move away from thinking about what others are thinking of you.
- Learn how to deal with conflict and to tolerate it. Learn how to be assertive.
- Consider medications for anxiety and depression.
- Eat a high protein low-carbohydrate diet for more energy. Hypoglycemia increases anxiety.

Functions of the Cingulate System



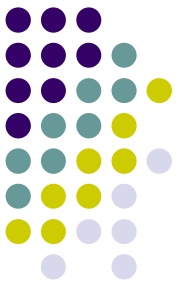
- Attention shifting.
- Cognitive flexibility: Considering alternative perspectives. Essential for personal, interpersonal and professional growth.
- Adaptability.
- Movement from idea to idea.
- Ability to see options.
- Ability to “go with the flow”.

Functions of the Cingulate System



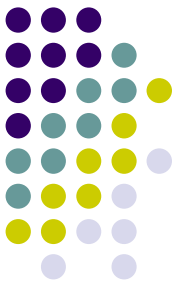
- Ability to cooperate.
- Ability to manage transitions.
- Assists in goal setting and planning.

Problems with the Cingulate Gyrus



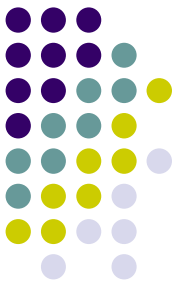
- Holding onto hurts from the past.
- Obsessive compulsive thinking.
- Eating disorders.
- Road rage.
- Worrying:
 - Creates stress.
 - Creates stress in relationships.

Problems with the Cingulate Gyrus



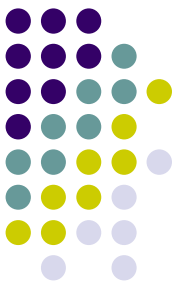
- Getting stuck on thoughts and behaviors.
- Argumentativeness.
- Oppositional behavior.
- Uncooperativeness.
- Addictive behaviors.
- Chronic pain.
- Cognitive inflexibility:
 - Can destroy happiness and intimacy.

Enhancing Cingulate System Functioning



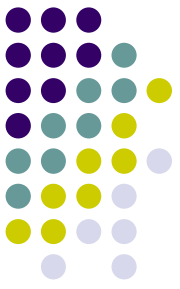
- When you get stuck, get up and do something else. Make a list of what is helpful.
- Control the automatic “no”. Pause before you answer.
- Make a list of options in a situation.
- Know what you can control and what you cannot in a situation.
- When you cannot put aside repetitive thoughts, talk to someone else to help you see options and alternative perspectives.

Enhancing Cingulate System Functioning



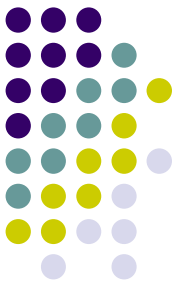
- Find a poem, mantra, etc., to recite to yourself when you are bothered by repetitive thoughts.
- Try paradoxical suggestions or requests: “You probably wouldn’t want to...”.
- Find ways to distract your negative thoughts.
- Eat a high protein diet: The larger amino acids compete more successfully to get into the brain causing lower levels of brain serotonin and more negative emotional re-activeness.

Enhancing Cingulate System Functioning



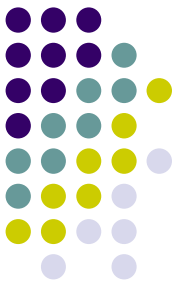
- Eat foods that increase serotonin levels: Carbohydrates are high in L-tryptophan (building block for serotonin) and has a calming affect on the brain. Not good for prefrontal under activity where there is low dopamine.
- Exercise can be helpful in calming worries and increasing flexibility:
 - Increases brain level so l-tryptophan.
 - Can distract you from negative thoughts.

Functions of the Prefrontal Cortex



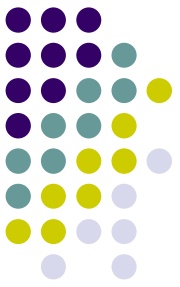
- Attention span:
 - Sustaining attention.
 - Filtering out irrelevant and distracting stimuli.
 - Keeping on task.
 - Quiets the limbic system and other sensory areas of the brain to help to stay focused.
- Perseverance.
- Judgment.

Functions of the Prefrontal Cortex



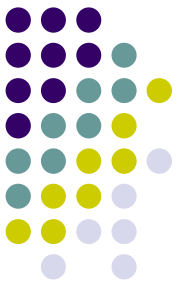
- Impulse control:
 - Think about what you say or do before you say or do it.
 - Think through the consequences of your actions.
- Organization.
- Self-monitoring and supervision.
- Problem solving.
- Critical thinking.
- Forward thinking.

Functions of the Prefrontal Cortex



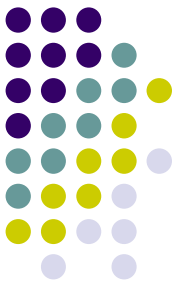
- Learning from experience: Avoid repeating mistakes.
- Ability to feel and express emotions (dorsal lateral):
 - Translates signals from the limbic system into recognizable feelings, emotions and words.
- Interaction with the limbic system.
- Empathy.

Functions of the Prefrontal Cortex



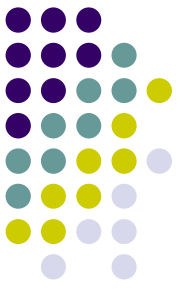
- Watches, supervises, guides, directs and focuses behavior.
- Executive functions (time management, judgment, impulse control, planning, organization and critical thinking). These are hard wired skills.
- Occupies the third front of the brain:
 - The dorsal lateral section.
 - Inferior orbital section.
 - Cingulate gyrus (often considered part of the limbic system).

Problems with the Prefrontal Cortex



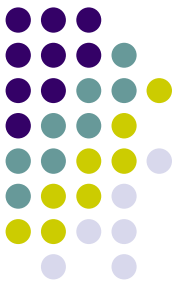
- Impaired functioning may result in poor inhibition of the limbic system:
 - Overactive limbic system may result in depression.
- Short attention span.
- Distractibility.
- Tendency toward ADD.
- Feel a sense of underachievement, experience repetitive failure.
- Poor judgment.
- Trouble learning from experience.

Problems with the Prefrontal Cortex



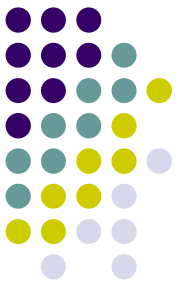
- Experience low self-esteem.
- Lack of perseverance.
- Impulse control problems.
- Hyperactivity.
- Poor time management and chronic lateness.
- Disorganization.
- Procrastination.
- Unavailability of emotions.
- Misperceptions.
- Short-term memory problems.
- Social and test anxiety.

Problems with the Prefrontal Cortex



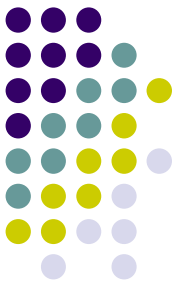
- Seeking conflict stimulates the PFC.
- Dorsal lateral: Decreased attention span, impaired short-term memory, decreased mental speed, apathy, decreased ability to verbally express oneself.
- Inferior orbital cortex: Poor impulse control, mood control problems due to connections with the limbic system, decreased social skills, decreased control over behavior, increased experience of anxiety.
- Subject to damage because of position in the head.

Enhancing the Prefrontal Cortex



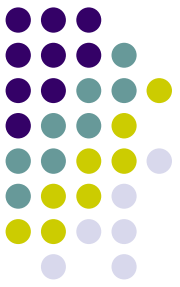
- Develop goal directed plans for relationships, money, work and self:
 - Current and future goals.
- Focus on the positive.
- Focus on meaning and purpose.
- Focus on stimulating activities.

Enhancing the Prefrontal Cortex



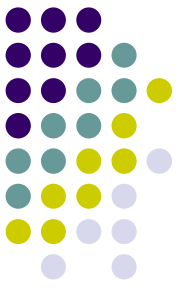
- Get organized:
 - Set goals.
 - Set time aside to organize.
 - Prioritize.
 - Set time frames.
 - Make to-do lists.
 - Record ideas during the day.
 - Break down tasks into smaller tasks.
 - Get unpleasant tasks out of the way.
 - Use folders and organizers.
 - Hire a professional organizer.

Functions of the Temporal Lobes



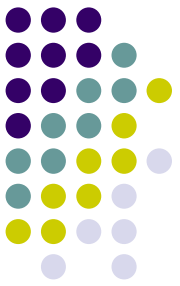
- Temporal lobes play an integral part in memory, emotional stability, learning and socialization.

Function of the Temporal Lobes



- Dominant Side: Understanding and processing language:
 - Spoken and written.
 - Intermediate-term memory.
 - Long-term memory.
 - Auditory learning.
 - Retrieval of words.
 - Complex memories: Responsible for personal identity and sense of connectedness.
 - Visual and auditory processing.
 - Emotional stability and mood stability: Consistently feel stable and positive despite daily ups and downs.

Functions of the Temporal Lobes



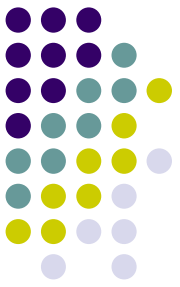
- Non-Dominant Side:
 - Recognizing facial expressions.
 - Decoding vocal intonation.
 - Hearing rhythm.
 - Appreciating music.
 - Visual learning.

Functions of the Temporal Lobes



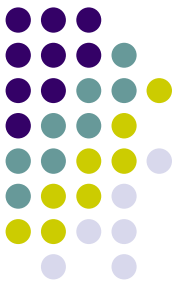
- Temporal Lobes are responsible for critical social skills.
 - Recognizing familiar faces.
 - Recognizing facial expressions.
 - Accurately perceiving voice tones and intonations.
 - Accurately decoding facial expressions and emotional states (an inborn skill).
 - Interpretative cortex: Interpret what we hear and integrate it with stored memories to give meaning to incoming information.

Problems with the Temporal Lobes



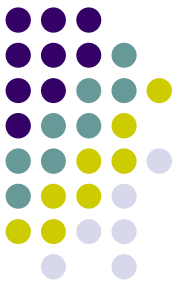
- Problems with the dominant temporal lobe:
 - Aggression internally or externally directed.
 - Dark or violent thoughts.
 - Sensitivity to slights (mild paranoia).
 - Word-finding problems.
 - Auditory processing problems.
 - Reading difficulties.
 - Emotional instability.
 - Mental rigidity.
 - Perseveration.
 - OCD traits.

Problems with the Temporal Lobes



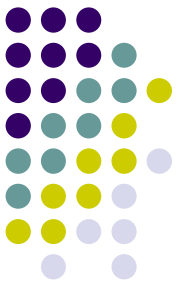
- Problems with the non-dominant temporal lobe:
 - Difficulty recognizing facial expression.
 - Difficulty decoding vocal intonation.
 - Difficulty with social skills.

Problems with the Temporal Lobes



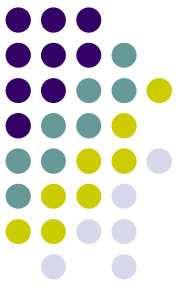
- Problems with either or both temporal lobes:
 - Difficulty recognizing facial expression.
 - Memory problems.
 - Unexplained headaches or abdominal pain.
 - Anxiety or fear for no particular reason.
 - Abnormal sensory perceptions, visual or auditory distortions.
 - Feelings of déjà vu or jamais vu.
 - Periods of fog or confusion.
 - Religious or moral preoccupation.

Problems with the Temporal Lobes



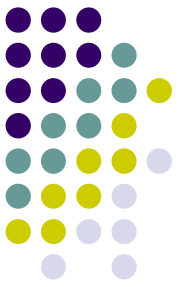
- Problems with either or both temporal lobes:
 - Hypergraphia: Excessive writing.
 - Seizures.
 - Prone to irritability, anger and violent thoughts.
 - May be prone to suicidal thoughts.
 - Illusions such as seeing shadows, seeing objects change size, hearing buzzing, smelling odors, odd tastes, skin sensations such as bugs crawling under or on the skin.

Enhancing Temporal Lobe Functions



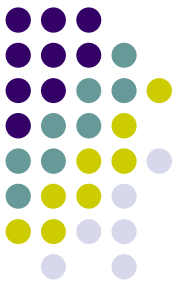
- The temporal lobe stores the experiences of our life. Keeping them stimulated with positive experiences will help to keep you healthy:
 - Record experiences.
 - Singing.
 - Vocal toning.
 - Dancing.
 - A balanced diet.

Enhancing Temporal Lobe Functions



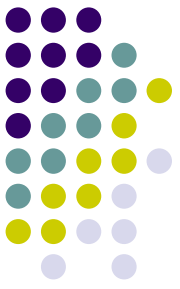
- Listening to classical music:
 - Study found that listening to Mozart's Sonata for Two Pianos enhanced visual-spatial learning (enhances right-brain processing).
 - Campbell (Mozart Effect): Mozart's Violin Concerto's especially 3 and 4 have an even greater effect on learning.
 - Music activities the temporal lobes to enhance learning and memory.

Enhancing Temporal Lobe Functions



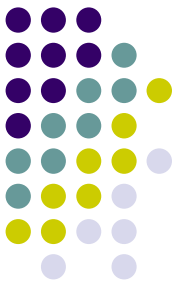
- Learn a musical instrument:
 - Study of university students found that music majors had the highest reading scores of any students on campus.
 - Study found that students with experience in musical performance had higher verbal and math scores on the SAT's than other students.

Enhancing Temporal Lobe Functions



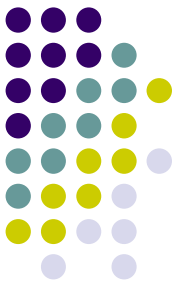
- Getting sufficient sleep:
 - Study found that people with less than six hours of sleep had a marked decrease in temporal lobe perfusion on a SPECT scan.
 - Decreased sleep is associated with decreased cognitive function, irritability and periods of spaciness (all temporal lobe function).
- Reduce or eliminate caffeine and nicotine:
 - Both are vasoconstrictors that decrease blood flow to the brain, especially the temporal lobes. May be a temporary left but in the long run will reduce functioning.

Brain Function and Effects on Relationships



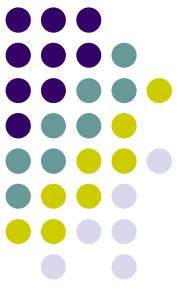
- Limbic system - When the limbic system is functioning well:
 - People are more positive and better able to connect with others.
 - Tend to hear and see through positive filters.
 - Better able to give others the benefit of the doubt.
 - More playful and sensual.
 - Have easy access to positive memories.

Brain Function and Effects on Relationships



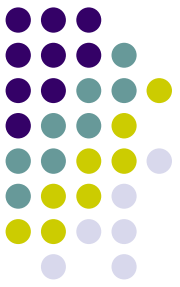
- Limbic system - When the limbic system is overactive:
 - Tend toward depression, negativity and distance from others.
 - Focus on negative aspects of others.
 - See and hear through a negative filter.
 - Less likely to give others the benefit of the doubt.
 - Tend not to be playful.
 - Tend not to feel sexy and sensual.
 - Memories tend to be negative.
 - Tend to push people away with negativity.

Brain Function and Effects on Relationships



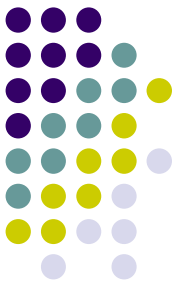
- Enhancing limbic functioning to enhance connections:
 - Spend time together to increase bonding.
 - Choose scents your partner likes.
 - Build positive memories. Focus on the things you have enjoyed together. The limbic system stores emotional memories.
 - Touch each other. Touching stabilizes mood.
 - Avoid the automatic negative thoughts. Focus on the positive.

Brain Function and Effects on Relationships



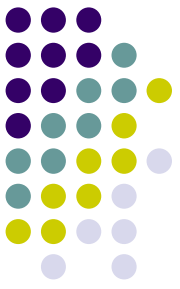
- Don't isolate oneself. Encourage activity and togetherness.
Help your partner around the house. Limbic problems are associated with low energy and poor concentration.
- Take care of yourself. When your partner is depressed it is stressful for you.

Brain Function and Effects on Relationships



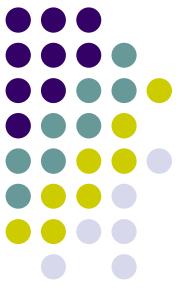
- Basal ganglia - When the basal ganglia is functioning well:
 - Tend to be more relaxed and calm.
 - Tend to see a positive future.
 - Tend to feel physically good.
 - Tend to feel sexy.
 - Able to deal with conflict in an effective way.

Brain Function and Effects on Relationships



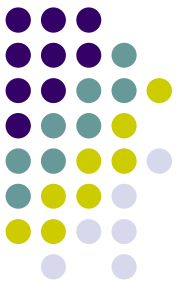
- Basal ganglia - When the basal ganglia is overactive:
 - Experience anxiety, fear, panic, and tension.
 - Focus is on the negative.
 - Filter information through fear.
 - Tend not to give others the benefit of the doubt.
 - Experience headaches, backaches and other physical problems.
 - Lowered sexual interest.
 - Most memories are filled with fear and anxiety.
 - Tend to wear people out with their constant fear.

Brain Function and Effects on Relationships



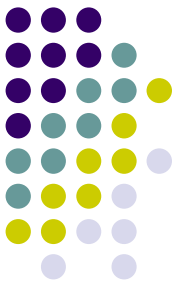
- Enhancing basal ganglia functioning to enhance connections:
 - Predict the best. Think positively. Fight tendency to think negatively.
 - Control breathing. Deep breathing will increase oxygen to brain and help you feel more relaxed.
 - Deal with conflict in a kind and respectful manner. Putting off dealing with the conflict promotes anxiety and tension (PREP techniques and Speaker Listener).
 - Soothe your partner's anxiety with gentle words or touch.

Brain Function and Effects on Relationships



- Cingulate gyrus - When the cingulate gyrus functions well:
 - Tend to shift attention easily.
 - Tend to be flexible and adaptable.
 - Able to forgive mistakes of others.
 - Tend not to hold on to hurts.
 - Tend to be helpful without being controlling.
 - Tend to have a positive outlook and see a hopeful future.
 - Roll with the ups and downs of a relationship.

Brain Function and Effects on Relationships



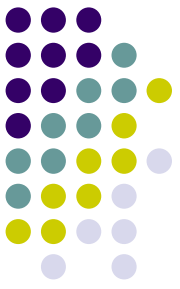
- Cingulate gyrus - When the cingulate gyrus is overactive:
 - Tend to be rigid and inflexible.
 - Tend to hold on to grudges.
 - Tend to hold on to hurts and be unforgiving.
 - Tend to be upset when things do not go as expected.
 - Tend to have difficulty dealing with change.
 - Tend to be oppositional and argumentative.

Brain Function and Effects on Relationships



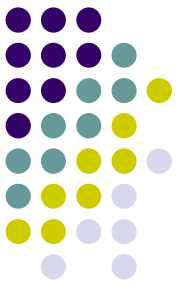
- Enhancing cingulate functioning to enhance your relationship:
 - Notice when you are stuck in a negative pattern of behavior.
 - Take a break when things get hot.
 - Be aware of the physical signals of escalating tension and negativity.
 - Stop nagging and complaining. Find other ways to deal with your frustration.
 - Beating someone over the head will not change behavior.

Brain Function and Effects on Relationships



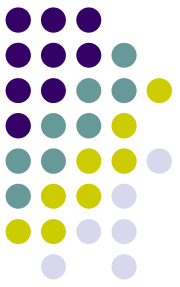
- Enhancing cingulate functioning to enhance your relationship:
 - Use good problem solving techniques. Write out the problem, options and solutions. Write down the issue.
 - Exercise together. Enhances serotonin production in the brain and increases flexibility of thinking.
 - Have a carbohydrate snack to increase blood sugar. This tends to increase mood and reduce irritability and anger often seen in low blood sugar.

Brain Function and Effects on Relationships



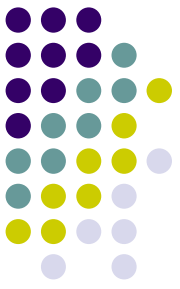
- Prefrontal cortex - When the prefrontal cortex is functioning well:
 - Tend to engage in goal-directed behavior.
 - Able to think before speaking.
 - Actions tend to be consistent with their goals.
 - Tend to learn from mistakes and don't repeat mistakes.
 - Tend to follow through on commitments and chores.

Brain Function and Effects on Relationships



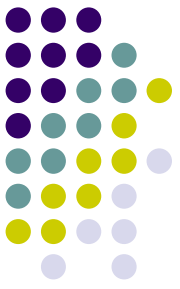
- Prefrontal cortex - When the prefrontal cortex is functioning well:
 - Able to focus on conversations and be more responsive to others.
 - Able to express feeling.
 - Tend to feel settled.
 - Tend not to like tension, turmoil and conflict.

Brain Function and Effects on Relationships



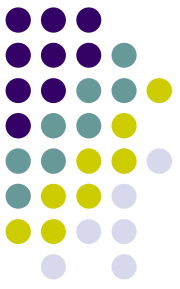
- Prefrontal cortex - When the prefrontal cortex is under active:
 - Relationships can be sabotaged.
 - Can create relationship and family turmoil.
 - Tend to be impulsive.
 - Speak and act without thinking.
 - Live in the moment and have trouble delaying gratification.

Brain Function and Effects on Relationships



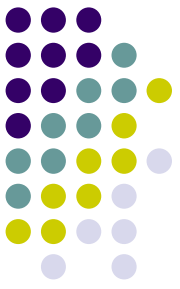
- Prefrontal cortex - When the prefrontal cortex is under active:
 - Tend not to learn from mistakes.
 - Have trouble listening to others and easily distracted.
 - Have difficulty expressing thoughts and feelings.
 - Partners complain of communication problems.
 - Tend to be restless and fidgety.
 - Sensitive to noise, smell, touch and light.

Brain Function and Effects on Relationships



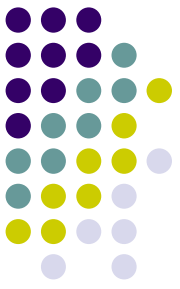
- Prefrontal cortex - When the prefrontal cortex is under active:
 - Difficulty staying on task and meeting commitments and completing chores.
 - Often late.
 - Tendency to seek conflict or look for problems.
 - Tend to engage in highly stimulating behaviors that upset and frighten their partner.
 - Miss deadlines.

Brain Function and Effects on Relationships



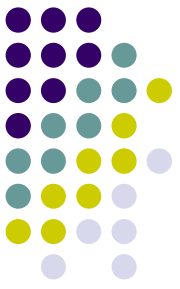
- Enhancing prefrontal cortex functioning:
 - Focus on your goals for the relationship in communication, time together, money, work, parenting and sexuality. Keep reviewing your goals.
 - Focus on the things you like about your partner and reinforce that.
 - Look for new and exciting ways to stimulate the relationship.

Brain Function and Effects on Relationships



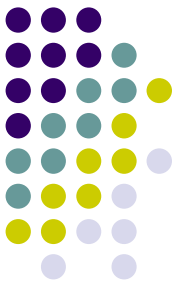
- Enhancing prefrontal cortex functioning:
 - Learn to say “I’m sorry.” Take responsibility for mistakes and impulsive behavior.
 - Do not let yourself become provoked to provide your partner with simulation. Take deep breaths and remain calm.
 - Notice the positive in your partner.
 - Help your partner with organization.
 - Help your partner to be consistent with appointments and commitments.

Brain Function and Effects on Relationships



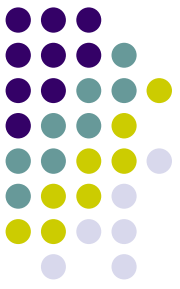
- Temporal lobe - When the temporal lobe is functioning properly:
 - Tend to be emotionally stable.
 - Process and understand what others say in a clear way.
 - Can retrieve words for conversation.
 - Can accurately read the emotional states of others.
 - Have control over temper.
 - Have access to accurate memories.
 - Have a sense of personal identity and history.

Brain Function and Effects on Relationships



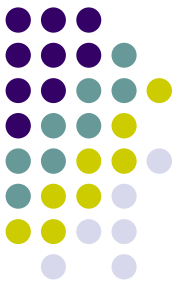
- Temporal lobe - When the temporal lobe is not functioning properly:
 - Struggle with memory.
 - Don't have clear access to personal history and identity.
 - Tend to be emotionally labile.
 - Tend to be temperamental and have problems with anger.
 - Express frustration with aggressive talk.
 - May have violent talk.
 - Tend to take things the wrong way.

Brain Function and Effects on Relationships



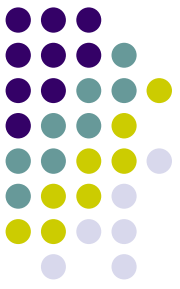
- Temporal lobe - When the temporal lobe is not functioning properly:
 - Tendency toward mild paranoia.
 - May have periods of spaciness or confusion.
 - May misinterpret what others say.
 - Rage and angry outbursts.
 - Mood swings.
 - Low frustration tolerance.
 - Hear things incorrectly.
 - Low frustration tolerance.

Brain Function and Effects on Relationships

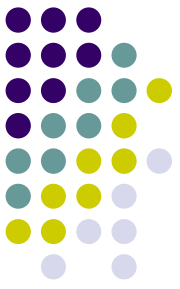


- Enhancing temporal lobe functioning to enhance your relationship:
 - Use positive memories to keep your relationship fresh.
 - Send notes, e-mails to create positive memories.
 - Send flowers (limbic smells), CD's (music).
 - Listen to music together, dance, hold hands.
 - Remember the best times to reinforce positive memories.
 - Deal effectively with anger. Practice anger management strategies.

Brain Function and Effects on Relationships



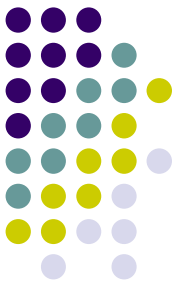
- Enhancing temporal lobe functioning to enhance your relationship:
 - Stay away from alcohol.
 - Keep your sensitivity in check. Do not automatically believe negative thoughts. Don't automatically take things personally.
 - Eat a protein snack to stabilize blood sugar and in turn stabilize the temporal lobe.
 - Take partners anger seriously and do not escalate a situation.
 - Talk in a soft voice.
 - Take a break.
 - Actively listen.



Attention

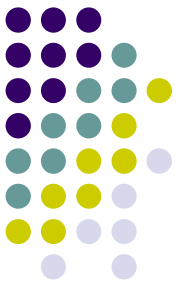
- The foundation of all other cognitive processes.
- Attention components:
 - Arousal.
 - Velocity: The speed of mentally processing information.
 - Concentration: Sustained or focused attention over a period of time.
 - Vigilance: The ability to detect rarely occurring signals over a prolonged period of time.

Attention



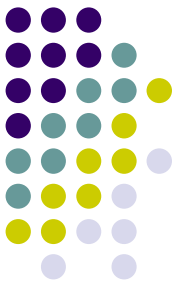
- Attention types:
 - Divided attention: Ability to perform two tasks simultaneously. May involve input to one or more sensory systems.
 - Selective attention: Ability to attend to one stimulus while blocking out another.
 - Search: Ability to find a particular stimulus within the context of similar stimuli.
 - Alternating attention (attention switching): The ability to switch from one stimulus to another.

Four Principles for Improving Attention



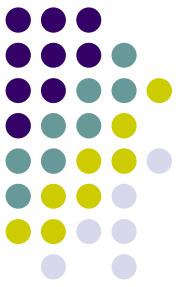
- Active effort: Active attention is the effort you put into observing and absorbing information. The greater the effort the better the encoding of information.
- Active focusing: Maintaining focus over time improves encoding of information.
- Energy conservation:
 - You can't focus on everything.
 - Limit distractions.
 - Take breaks when needed.

Four Principles for Improving Attention



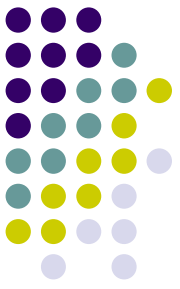
- Organization: Find ways to organize yourself to conserve energy and minimize distractions.
- Preparation: Helps to focus on a task.
 - Break down tasks into component parts.
 - Visualize what is needed to complete each part.
 - Review what worked and what did not work for the next time.

Memory



- Memory is an inner representation of our outer world. It includes our ability to access it and apply the information at a later time.
- Memory is something that with effort you can control.
- Must develop realistic expectations of memory.
- Memory is not just the recall of information. You may have difficulty remembering a name but can recall the richness of an experience and the sensations you experienced.

Memory



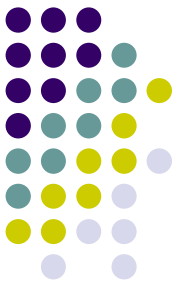
- The process by which information is taken in through the senses, processed and stored.
 - Encoding:
 - The taking in of information from the environment through the senses, organizing and storing it.
 - The creation of neural connections and networks. Involves numerous systems.
 - The better the encoding, the more the systems and networks, the easier it will be to recall or retrieve information.

Memory

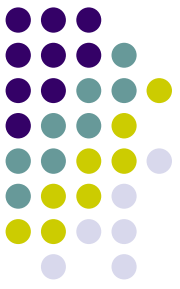


- Storage: The ability to effectively accumulate memory.
 - Working memory or short-term storage: The information you are using right now. The retention of information to be manipulated or transformed:
 - Paying a bill.
 - Calculating a tip.
 - The memory that is most effected by age.
 - Long-term storage: Stored for later use.
- Retrieval: The ability to recall information.

Memory

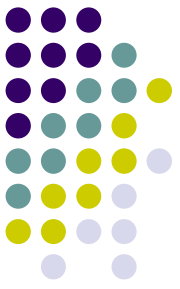


- Concerns about memory loss:
 - Alzheimer's: Begins in the sub-cortical regions and progresses to the temporal and frontal lobes. Characterized by severe deterioration in the consolidation and storage of new information not long-term memory.
 - Normal aging changes: Characterized by poor encoding and retrieval.



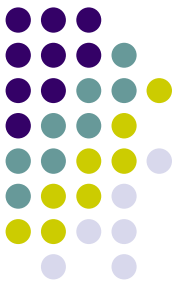
Types of Memory

- Working memory.
- Semantic memory:
 - Who, what and why (verbal and visual).
 - Memory for facts and concepts.
 - Declines late in the aging process.
- Episodic memory:
 - When and where?
 - Mediated in the frontal lobes.
 - Shows decline with age.



Types of Memory

- State dependent memory: You are more likely to remember information if you are in the same state as when you encoded it (e.g. walk back into a room to remember what you were looking for).
- Procedural memory:
 - How to do something.
 - Memory for physical skills such as swimming and biking.
 - Remains unaffected in normal aging.



Types of Memory

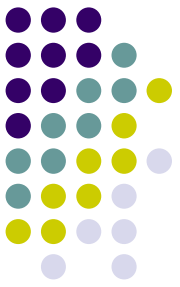
- Word retrieval: Common difficulty in the aging process.
- Perceptual memory: Memory patterns and themes.

Memory Changes with Aging



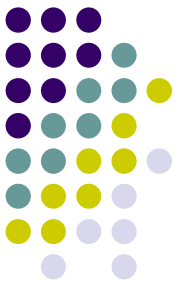
- Increasing difficulty for complex memory tasks requiring manipulation of a lot of new information.
- Increasing difficulty for facts, names and events that are not often accessed.
- Well practiced skills and abilities remain intact.
- Vocabulary continues to grow.
- Knowledge that has been accumulated over a lifetime repeatedly accessed and expanded is generally retained.

Memory Changes with Aging



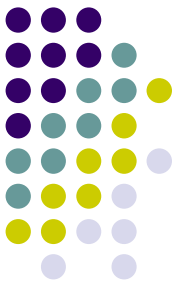
- As we age we become less effective in spontaneously encoding new information.
- Passive attention may no longer work.
- Changes in attention.

Techniques for Enhancing Memory



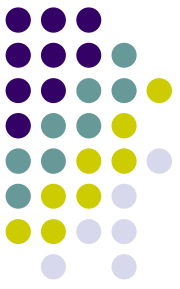
- Translate visual information to verbal information.
- Translate verbal information to visual information.
- Employ all five senses.
- Encoding strategies:
 - Rehearsal: Repetition of information.
 - Elaboration: Make information as detailed as possible. This involves multiple senses and areas of the brain.
 - Association: Anchor information to an existing memory.

Techniques for Enhancing Memory



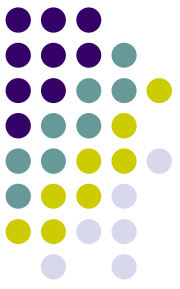
- Retrieval strategies:
 - Recreate the state you were in when the memory was encoded.
 - Utilize associations.
 - Recognition.
 - Talk about what you are trying to remember.

Techniques for Enhancing Memory



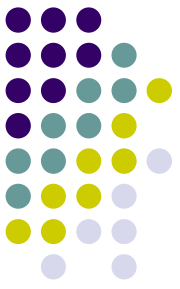
- RARE: RELAX, ATTEND, REHEARSE, ENVISION.
 - Relaxation:
 - Anxiety has a negative effect on memory.
 - Relaxation techniques improve memory performance.
 - Relaxation reduces anxious thoughts and feelings.
 - Attention: Focused attention enhances memory.
 - Putting things in numerical order to focus attention.
 - Memory spot for important items (keys, wallet, glasses).
 - Limit distractions.
 - Develop organization systems.

Techniques for Enhancing Memory



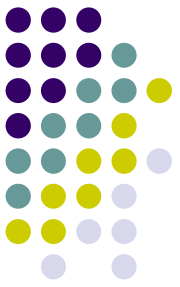
- RARE: RELAX, ATTEND, REHEARSE, ENVISION.
 - Rehearse:
 - Repeat information.
 - Utilize multiple sensory systems.
 - Visualize:
 - Make a mental picture.
 - Considered by some as the single most effective memory technique.

Techniques for Enhancing Memory



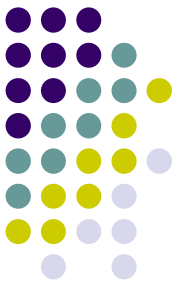
- **DREAM: DEVELOPING RATIONAL AND EMOTIONALLY ADAPTIVE MINDSETS.**
 - Develop realistic expectations about yourself and your memory.
 - Examine your mindset about memory (your beliefs, attitudes and perceptions).
 - Positive attitudes maximize chances for positive outcomes.
 - Negative attitudes maximize chances for negative outcomes.
 - Research shows that Subjective memory complaints in older adults more often reflects depression rather than cognitive changes.

Techniques for Enhancing Memory



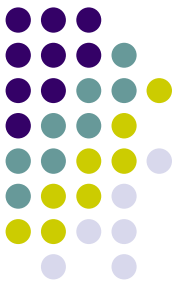
- **DREAM: DEVELOPING RATIONAL AND EMOTIONALLY ADAPTIVE MINDSETS.**
 - Create solutions to problems (e.g., extra set of keys, grocery lists) to help you feel in control.
 - Engage in self talk and notice your successes.
 - Balanced diet and exercise is a key to good memory.
 - Evaluate medications.

Techniques for Enhancing Memory



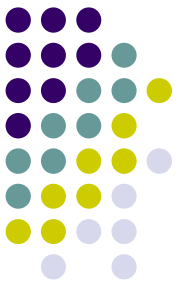
- Self-fulfilling prophecy: If you think you have a terrible memory, you will.
- Organize: Find a central location to put things. Develop a daily routine.
- Focus: Pay attention to your attention.
- Relax: Memory always works better when you are not under stress and when you've had refreshing sleep.
- Limit distractions: Chaos breeds confusion.
- Categorize: Place information in categories.

Techniques for Enhancing Memory



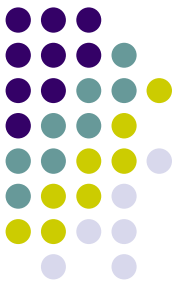
- Sense it: Utilize all of your senses.
- Attach it: Connect meaning to information.
- Preparatory set: Be a mental athlete. Prepare yourself for memory competition.
- Use humor: Compose a humorous phrase, song or mental image.
- Use it or lose it: Memory is improved through practice.
- Label memory files: Develop a mental filing cabinet.

Techniques for Enhancing Memory



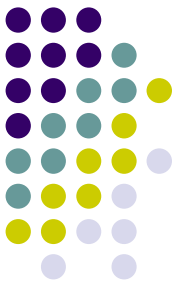
- Memory prosthetics: Use external aids to improve memory.
- Mind-body connection: Diet and exercise.
- Come in through the back door: Attempt to recall the items through other memory systems.
- Time is on your side: Try to reconstruct the timeframe associated with the memory you want to recall.

Techniques for Enhancing Memory



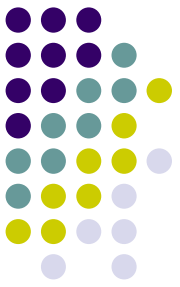
- Chunk it: Code small portions of information into larger, more meaningful concepts.
- Associate it: Connect it up with existing knowledge base.
- Creativity and flexibility: “What is another way I can look at this situation?” Alternative perspectives.
- Focus on your strengths: Think positive, be creative and challenge yourself.

Enhancing Visual Processing

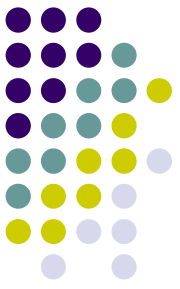


- Improve scanning:
 - Use your finger as a scan guide.
 - Focus on your finger.
 - Organize your scanning (scan horizontally, divide array into parts):
 - Where's Waldo?
 - Word searches.
 - Reading train schedules.
 - Reading maps.
 - Searching menus.
 - Finding items in a supermarket.
 - Locating shopping aisles.

Visuospatial Processing

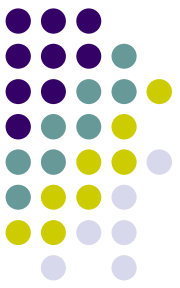


- Cornea, lens and iris send image to the retina. Photoreceptors, rods and cones turn light into electrical signal. Signals go through the optic nerve to the thalamus and brain stem and then to the occipital and parietal lobes.



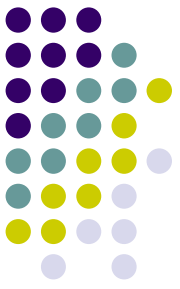
Visuospatial Processing

- Occipital lobe: Visual cortex. Identifies information and decides how to use the information.
- Parietal lobe: relationship of objects to one another.
- The ability to process spatial information depends on neural circuits that connect the occipital, parietal and frontal lobes. The ventral visual stream.



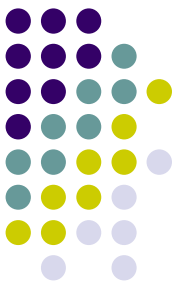
Visuospatial Processing

- Temporal lobe: Processes color, form, detail and size and connects the occipital, temporal and frontal regions. Dorsal visual stream.
- The left hemisphere processes limited objects one at a time.
- The right hemisphere processes information more globally and categorizes it.
- Three separate systems for processing visual information: Shape, color and movement, location and spatial organization.



Visuospatial Processing

- Visual information processing involves:
 - Eye movements.
 - Visual fields.
 - Visual acuity.
 - Scanning.
 - Visual attention.
 - Pattern recognition.
 - Visual memory and recognition: Apply what you have learned to a particular situation or circumstance.
 - Visual cognition: Ability to mentally manipulate or organize information.



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