BIAM Conference Presentation

Facilitating Learning in Traumatic Brain Injury Patients

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Welcome!

Joann Oliver, RN

- Experience with TBI individuals
- Managed children with TBIs as a school nurse
- Supervised nursing students on a TBI rehab unit
  - Personal experiences

Brain Injury

- No two brain injured individuals are alike!
- Outcome depends on:
  - Cause of the damage
  - Area(s) of the brain damaged
  - Extent of the damage
  - Support available to injured individual

- Repeat injuries = > impacts
  - then sum of injuries
  - Lowers the threshold for additional concussive injuries
  - Sports Concussion and Combat Blast Injury
    URL for Department of Defense Site
    http://www.dvbic.org/TBI---The-Military/Sports-vs--Military-Concussions.aspx

Brain Plasticity

- The capacity of the brain to adapt, change, and remap itself is know as

Neuroplasticity:

- During fetal development and very early childhood
  - Immature brain organizes itself
- Throughout life
  - Result of learning or memorization
- With brain injury
  - To maximize remaining neurological functions
  - To compensate for lost or altered function

Brain Plasticity

Jody's Story

- http://www.youtube.com/watch?v=TSu9HGnlMV0&feature=related

Rehabilitation / Learning Concerns

Understanding who the TBI injured individual is post injury

- Impact on sense of self
- Impact on role functioning
  - Recovery concept:
    - "zone of recovery"
      - Placing level of difficulty of activity just 'beyond do-able"
      - Select activities that person is
        motivated to do,
        wants to do, or
        needs to do
- Impact on significant others

Therapeutic Environment in Rehab

TBI individual often do very well during Rehabilitation

Environment is calm, focus it on individually progress

- Pace set by client's needs and progress
- One on one interaction
- Stressors are kept to a minimum

Evaluation is constant as to needs, progress, and tolerance level of client

- Areas of therapy can be compartmentalize
- Other health care providers available to meet other care needs.

TBI: Impact on Brain's Ability to Learn and Recall

Frontal Lobe

When Damaged
- IQ is not reduced
- Impaired mental flexibility and spontaneity

Perceptions regarding risk-taking and rule-abiding are impaired

Attention
- Distraction occurs more frequently

Sense or smell and/or taste
- Altered: may increase or decrease the following

Verbalizations /'talking'
- Amount of change may be dramatic; with increases or decreases in
  - Socialization
  - Creativity
  - Problem solving skills

Impaired appreciation of humor

Orbital frontal lobe damage can result in 'peculiar' sexual habits.

Dorsolateral frontal lobe damage reduces sexual interest.

Temporal Lobes

Normal Functions

Identification of
- Smells
- Sounds

Helps sort new information
- (Frontal lobe decides between what to sort)
- Involved in short-term memory

Right Lobe--Mainly involved in visual memory (i.e., memory for pictures and faces)

Left Lobe--Mainly involved in verbal memory (i.e., memory for words and names)

When Damaged
- Disturbed auditory sensation and perception
- Inability to pay attention to visual or auditory input
- Impaired
  - ability to comprehend language
  - Factual and long term memory
- Emotional disturbance
- Altered sexual behaviors
- Seizures
- Loss of sense of humor
- Develop obsessive behaviors

Parietal Lobes

Decreased: perception of danger, recognition of people & objects, & ability to multitask: Diminished proprioception

Right Hemisphere

More prominent role for left handers

Spatial relationships and visuospatial processing
- images
- maps

When Damaged
- neglect of left side space and left side of the body

loss of
- Imagery
- visualization of spatial relationships
  - drawing may be neglected from the left side

Left Hemisphere

More prominent role for right handers

Association 'functions' allow for symbolic manipulations:
- Language (reading and writing)
- mathematics

When Damaged
- Difficulties with
  - Mathematics
  - long readings
  - writing
  - understanding symbols

Occipital Lobe

Responsible for vision

When Damaged:
- Defects in vision or blind spots
- Blurred vision
- Visual illusion
- Difficulty in reading or writing/ tracking printed materials
- ? impaired long-term visual memories

Cerebellum

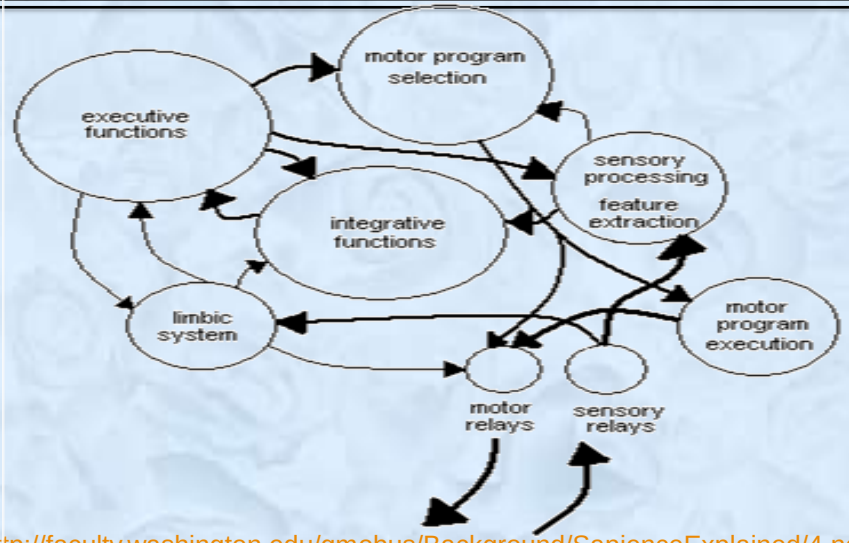
Involved in coordinated movements and balance

When damaged:

- Dizziness
- Tremors
- Impacts on speech/slurring
- Decreased coordination of fine movements

- ? Difficulty with long term muscle memory

"Intelligence" Related Areas of the Brain



http://faculty.washington.edu/gmobus/Background/SapienceExplained/4.neuroscienceSapience/neuroscience_files/brainFunctions.gif

Neurologic Areas that Manage Emotions

Diencephalon:

Thalamus & Hypothalamus

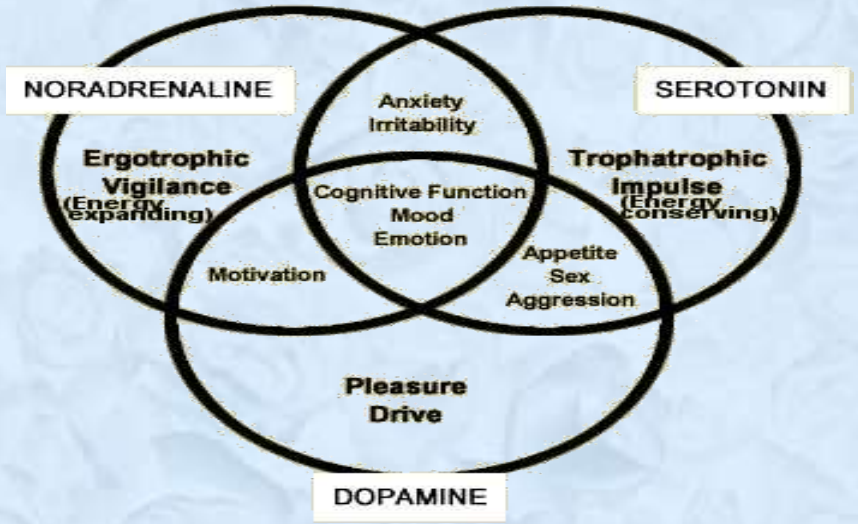
- General levels of activity, rage, fighting
- Tranquility
- Fear and punishment reactions
- May play major role in PTSD
- Sexual drive

Limbic System:

Amygdala & Hippocampus

- Controls and gauges emotional & behavioral activities
- Social behavior
- Sustains long-term emotional memories
- Role in anxiety

Behavior Effects of Neurotransmitters



http://universe-review.ca/I10-87-molecules.jpg

TBI:
THE IMPACT ON LEARNING

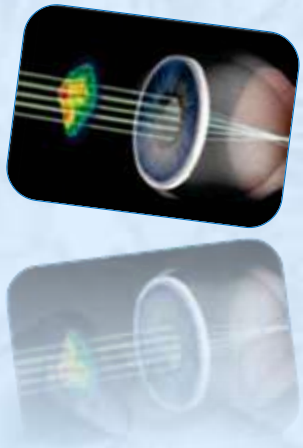
THE TBI LEARNER

- Physical Factors
  - *** Headaches**
  - *** Daytime fatigue** (often with poor sleep patterns)
  - Physical defects and motor/mobility difficulties
    - Balance
    - Coordination
    - Motor skills; clumsiness
      - Manual dexterity for writing
  - Bright lights or loud noises may be painful
  - Other pain (from TBI or comorbid conditions)

THE TBI LEARNER

Sensory Changes

- Verbal Apraxia
- Visual Tracking
- Unilateral Neglect
- Hemianopsia Hemianopia
- Visual Field Cuts
  - Horizontal or vertical
- Vestibular Changes
- Proprioception
- Motor Planning
- Intention Tremor



THE TBI LEARNER

Executive Dysfunctions

- Organizing
- Prioritizing
- Multi-tasking
- Strategizing steps in process
- Setting goals
- Being flexible
- Attentiveness
  - Attending to task
  - Staying on task
  - Visual attention
  - Auditory attention
- **Inability to make a decision**

The TBI Learner

Cognitive Dysfunctions

- **Mental stamina and fatigue**
- Impaired immediate memory (short term)
- Impaired information processing (comprehension)
  - Sequencing
  - PTA
- **Slowed responses** (expression)
  - Verbal and written responses
  - Delayed recall
- Using language effectively
  - Word finding

Characteristics of TBI Individual that Impact Ability To Learn

- Difficulty with logic, thinking and reasoning
- Slower to respond, react and complete activities and tasks
- Difficulty focusing attention
- Physical limitations
- Inappropriate social behaviors
- Difficulty remembering
- Frequently puzzled or challenged by level appropriate work
- Difficulty learning
- Speech and language deficits

Never underestimate the potential for growth and development

Learning Activities: Plan Ahead

Needs to Accommodate Known/Pre-existing Disabilities

- 7 – 8 second memory "rule" for attention & remembering
  - Short and simple
  - Verbal and written to follow
  - Step by step
- Wait between steps to complete each one
- Group materials logically and concretely
- Use more printed materials then you think you need

Environment: Plan Ahead

Minimize Stimuli in Environment to promote Focus on Learning

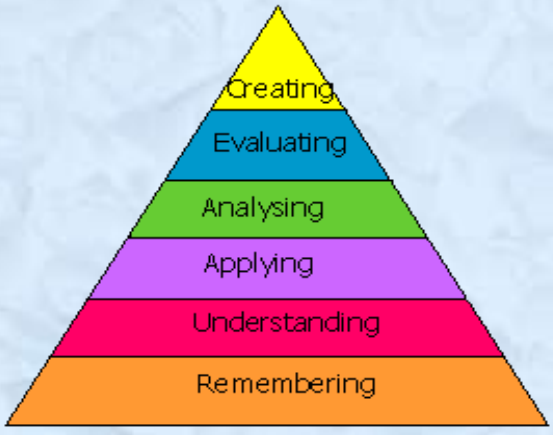
- Isolate learning spaces
- Low lights/focused lighting
- Low noise levels
  - Eliminate background noises
    - of all types
  - Use ear plugs if tolerated
- Provide areas to move/pace or fidget without disturbing others
- Provide for physical comfort
  - Sofas, seating groups, lounges
- Provide for physical needs

Structure Learning Activities

- Sequence Knowledge to Application
  - Written clearly
    - Concise 'concrete', not global
    - May need to be subdivided into small components
  - Acknowledge awareness of cognitive abilities of learners
    - Success oriented
    - Attention span
    - Memory
  - Criteria for mastery of learning may need to be minimal attainment
    - Evaluation criteria may need to be flexible
    - Evaluation may need to use alternate modalities

Knowledge to Application

From: The Critical-Gaming Network



From: http://critical-gaming.squarespace.com/blog/2010/8/13/mega-man-10-becoming-mr-perfect-pt2.html

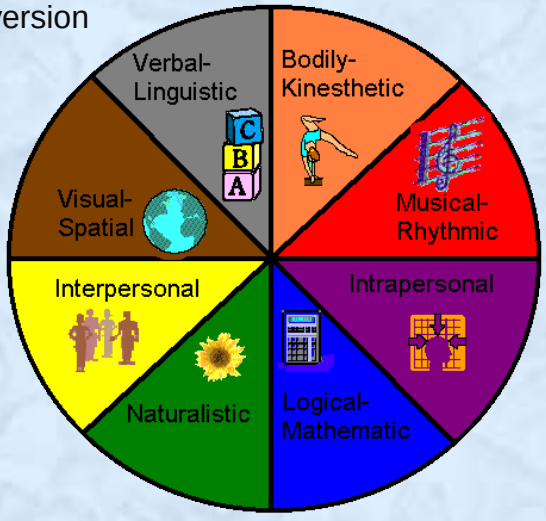
Structure Activities & Materials

- **Be Patient!**
  - Use all domains to facilitate learning
  - Verbal instructions followed by step by step printed instructions
    - Concise and to the point
    - Check lists when completed
  - Provide student with an indestructible written copy of class expectations
  - Promote short – time activities
    - Content provided – student activity – review

Learning Styles

V-A-K = abbreviated version

- Visual
- Auditory
- Kinesthetic



http://njfraser.typepad.com/learning_and_teaching_at_/learning-styles/

Learning Activities & Materials

- **Be Patient!**

  Expect to repeat instructions
  - Repetition – rehearsal – repetition – rehearsal
    - Ex: What takes an uninjured brain 3-4 repetitions to learn might take a TBI individual 12 – 20+ !
  - Repeat content in multiple formats an styles

  Summarize information frequently

  Ongoing monitoring of learning activities
  - Aids in 'learning' about retention style of learner
  - Aids in modifying teaching style and content

Timelines and Learning Expectations

TBI Individual has limited **Mental Stamina**:

- Modify timelines:
  - Processing times may be similar to that of individual with a learning disability
    - Build in mechanisms to repeat content until 'mastery'
    - May require alternate timeframes for expectations, reimbursement schedules, programs, etc.
  - Structure short blocks of time for 'work'

    - Followed by 'non-stressful' activities
    - Mix sitting with tactile and kinesthetic activities
    - If scheduled time is 'long' – allow for 'naps'

Structure Learning Activities

- Model linkages and thought processes out loud
- Use graphics to show relationships
  - Venn diagrams, graphs, concept maps/mind maps
- Do not expect learned content will be generalized to next situation
  - provide links, show relationships

Structure Activities & Materials

Difficulties retrieving information

- Involve in activity in alternate domain
  - Ask questions while doing that activity that is difficult to retrieve
  - Sing information
  - Rap information
  - Develop pneumonics
- Support and enourage
  - Often they will retrieve it when not expecting to or
  - When stress level is lower

Structuring Learning Activities

"One on One" instruction

- Small group size
- Staggered individual start times
  - Allows for orientation to day
  - Allows time to 'shift gears' and focus on task at hand
  - Orient to classroom rules and expectations
    - (Short term memory deficits)
  - Minimizes distraction

Emotional Dysregulation

- **Be Patient!**
  - After group work, meet individually to review main points
  - Provide feedback or correction in neutral fashion
    - Don't fuel emotional liability
  - Give take home information for review and reinforcement
  - Expect the learner to forget
    - His or her homework
    - The lesson he knew last week
    - Class locations, dates, and times, where he sits

Many TBI's "Can't Finish!"

Have difficulty making decisions!

- Model behaviors
- Break into component parts
  - Present options
    - Verbally, visually, graphically, etc
    - Write out pros and cons
    - Decide on the component pieces
    - Work into the whole
- Use repetition to 'strengthen' brain pathways

USE Organizers!

Provide 'memory organizers':

- Name them and personalize them!
  - PDAs
  - Tablets
  - Calendars
  - Timelines

- **Wait for the Rewards!**

Emotional Dysregulation

- Emotional/Affect –
  - Pretending to be 'normal'/Hiding disability
    - Common with TBI individual
  - Major depression
  - Irritable
  - Angry
  - Scared
    - They know they have changed
  - Diminished 'range of emotions'
  - Disinhibited
    - Poor emotional self-control
  - Emotionally self-centered
    - Less sensitive to emotions of others

Emotional Dysregulation

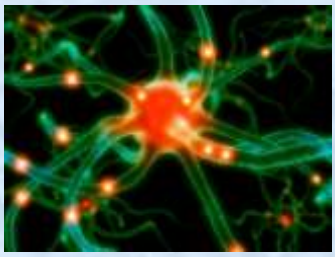
- **TBI individuals can and will be Emotionally Labile**
  - Non-compliance
    - Often not willful
    - Often not related to arises from lack of motivation or resistance
  - Confrontation shuts down thinking and elicits rigidity
  - Roll with resistance!
  - Use resources to determine why compliance is not happening

Structure Learning Activities

- **Be Patient!**
  - Expect frustration in learners
  - Expect emotional outbursts even with no apparent reasons – you can't tell level of internal stress the patient is experiencing
    - Easily frustrated
    - Mood swings
    - Mental fatigue
    - Inattentiveness
    - May not be receptive to feedback

PTSD

- Chemical changes may accentuate TBI injuries in genetically susceptible individuals
- Chemical alterations in some areas of the brain are the same for TBI and PSTD



Leisure Activities

- 1 year post injury
- 81% had not returned to pre-injury levels of participation
  - Most often cited:Parting, drug and alcohol use and sports
  - Most common new post injury activity = watching television
    - 60% of this group were not happy with change
- Those who did return to pre-injury levels (remaining 19%)
  - 70% were able to return within 4 months of injury

From:

- Impact of Traumatic Brain Injury on Participation in Leisure Activities
- *Wise EK, Mathews-Dalton C, Dikmen S, Temkin N, Machamer J, Bell K, Powell JM. Archives of Physical Medicine and Rehabilitation. Vol. 91(9), pp 1357-1362.*

Conclusions: Use All Your Resources

- May require additional community services and resource referrals – requires 'case management'
- May be angry or feel 'cheated' by injury
- Adjusting to altered body image and changes in life

Conclusions: Promote Learning

- Structure environment
- Structure and sequence
- Provide repetition
- Allow to learn at their speed not your
  - Build in mechanisms to repeat content until mastery
  - Use multiple learning approaches/styles/domains
- Expect frustration and
- REWARDS!

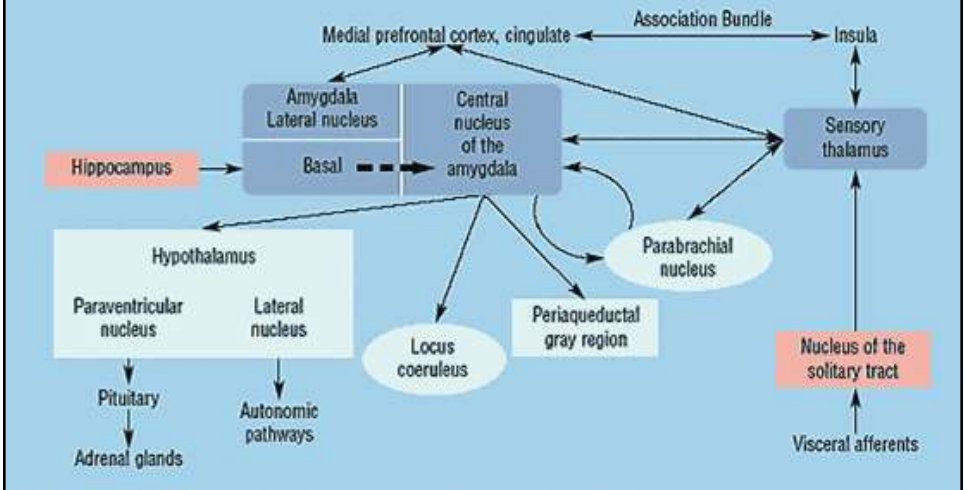
Additional Resources

- To facilitate fullest extent of learning:
  - Case Management & 'Intensive' Advising
  - Personal Care Assistants
  - Financial support
  - Transportation
  - Assistive technology
  - Long-term rehab
  - Counseling
  - Substance abuse treatment
  - (Home modifications)

Resources and URLs used in Preparing this Presentation

And a few of my 'favorite' extras

Amygdala Controls Emotional Output



The amygdala, with connections to the hippocampus and cortical regions, including the anterior and posterior cingulated cortices and the orbitofrontal cortex, is responsible for determining the emotional content of information and to processing emotionally valenced stimuli. Given its central role in the circuit, considerable research has attempted to define the role of the amygdala in the regulation of fear and anxiety and its role in the pathogenesis of PTSD.

Source: Adapted from Gorman JM, Kent JM, Sullivan GM, Coplan JD (2000), Neuroanatomical hypothesis of panic disorder, revised. Am J Psychiatry 157(4):493-505.

URL FOR "*AMYGDALA CONTROLS EMOTIONAL OUTPUT*"

PREVIOUS SLIDE

- http://www.google.com/imgres?imgurl=http://imaging.cmpmedica.com/CME/pt/content/2006/0604/060401PTNeumeisterF1.gif&imgrefurl=http://www.psychiatrictimes.com/display/article/10168/50736&usg=__3x_y3cddhP1_Q3hxaIcDHfJVq4A=&h=401&w=600&sz=22&hl=en&start=18&zoom=1&tbnid=MfD9g7TpYFsZwM:&tbnh=130&tbnw=195&ei=4FqSTaiILovVgAeYxY0Z&prev=/images%3Fq%3Dbrain%2Bchanges%2Bin%2Bptsd%26hl%3Den%26sa%3DX%26rls%3Dcom.microsoft:en-us:IE-SearchBox%26rlz%3D1I7GGLJ_en%26biw%3D1344%26bih%3D654%26tbs%3Disch:1&itbs=1&iact=rc&dur=281&oei=tFqSTYWOHIji0gHPq7HNBw&page=2&ndsp=19&ved=1t:429,r:6,s:18&tx=101&ty=82

RESOURCES AND URLS

Balance and Vestibular Training

- http://www.brainline.org/content/2011/02/what-is-balance-and-vestibular-rehabilitation-therapy.html

Brain Injury Association of America

- http://www.biausa.org/

BIAM: Brain Injury Association of Maryland

- http://www.biamd.org/

Corrigan JD, Suggestions for Substance Abuse Treatment Providers Working with Persons Who Have Limitations in Cognitive Abilities. Ohio Valley Center, 2003. http://www.ohiovalley.org/abuse TBI Provider Training Manual - 200511

Teaching to Promote Brain Plasticity

- Goal of Rehabilitation is to create new brain cell links to replace broken ones

Photo from
DOD Wounded Warriors Diaries
Jarrett Jongema, **SFC.,**
U.S. Army

URL:

- http://www.defense.gov/home/features/2008/0908_wwd/index_jongema.html

Resources and URLs

DOD Wounded Warriors Diaries

- http://www.defense.gov/home/features/2008/0908_wwd/index_jongema.html

Grewal Eye Institute: WaveScan WaveFront™ System

- http://www.lasikgei.com/pages/wavescan.htm

ICYOU: Intensive Content for Your Health

- http://www.icyou.com/topics/neurology/2d-3d-medical-animation-tbi-traumatic-brain-injury-part-i+

Internet Brain Injury Collaborative:

- http://www.intebic.com/Article40.html

Resources and URL

Learning Styles

- Discover how your brain is hard wired for learning with ILP. A look into the theories of the brain and how applying this knowledge using the information from
  - www.achievementinmind.com/ilp can help all learners achieve.
  - http://www.youtube.com/watch?v=uOIWVo-4-lc

MSNBC nerve image:

- http://msnbcmedia3.msn.com/j/msnbc/Components/Photos/051212/051212_neurons_hmed_1p.hmedium.jpg

On the Brain: Michael Merzenich, PhD

- http://merzenich.positscience.com/about-brain-plasticity/

Resources and URL

On Brain Plasticity:

- http://www.sharpbrains.com/blog/2008/02/26/brain-plasticity-how-learning-changes-your-brain/
- http://www.mindmodulations.com/mindmods/images/blogimages//biofeedback-neuroplasticity.jpg

youTube: How Brain Cell Imaging Works

- http://www.youtube.com/watch?v=t61h9idEC0Q&feature=fvw

YouTube: From axons to tracts: A journey through the brain's wiring

- http://www.youtube.com/watch?v=A1ILrYHvnpA&feature=related

youTube: Neuron Zoom

- http://www.youtube.com/watch?v=4Skvvie4ba8&feature=related

NEUROTRANSMITTERS

Name	Type	Postsynaptic Effect	Location(s)	Function(s)
Dopamine	Amine	Excitatory	Brain, smooth muscle	Control arousal levels
Serotonin	Amine	Excitatory	Brain, smooth muscle	Effects on mood, sleep, pain, appetite
Norepinephrine	Amine	Excitatory	Brain, smooth muscle	Induce arousal, heighten mood
Acetylcholine (ACH)	Acetic acid	Excitatory & Inhibitory	Parasymathetic nervous system, brainstem	Role in memory, vasodilation
GABAs	amino acid	Inhibitory	Brain	Control anxiety level
Encephalins (opioid)	Neuro-peptide	Inhibitory	Brain, spinal cord	Reduce stress, promote calm, natural painkiller

http://universe-review.ca/R10-16-ANS.htm