Nervous System

Pathological Conditions
Functions CNS:

Helps maintain homeostasis

Responsible for:

Mental processes
Behaviors
Emotional responses
Function PNS:

Transmit electrical impulses to and from central nervous system (CNS) (sensation and motor control)

Interconnecting neurons in CNS provide for
Consciousness, learning, creativity, memory (outside this scope)
Structure:

~ Each neuron has axon, cell body, dendrite
  Peripheral nerves = bundles of axons and dendrites
  Sensory neurons: long dendrites, cell body in dorsal root ganglion (DRG), short axons
  Motor neurons: long axons, cell body and short dendrite in ventral horn of spinal cord
  All motor neurons terminate in muscle or glandular tissue

~ Neurons communicate at synapses, using neurotransmitters
THE NEURON

The image shows a diagram of a neuron with the following labeled parts:

- Dendrites
- Cell body
- Nucleus
- Nucleolus
- Axon
- Collateral branch
- Node of Ranvier
- Neurilemma
- Myelin
- Nucleus of Schwann cell
- Axon
- Telodendria
- Synaptic bulb

The direction of impulse is indicated by red arrows.
NEURON COVERINGS

Myelin in CNS and peripheral nervous system (PNS):
Schwann cells and oligodendrocytes
Speeds transmission, electrical insulation
Neurilemma in CNS only
Promotes repair of PNS tissue
Most PNS nerves run close to bone for protection
Vulnerable in a few places
SYNAPSE

1. Nerve impulse arrives
2. Released neurotransmitter molecule
3. Receptor site

Axon of transmitting neuron
Synaptic bulb (axon terminal)
Vesicle
Synaptic cleft
Plasma membrane of postsynaptic neuron
FUNCTIONS OF THE NERVOUS SYSTEM

**Sensory function:** receptors detect stimuli and respond by sending information to the CNS

**Integration function:** CNS integrates this information and decides on a response

**Motor function:** motor neurons carry impulses from the CNS to the muscles and glands
CENTRAL NERVOUS SYSTEM

**Brain:** Housed in skull

**Spinal cord:** Housed in vertebral column

Both brain and spinal cord protected by meninges and cerebrospinal fluid
SPINAL CORD AND NERVES

A. Cervical plexus
   Brachial plexus
   Lumbar plexus
   Femoral nerve
   Sacral plexus
   Sciatic nerve
   Pudendal nerve
   Posterior cutaneous nerve of thigh

B. Thalamus
   Coccix
Brainstem
Cerebellum
Diencephalon
Cerebrum
PERIPHERAL NERVOUS SYSTEM

Somatic nervous system
Consciously controlled (voluntary)

Autonomic nervous system
Not consciously controlled (involuntary)
Divided into parasympathetic and sympathetic nervous systems
AUTONOMIC NERVOUS SYSTEM

Parasympathetic
Rest-and-digest

Sympathetic
Fight-or-flight
GENERAL NEUROLOGICAL PROBLEMS

- Many disorders involve mechanical impairment of nerve function: compression or distortion
  Massage may aggravate or relieve pressure

- Brain and spinal cord injuries are inaccessible
  Patients can benefit from massage to maintain function
  Proprioceptive adaptation may be subject to interruption

- Psychological disorders are a different class
  May benefit from massage for stress balance
  Risk of interpersonal complications
GENERAL NEUROLOGICAL CAUTIONS

MAJOR CAUTIONS FOR MASSAGE THERAPISTS:

Numbness (more dangerous than pain)

Verbal communication (watch for nonverbal signals)

Medications (may have interactions with massage)
NERVOUS SYSTEM CONDITIONS

Chronic Degenerative Disorders:
- Alzheimer disease
- Amyotrophic lateral sclerosis
- Multiple sclerosis
- Peripheral neuropathy

Movement Disorders
- Dystonia
- Parkinson disease
- Tremor

Infectious Disorders
- Encephalitis
- Herpes zoster
- Meningitis
- Polio, postpolio syndrome

Psychiatric Disorders
- Anxiety disorders
- Attention deficit hyperactivity disorder
- Autism spectrum disorder
- Chemical dependency
- Depression
- Eating disorders
NERVOUS SYSTEM CONDITIONS, CONT.

Nervous System Injuries
- Bell palsy
- Cerebral palsy
- Complex regional pain syndrome
- Spina bifida
- Spinal cord injury
- Stroke
- Traumatic brain injury
- Trigeminal neuralgia

Other
- Guillain-Barré syndrome
- Headaches
- Ménière disease
- Seizure disorders
- Sleep disorders
- Vestibular balance disorders
CNS Disorders

1. Cerebral palsy
2. Spina bifida
3. Seizure disorders
4. Spinal cord injury
5. Attention deficit-hyperactivity disorder
6. Autism
CEREBRAL PALSY

~ Group of motor disorders; damage to cerebrum from inadequate or reduced blood flow

~ Lighter pressure; avoid joint mobilizations or administer carefully; instruct parents to massage if affected person is a child
CEREBRAL PALSY

Definition
Group of brain injuries that happen during gestation, birth, early infancy

Signs and Symptoms
Vary, depending on type, area of brain damage

Hypotonicity, hypertonicity, poor coordination, poor control, weak muscles, random movements, etc.
CEREBRAL PALSY

Treatment

Skills, equipment to live as functionally as possible:
- Braces, other aids
- OT, PT, speech therapy
- Adapted computers

Extensive massage/physical therapy may yield surprising results: interferes with proprioceptive limitations

Medication:
- Antiseizure, reduce muscle spasm, Botox for excessive salivation, involuntary muscle contractions

Surgery for dislocations, bone corrections
CEREBRAL PALSY: cont’d

Massage:

Many benefits:
can work with proprioceptors to increase ROM, maintain function

Be careful about communication, nonverbal signals for people who can’t speak clearly
SPINA BIFIDA

Definition
- Cleft spine: neural tube defect in which the vertebral arch fails to close completely over the spinal cord
- Ranges from subtle to severe

Spina bifida occulta (SBO)
- Vertebral arch may not completely fuse; no signs are visible
- May not know until radiography for something else
- May be common: 5–10% of population?
- May show dimple, tuft of hair at low back
- Can be serious: tethered cord
**Spina bifida meningocele**

Rarest form
Only dura, arachnoid press through cleft to form a cyst visible at birth
Repaired with surgery, few long-term consequences

**Spina bifida myelomeningocele**
Most common, most serious diagnosed form: 94% all cases
Cauda equina protrudes with meninges through cleft
Skin may or may not cover cyst (risk of CNS infection)
Complications

~ 85% of patients have hydrocephalus
   Treated with a shunt
~ Some may have cognitive impairment
~ Latex hypersensitivity can become dangerous
~ Decubitus ulcers, GI problems, urinary problems, obesity, muscle imbalances, scoliosis

Treatment

~ Surgery to reduce cyst within a few days of birth
~ PT to retain function, build leg muscles
~ Assistive equipment as necessary
~ Additional surgeries to release tethered cord, deal with hydrocephalus, etc.
SPINA BIFIDA
Massage:

~ Depends on sensation, level of function, other complications

~ Can be helpful in the context of PT to promote good function
Spinal cord injury

Definition

~ Self-evident

~ Concussion, contusion, compression, laceration, transaction

~ Paraplegia, tetraplegia, quadriplegia
**Signs and Symptoms:**

- Higher the lesion → more damage
- Anterior cord → motor damage
- Posterior, lateral cord → sensory damage

**Complications:**

- **Respiratory infection**
  Especially if injury is above T12; leading cause of death for SCI patients is pneumonia

- **Deep vein thrombosis, pulmonary embolism**
  Pulmonary embolism is number 2 cause of death for SCI patients

- **Urinary tract infection**
  Neurogenic bladder, catheter use carries high risk of urinary tract infection (UTI), kidney infection
**Decubitus ulcers:**
High risk for infection, blood poisoning

**Heterotopic ossification:**
Usually around hips, knees; can be painful
Corrected surgically

**Autonomic hyperreflexia:**
Especially with damage above T6
Minor stimulus creates sympathetic reaction:
pounding headache, increase heart rate, high
blood pressure; can be medical emergency

**Cardiovascular disease:**
Related to immobility

**Numbness:**
Allows minor injuries to be ignored; risk of infection

**Pain:**
From damaged nerve tissue, secondary injury,
heterotopic ossification, musculoskeletal injury
Spasticity, contractures

~ Some is related to CNS damage

~ Can be reinforced by proprioceptive messages
   (Some of this may be interruptible with PT, massage)

~ Damaged sensation may → painful temporary spasms)
**Treatment:**

~ Acute: remove pressure on spinal cord  
   ~ Limit inflammation, secondary damage  
~ Later:  
   ~ Implant electrodes in muscles; surgical transfer of healthy tendons, work with spinal reflexes  
   ~ Work to provide living skills  
   ~ New branches of research: influence growth medium in CNS for regeneration of damaged cells

**Massage:**

Respect complications

Otherwise indicated for improved function, pain relief, proprioceptive training
Seizure Disorder

A  **Tonic phase (10 seconds)**
Eyes open. Elbows flexed. 
Arms pronated. Legs extended. 
Teeth clenched. Pupils dilated. 
Breath held — cyanosis. 
Bowel/bladder control may be lost at the end of this phase.

B  **Clonic phase (1–2 minutes)**
Tremor gives way to violent generalized shaking. 
Eyes roll backwards and forwards. 
Tongue may be bitten. Tachycardia develops. 
Breathing recommences at end of phase.
First-Aid for Seizures

Remain calm and begin to time seizure

Clear area of objects

Gently place person on floor (if possible)

Place soft material or cushion under head; lift chin slightly to open airway

Roll on side if choking or vomiting

Remain with person until seizure has ended
First-Aid for Seizures (cont’d.)

If seizure lasts more than 5 minutes or immediately repeats, call 911, then:
- Talk calmly to person until help arrives
- Inform medical personnel how long seizure occurred and symptoms exhibited
- Write incident report

If no medical help is called, make certain that person does not attempt to drive home alone. Seizure leaves disorientation. Call relative or friend.

**Massage**
- Contraindicated during seizure; consult with client for best strategies
- Other times massage is fine
Attention Deficit Hyperactivity Disorder

**Definition**
Neurobiochemical disorder → difficulties with attention, movement, impulse control

**Demographics**
- Estimates only 4.3% school-age children
  - (= 4.4 million) in the United States
- Some surveys show higher, lower numbers
  - May be both overdiagnosed and underdiagnosed
- Boys > girls 2.5:1; may not be accurate
  - 30–75% of children with ADHD have it as adults
    - They may raise kids with ADHD
Attention Deficit Hyperactivity Disorder

**Massage**

*Indicated*: may improve classroom behavior, interpersonal relationships

May need to adjust length of session
AUTISM SPECTRUM DISORDERS

**Definition**
Communication disorders
Specific, predictable movement patterns
Sensory problems
Usually begins early in childhood; diagnosable by age 3
*Also called pervasive developmental disorders (PDD)*

**Demographics**
Three to four in 1,000 school-aged children
Number is rising; unclear why
Autism Spectrum Disorders, cont.

**Signs and Symptoms**

Three major issues:
- Deficit in verbal and nonverbal communication
- Problems with social interactions
- Repetitive behaviors, movements

Sometimes: extreme reactions to sensory stimuli

Locked inside perspective: no understanding of other consciousness
- No interpretation of voice or tone
- People seem completely unpredictable
Autism Spectrum Disorder:
Syndrome of social withdrawal and obsessive behavior; five types ranging from mild and highly functional to severe

Reduce treatment time; use firm gliding and compressive strokes with full hand contact; instruct parents to massage if affected person is a child

- Asperger syndrome is the most common type and is a mild form of autism.
  1. People with Asperger have difficulty parsing social cues and conventions. They cannot relate on an emotional level and have great difficulty reading the emotions of others.
Types of autism spectrum disorders:

1. Autistic disorder
2. Asperger syndrome
3. PDD-NOS: pervasive developmental disorder, not otherwise specified
4. Rett syndrome: note below
5. Childhood disintegrative disorder: see note below

Massage:
- Can be helpful
  - Improves sleep, more positive social interactions, more time on task
- Some may not tolerate touch: requires adjustments from therapist
Depression: an affective disorder

**Definition:**
A genetic-neurochemical disorder requiring a strong environmental trigger whose characteristic manifestation is an inability to appreciate sunsets.
**Treatment: also see below**

- Most types are treatable
  - Can be challenging to find right combination, dosage
  - Important to treat fully to decrease risk of repeat episodes

**Massage**

**Benefits:**
- Improves HPA axis function
- Parasympathetic balance
  - Increase in serotonin, decrease in cortisol
- Shift in mood state
- Self-care

**Risks:**
- Clients may want to stop taking meds
- Complex emotional issues, high risk for boundary confusion
Spinal Cord Injury

Damage to the vertebrae and neural tissues causing loss of movement (paralysis) and loss of sensation distal to area of insult

- Paraplegia: paralysis of the lower extremities and trunk
- Quadriplegia: paralysis of the trunk and all extremities

Medical clearance is needed

Some of the common problems with SCI: bladder and bowel incontinence, decubiti, atrophy, extraneous medical equipment.
Spinal Cord Injury (cont’d.)

Paraplegia

Quadriplegia
A Flexion injury

B Hyperextension injury

C Compression fracture

D Flexion-rotation injury

- Forward dislocation
- Damage to spinal cord
- Ruptured posterior ligaments
- Compressed ligament
- Ruptured anterior ligament
- Compression of spinal cord
- Fractured vertebrae
- Displacement of vertebrae
Attention Deficit-Hyperactivity Disorder (ADHD)

Array of behaviors associated with inattentiveness, hyperactivity, impulsivity, or combination of these

Reduce treatment time; instruct parents to massage if affected person is a child

● The therapist will most likely face challenging situations when working with adults who have ADHD. These range from excessive fidgeting and talking during the massage to missed appointments and forgotten wallets. Be tolerant on one hand and, and the other hand, too much tolerance may lead to unenforced office policies.
Wheelchair-Bound Clients

Maintain eye level during intake interview

Inquire about any medications and their side effects such as drowsiness

If indicated, use stimulating strokes at the end of session and ask client to move slowly and carefully

Observe wheelchair etiquette

- Never push a wheelchair without permission from the person in the chair. Never assume a wheelchair-bound client is helpless; let them direct you if they need any assistance.
Wheelchair-Bound Clients (cont’d.)

Avoid skin lesions such as bedsores

Use light to moderate pressure depending on sensation level

Trigger points are often located in shoulders and chest area

Limit ROM exercises, especially on neck, spinal column, and hip joints

*If you do not understand: ASK.*
Infectious Diseases

Meningitis

Encephalitis

Poliomyelitis and

Postpolio syndrome
Encephalitis
Inflammation of the brain usually the result of a viral infection

Meningitis
Inflammation of the meninges most often the result of a viral or bacterial infection

Poliomyelitis
Highly contagious viral infection that is now rare

For all these conditions: Massage is contraindicated until client completely recovers
Postpolio Syndrome

Collection of symptoms seen in individuals who have previously recovered from polio or who were misdiagnosed, but now considered to have been infected.

Light massage of shorter duration; omit or only cautiously apply passive stretches and ROM.

- Be sure to position the client for comfort.
Neuro-degenerative Diseases
Chronic

Dementia
Alzheimer disease
Huntington disease
Parkinson disease
Multiple sclerosis
Amyotrophic lateral sclerosis
Complex Regional Pain Syndrome
Dementia

Group of disorders characterized by a decline of mental facilities and personality changes that interfere with work, social activities; two most common types are Alzheimer and vascular

Gentle massage of shorter duration during later stages; behavior tolerance is needed
Alzheimer Disease

Progressive degenerative disease of the brain
Gentle massage of shorter duration during later stages; behavior tolerance is needed
Brain shrinks:
- Fewer brain cells function, neurotransmitter levels drop
  Remaining neurons don’t work as well

- Other issues may contribute
  Chronic inflammation, history of head injury, exposure to toxins, high cholesterol, low estrogen, and other factors
Alzheimers Cont’d

**Treatment**
Medication to prevent reuptake of acetylcholine
  Mood, behavioral modifiers

**Massage**
Patients respond well to touch
  Less disruptive, better orientation, etc.

**Cautions:**
  Elderly clients have other health problems
  Inability to communicate verbally
Warning Signs of Alzheimer Disease

Recent memory loss that impairs functioning at work or home

Problems with language

Disorientation in time and space; getting confused or lost in familiar places

Difficulty completing familiar tasks

Distorted judgment

Problems with abstract thinking
Warning Signs of Alzheimer Disease (cont’d.)

- Misplacing things
- Repeated and sudden changes in mood and behavior
- Changes in personality
- Loss of initiative to do things
HUNTINGTON DISEASE

Inherited disorder characterized by motor disturbances, mental deterioration, and abnormal behavior

Light massage of shorter duration; omit or only cautiously apply passive stretches and joint mobilization (jt. Mobs)
PARKINSON DISEASE

Disorder producing abnormal movements marked by destruction of dopamine-producing neurons in the brain

Gentle massage of shorter duration
Parkinson cont’d

**Massage**

Massage can be safe and effective

- People don’t move easily
- Can reduce rigidity
- Can improve sleep
MULTIPLE SCLEROSIS

Progressive neural demyelination

Massage
Safest in remission; take care not to overstimulate (→ spasms, pain)
Exacerbated with heat: avoid rapid changes in environment

Gentle massage of shorter duration; evaluate client at each visit as symptoms change
AMYOTROPHIC LATERAL SCLEROSIS (LOU GEHRIG’S DISEASE)

Degeneration of motor neurons leading to secondary demyelination; this causes generalized paralysis leaving the affected person immobile

**Massage**

Appropriate for pain, within client resilience

Gentle massage of shorter duration

Work with health care team
Complex Regional Pain Syndrome

Definition
Collection of signs and symptoms: long-lasting pain and changes to the skin, muscles, joints, nerves, and blood vessels of the affected areas
  - CRPS 1 = mostly in extremities (used to be called RSDS)
  - CRPS 2 = pain outlives nerve injury, spills over boundaries of affected nerve (used to be called causalgia)

Signs and Symptoms
Vary widely; three main issues:
  - Burning pain at site of injury
  - Autonomic dysfunction: changes in skin temperature, texture, edema, hair and nail growth, bone density loss,
  - Motor dysfunction: weakness in local muscles, goes to stiffness, contractures, atrophy
Complex Regional Pain Syndrome, cont.

Treatment:
- PT, OT to preserve function, delay atrophy
- Psychotherapy for depression, anxiety, sleep disorders
- Chemical nerve blocks
- Intrathecal pumps
- Sympathectomy

Massage:
- Local contraindication wherever stimulus is too intense
- Anything well tolerated can be helpful
VASCULAR DISORDERS THAT EFFECT THE NERVOUS SYSTEM

Cerebrovascular accident (stroke)

Transient ischemic attack

Migraine headache
TRANSIENT ISCHEMIC ATTACK

- Brief episode of impaired brain functioning caused by temporary reduction of blood flow; lasts a few seconds to possibly hours and is characterized by visual disturbances, speech difficulties, and difficulty understanding others.

- No modifications needed
CEREBROVASCULAR ACCIDENT (STROKE)

Sudden disruption in cerebral blood flow by occluded or ruptured blood vessel

Obtain medical clearance during rehab stage; initial sessions should be brief (up to 30 min), gradually increasing to 1 hr

**Massage**
- Get information on cardiovascular health
- Be cautious with paralysis, numbness, problems with language
- Otherwise, massage can help with recovery, proprioceptive training, etc.
Left brain damage

Results:
- Right side paralysis
- Speech and memory deficits
- Cautious and slow behavior

Right brain damage

Results:
- Left side paralysis
- Perceptual and memory deficits
- Quick and impulsive behavior
STROKE WARNING SIGNS

Sudden or transient weakness, numbness, or tingling in face, arm or leg, or on one side of the body

Temporary loss of speech, failure to comprehend, or confusion

Sudden loss of vision

Sudden severe headache

Unusual dizziness or loss of balance
MIGRAINE HEADACHE (VASCULAR HEADACHE)

Severe, recurrent headaches accompanied by symptoms such as visual disturbances, photo and noise sensitivity and nausea; often provoked by a trigger factor

Massage is contraindicated during attack
PERIPHERAL NERVE DISORDERS

- Trigeminal neuralgia
- Bell palsy
- Myasthenia gravis
  - Guillain-Barré syndrome
  - Peripheral neuropathy
  - Degenerative disc disease
  - Herniated and bulging discs, and radiculopathies
- Sciatica
- Carpal tunnel and thoracic outlet syndromes
TRIGEMINAL NEURALGIA (TIC DOULOUREUX)

Condition characterized by excruciating episodic pain in areas supplied by the trigeminal nerve (cranial nerve V)

Avoid prone position and avoid massage to the face and scalp
BELL’S PALSY

Condition of facial nerve (cranial nerve VII) causing muscle weakness or paralysis on one side of face
BELL PALSY: cont’d

Treatment

Steroidal anti-inflammatories, acyclovir to shorten viral activity
Take care of affected eye

Massage

Massage to stretch, mobilize muscles while nerve heals
Indicated for muscle health; warning: sensation is intact
MYASTHENIA GRAVIS

Disorder caused by loss of acetylcholine receptors within the neuromuscular junction resulting in progressive weakness and paralysis

Gentle massage of shorter duration
GUILLAIN-BARRÉ SYNDROME

Neurologic inflammatory disease of the peripheral nerves; typically begins as leg weakness and ascends to trunk and arms

**Massage**
Contraindicated for circulatory work while acute
Later with PT etc. can be helpful
Work with health care team
PERIPHERAL NEUROPATHY

Inflammation or degeneration of PNS causing symptoms of impaired sensations and movement difficulties

**Massage**
- Numbness, tingling, changes in sensation should be diagnosed
  - Touch may soothe or irritate PN
- Reduced pressure while avoiding hypersensitive areas; if neuropathy in in lower extremities, avoid bolster use

**Signs and Symptoms**
- Usually has slow onset
  - Depends on which neurons are damaged
  - Sensory: pain, tingling, hypersensitivity, loss of sensitivity, numbness
  - Usually at extremities
- Motor: twitching, cramps, atrophy of muscles
- Autonomic: problems with heart rate, blood pressure, respiratory rate, digestive and urinary function
PERIPHERAL NEUROPATHY cont’d

Usually a complication of some other problem

**Injury**: carpal tunnel syndrome, thoracic outlet syndrome, Bell palsy, disc disease, trigeminal neuralgia

**Infection**: herpes simplex, herpes zoster, HIV/AIDS, Lyme disease, hepatitis, syphilis, leprosy

**Systemic disease**: diabetes (type 1 or type 2), renal failure, vitamin B\textsubscript{12} deficiency, cancer; also autoimmune diseases, including lupus, Sjögren syndrome, sarcoidosis, Guillain-Barré syndrome.

**Toxic exposure**: chronic alcoholism, sniffing glue, some medications, exposure to heavy metals (especially lead and mercury), solvents, other environmental contaminants
DEGENERATIVE DISC DISEASE

Deterioration of the intervertebral discs resulting from the aging process

Medical clearance required; once obtained, reduce pressure over affected areas and avoid spinal mobilizations
HERNIATED DISC, BULGING DISC, AND RADICULOPATHIES

**Herniated disc** – protrusion of nucleus pulposus through tear in annulus fibrosus

**Bulging disc** – similar to herniated disc but nucleus pulposus contained within annular wall

**Radiculopathy** – pain radiating along the path of a compressed nerve
HERNIATED DISC, BULGING DISC, AND RADICULOPATHIES (CONT’D.)

Symptoms include severe, sharp pain that may worsen with movement; limited ROM; tenderness; **paresthesias**

Postpone massage if pain is severe; otherwise, reduce pressure over affected areas and in areas of paresthesias; avoid spinal mobilizations
Ménière Disease

**Definition**
Inner ear dysfunction leading to vertigo, tinnitus, hearing loss

**Etiology**
Still being explored
- Accumulation of excess fluid in the endolymph inside the membranous labyrinth
- Idiopathic endolymphatic hydrops
Massage

No contraindications as long as client is comfortable on table
SCIATICA

Inflammation of the sciatic nerve

Reduce pressure in areas of paresthesias; avoid use of bolsters on lower extremities
CARPAL TUNNEL SYNDROME

Compression of the median nerve within the carpal tunnel

Local contraindication if area is inflamed
AVOIDING CARPAL TUNNEL SYNDROME

Strengthen forearm and hand muscles
Keep wrists neutral while working
Perform regular self-massage of forearms and hands
Use variety of strokes during the massage
Rest hands by spacing clients
Stretch between sessions
Lower table height
THORACIC OUTLET SYNDROME

Compression or entrapment of neurovascular bundle

Avoid vigorous massage if swollen or inflamed; otherwise, massage is helpful
ANXIETY DISORDERS

Definition
Collection of disorders
  Irrational fears
  Efforts to control them
Mild to debilitating

“Am I safe?”
“Probably not.”
Arousal: preparation for a stressful event
Fear: the event is confirmed
Anxiety: prolonged arousal or fear—without an event

This condition has a biochemical/physiologic causative agent in the neuro system. It is not purely a psychiatric illness and the major effects of the disease may be sequella to the physiologic. See next page.
Two major factors:

*The limbic system and the hypothalamic-pituitary-adrenal (HPA) axis*

Limbic system determines perceived safety
Amygdala, hippocampus
Linked to hypothalamus: center for sympathetic/parasympathetic response

Hippocampus: center for verbal memory
Amygdala: history of fear responses

Together they can stimulate the HPA axis to establish a stress response:

*HPA axis*

Chemical/electrical connections
Excessive glucocorticoid secretion (cortisol) with prolonged stress

  - Weakens connective tissue
  - Suppresses immunity
  - Shrinks hippocampus

Extra info for those interested. Will not be on the test.
Anxiety Disorders, cont.

**Massage:**

Relaxation techniques, breathing exercises, biofeedback are often taught; massage

Touch and massage can reduce self-reported anxiety

*Indicated* as long as the stimulus is perceived as safe and nurturing
Guess What!