Mechanisms of Health & Disease

Homeostasis

Homeostasis: relatively constant state maintained by the physiology of the body

Adaptation: body's response and adjustment to a stressor to maintain homeostasis

- Occurs before person is aware of stressor

Health: effectiveness of the body's ability to maintain homeostasis

- Also called *adaptive capacity*

When the body's regulatory balance is interrupted, homeostasis is altered, and the body is more susceptible to a disease process.

If adaptation does not occur, homeostasis is lost, and dysfunction begins.

Reduced adaptive capacity causes:

- Too much demand to adapt
- Not enough ability to adapt
- Dysfunction in the body's organ systems

Dysfunction and disease can happen when there is reduced adaptive capacity.

Intervention involves:

- Reducing the demands
- Supporting healthy lifestyle changes
- Using medical treatment, such as medication or surgery, to replace lacking substances or correct dysfunction.

Homeostasis, Traditional Chinese Medicine, and Ayurveda

Box 2-1 Characteristics of Yin and Yang

Fire is yang.	Hard is yang.
Water is yin	Soft is yin.
Hot is yang.	Excitement is yang.
Cold is yin.	Inhibition is yin.
Restlessness is yang.	Rapidity is yang.
Excessive fatigue or sleepiness is yin.	Slowness is yin.
Dry is yang.	Transformation/change is yang.
Wet is yin.	Conservation/storage is yin.

Modified from Maciocia G: *The foundations of Chinese medicine,* ed 2. Edinburgh, 2005, Churchill Livingstone.

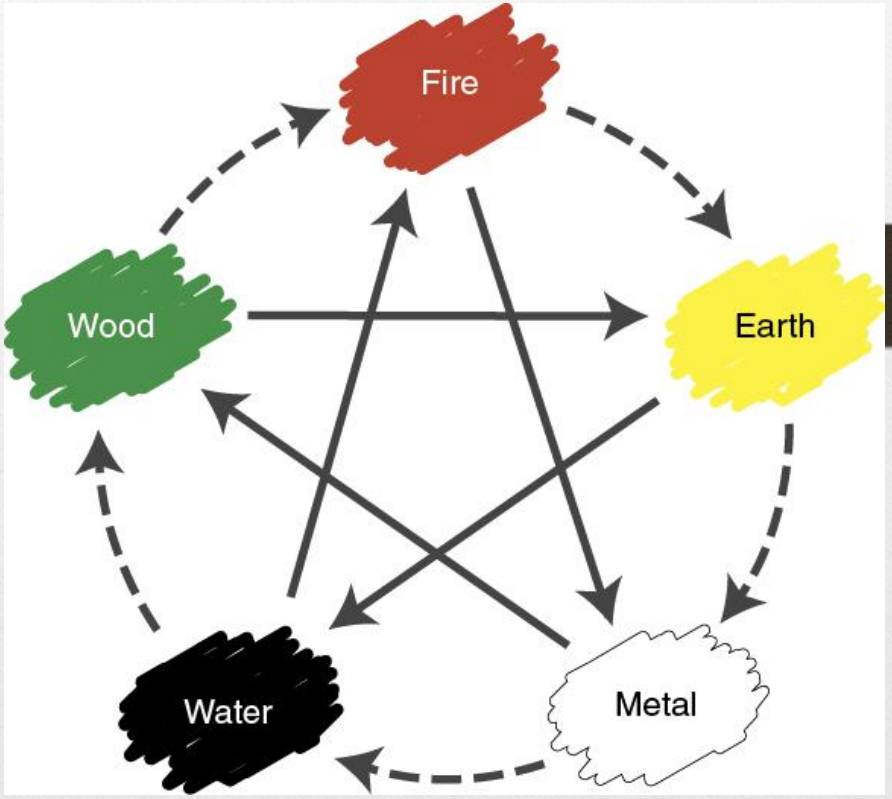
Homeostasis is the delicate maintenance of the balance of yin and yang.

Asian Five-Element Theory

Metaphor for the life elements of fire, earth, metal, water, and wood

These elements are found in nature, and their characteristics are reflected in our bodies.

Each element can support or control another to support balance. Fire is hot and consumes, but it needs fuel, which is wood. This metaphor describes how our food is used as fuel to provide energy for body function or metabolism.



Ayurvedic Theories

Ayurveda

- Ancient and indigenous healing system native to India
- Means knowledge or science of life
- Based on the premise that an individual is made up of five primary elements:
  - Ether (space), air, fire, water, and earth

The elements in Ayurveda differ from the Asian model, but the whole picture of balance is similar.

Doshas: in the Ayurvedic model, doshas are combinations of elements that create physiological functions.

- Vata dosha: ether and air
- Pitta dosha: fire and water
- Kapha dosha: water and earth

Vata governs the principles of movement and is seen in nerve impulses, circulation, respiration, and elimination.

Pitta is a combination of fire and water and represents the process of transformation or metabolism.

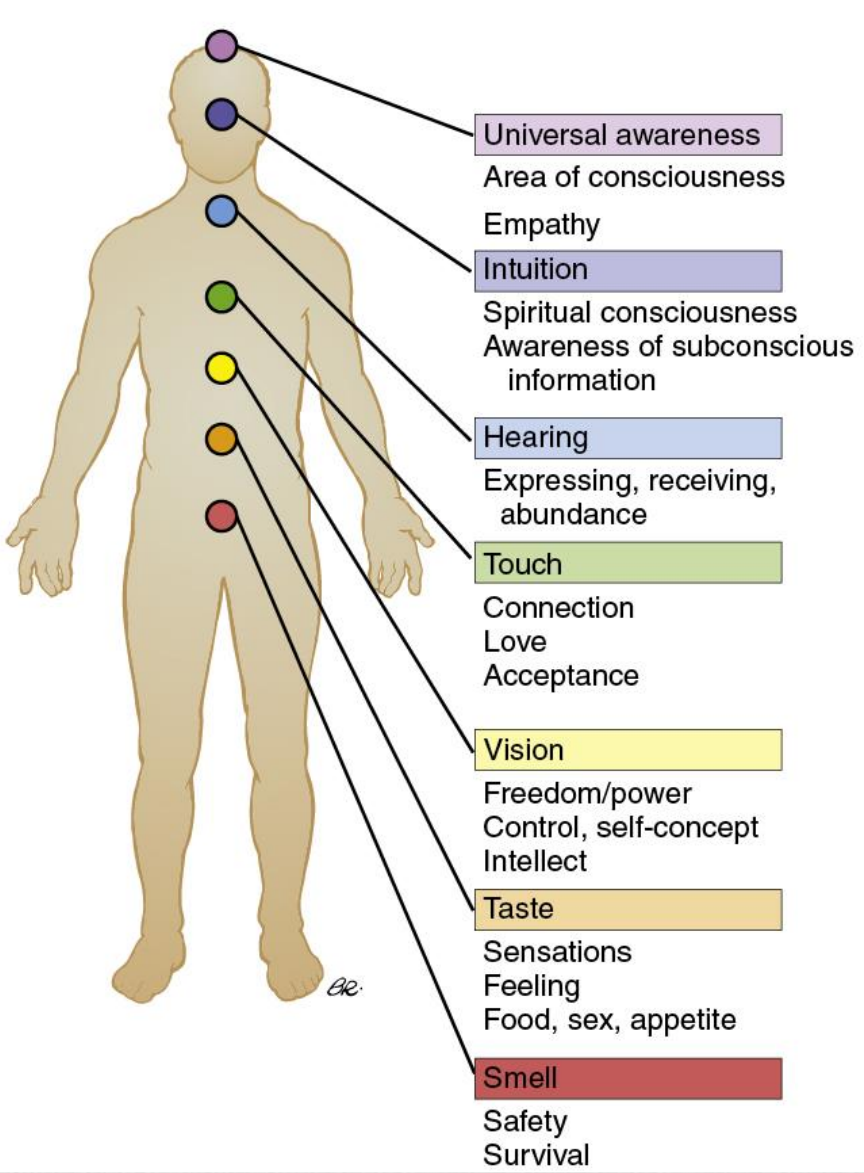
The Kapha dosha elements hold our cells together and build our muscles, fat, and bones. They also form some of the protective lining and fluids, such as the mucosal stomach lining and cerebrospinal fluid.

Chakras

Healing systems indigenous to India are also based on the chakra system.

A chakra is a wheel-like energy center believed to receive, assimilate, and express life force energy.

There are seven chakras, as shown here.



Feedback Loops

The body's control system; transmits information to maintain homeostasis

Each loop contains

- A sensor mechanism
- An integration/control center
- An effector mechanism

Afferent and efferent are directional terms. Afferent means that a signal is traveling toward a point of reference; efferent means that a signal is traveling away from a point of reference.

Negative feedback reverses the original stimulus.

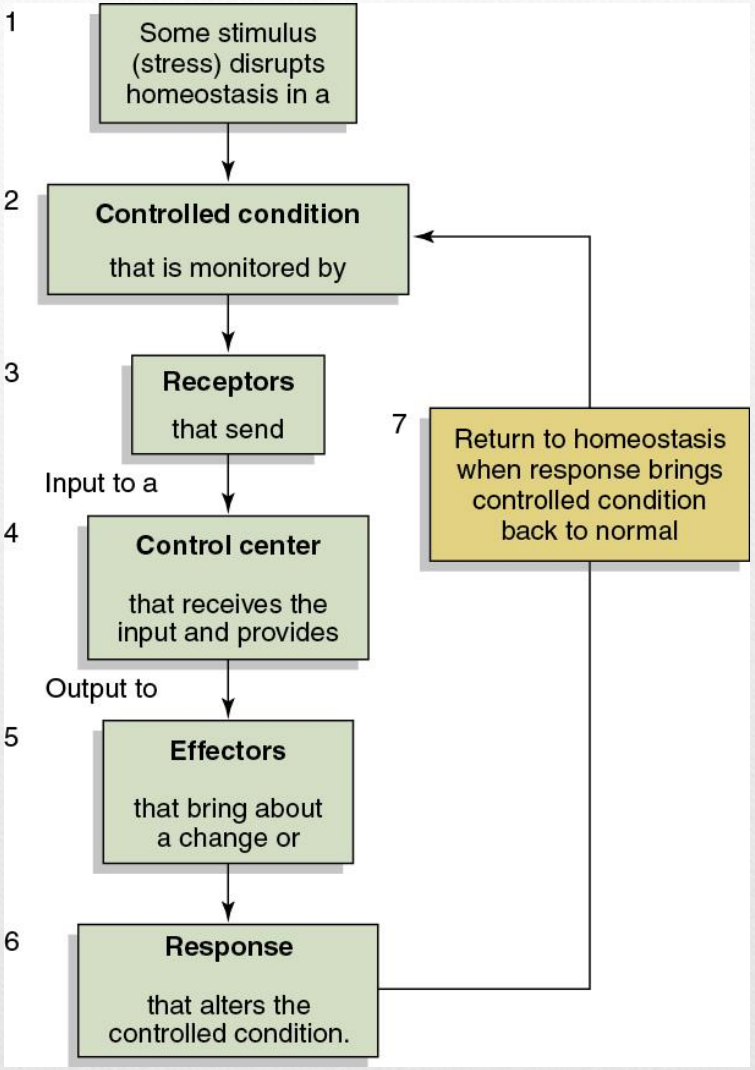
Positive feedback enhances the original stimulus.

Most feedback loops are the negative feedback type.

The purpose of positive feedback is not to maintain a stable internal environment, but to continue the disturbed state of homeostasis until something outside the loop stops it.

Negative Feedback Loop

One type of continuing positive feedback loop may become harmful if it does not cease when the cycle no longer serves a purpose. An example of this is a muscle spasm that causes pain, which results in increased spasm. This is referred to as the pain-spasm-pain cycle.



Feedback Loops

Practical application

- Therapeutic massage can support or stimulate homeostatic processes.
- Approaches are often nonspecific.
  - Objective is to reestablish homeostasis.

Biologic Rhythms

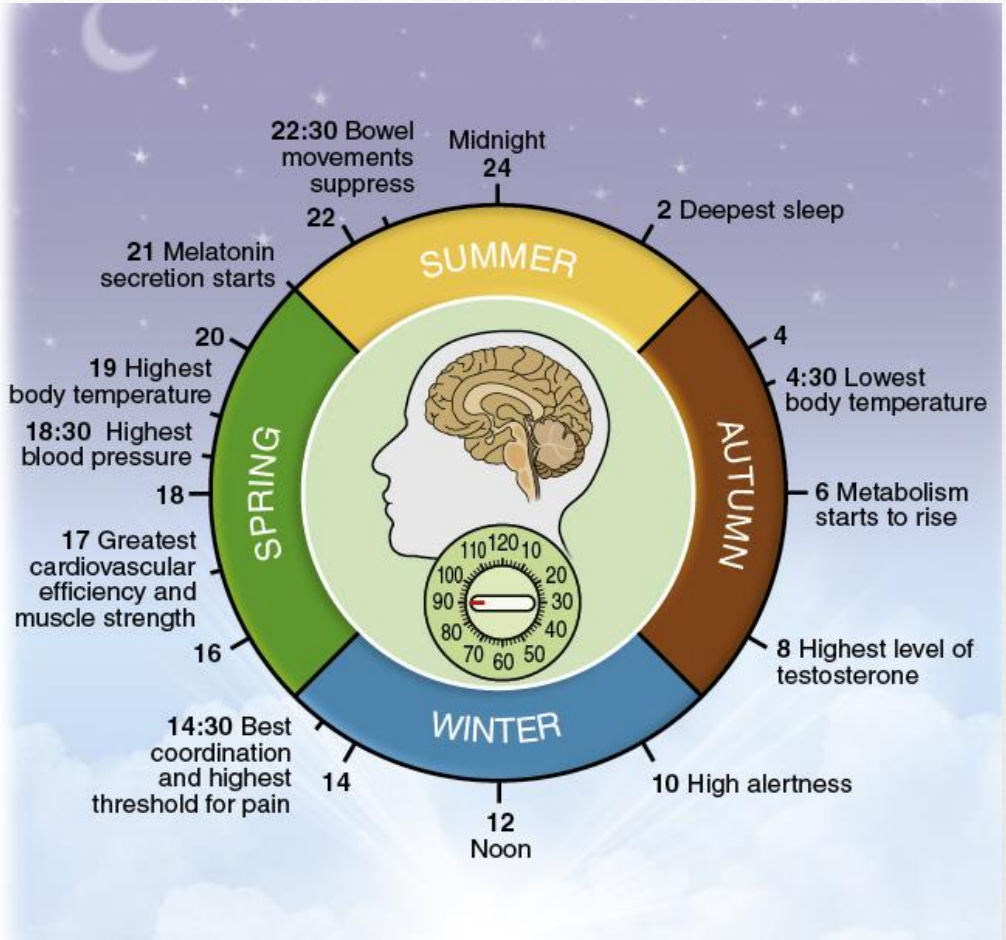
Internal, periodic timing components

- Circadian
- Ultradian
- Seasonal

Circadian rhythms operate on a 24-hour cycle; ultradian rhythms repeat themselves between every 90 minutes and 3 hours; and seasonal rhythms are annual.

The biologic rhythms of the body are interconnected and kept balanced by negative feedback loops.

The rhythmic and ordered approach used in massage and bodywork methods seems to affect biologic rhythms, especially when provided by a calm and focused practitioner.



Mechanisms of Disease: Pathology

Pathology: study of disease

Disease: abnormality in functions of the body

Epidemiology: study of frequency, transmission, occurrence, and distribution of disease

Etiology: study of all factors involved in causing a disease

Disease occurs when the demand for the body to adapt exceeds the body's ability to do so. It becomes difficult, even impossible for the body to maintain homeostasis.

The following terms are used to describe disease:

- ***Pathology*** is the study of disease.
- ***Disease*** can be described as an abnormality in the function of the body, especially when the abnormality threatens well-being.
- ***Epidemiology*** is the field of science that studies the frequency, transmission, occurrence, and distribution of disease in human beings.
- ***Etiology*** is the study of all the factors involved in causing a disease.
- ***Idiopathic*** is a term that refers to diseases with undetermined causes.
- ***Pathogenesis*** describes the development of a disease. For example, flu begins with a latent or nonactive stage, during which the virus becomes established. When a disease is infectious, this stage is called the *incubation stage*. After the disease develops and has run its course, body functions return to normal during the convalescence stage.
- ***Diagnosis*** occurs when a licensed medical professional categorizes a disease by identifying its signs and symptoms.
- ***Signs*** are objective changes that can be seen or measured by someone other than the client.

Symptoms are the subjective changes noticed or felt only by the client.

Acute Diseases have a specific beginning and signs and symptoms that develop quickly, last a short time, and then disappear.

Chronic Diseases have a vague onset, develop slowly, and last for a long time, sometimes for life. Some chronic disorders are initiated by an acute injury/disease.

Subacute refers to diseases that have characteristics that fall between those described as acute or chronic.

Syndromes are groups of signs and symptoms that identify a pathologic condition, especially when they have a common cause.

Communicable Diseases can be transmitted from one person to another. Communicable diseases are infectious diseases that spread through contact with infected individuals; also called a *contagious disease*. Contact with the bodily secretions of such individuals, or with objects that they have contaminated, can also spread this kind of disease. Infectious diseases are airborne and can be caught at any time. Diseases can also be transmitted by bites from insects and other creatures.

- ***Congenital Diseases*** are present at birth, not acquired during life.
- ***Inherited Diseases*** are due to genetics.
- ***Prognosis*** is the expected outcome in a client who has a disease.
- ***Remission*** is the reversal of signs and symptoms that may occur in clients who have chronic diseases. Remission can be temporary or permanent.
- ***Pharmacology*** deals with the preparation and the actions of medications and their uses in treating or preventing a disease.

Causes of Disease

Risk factors for disease development:

- Genetic factors
- Age
- Lifestyle
- Stress
- Environment
- Preexisting conditions

Risk factors are predisposing conditions that may make a disease more likely to develop.

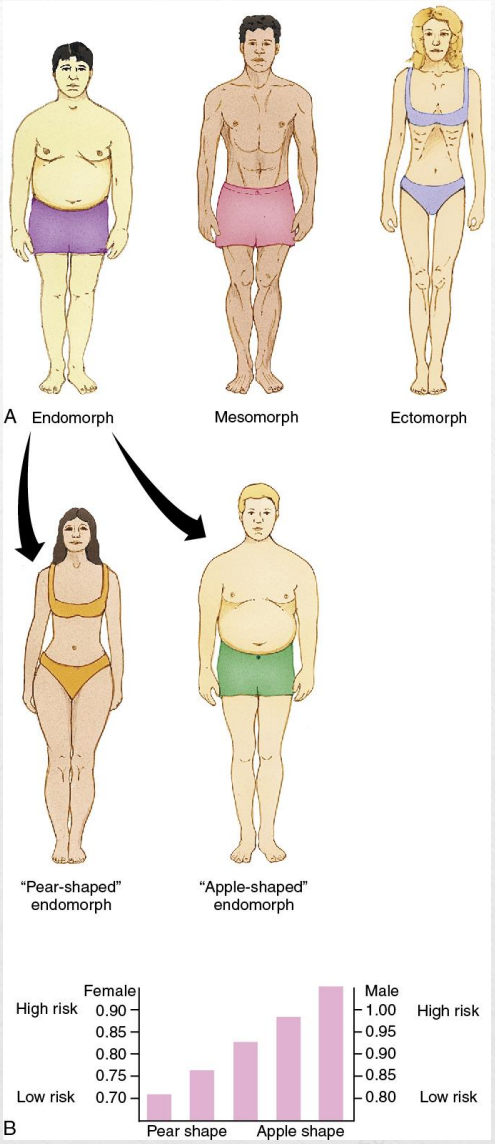
These conditions may put one at risk for a disease but do not actually cause a disease.

Genetic mechanisms

Predisposition is the genetically determined tendency toward disease development.

Genetic disease is caused directly by genetic abnormality.

Body type is also determined by genetics.



Physical and chemical agents

Malnutrition

Degeneration

Hypersensitivity of the immune system

Immune suppression or deficiency

Massage therapy supports immune system function and helps the body maintain or achieve a balanced state – homeostasis. A disease condition exists when homeostasis cannot be easily restored.

Pathogenic organisms, infectious agents

The ability of infectious agents to cause disease is called pathogenicity.

An organism that lives in or on another organism to obtain nutrients from it is called a parasite.

The presence of microscopic or larger parasites may interfere with the normal body functions of the host and cause disease

Box 2-3 Pathogenic Organisms and Treatment Medications

Bacteria, *Rickettsiae* species, and *Chlamydiae* species: Tiny cells without nuclei that secrete toxins, eat body cells, or form colonies.

Fungi: Simple plantlike organisms that lack chlorophyll. Fungi are generally molds or yeast.

Pathogenic animals: Large multicellular organisms, such as roundworms, flatworms, flukes, mites, and lice.

Protozoa: Large one-celled organisms having organized nuclei such as ameba.

Viruses: Microscopic, intracellular parasites that consist of a nucleic acid core with a protein coat. Viruses invade a host cell and take over the cell function to produce more viruses.

Medications and herbs used to prevent or treat pathogenic organisms are classified by type:

- Bacteria: Antibiotics
- Viruses: Antivirals and vaccines
- Fungi: Antifungals
- Worms: Anthelmintics
- Lice: Pediculicides
- Scabies: Scabicides

Tumors and cancer

- Benign
  - Tumor is contained and encapsulated.
  - Relatively harmless, localized, and slow growing
- Malignant (cancer)
  - Nonencapsulated mass that invades surrounding tissue
  - Ability to metastasize

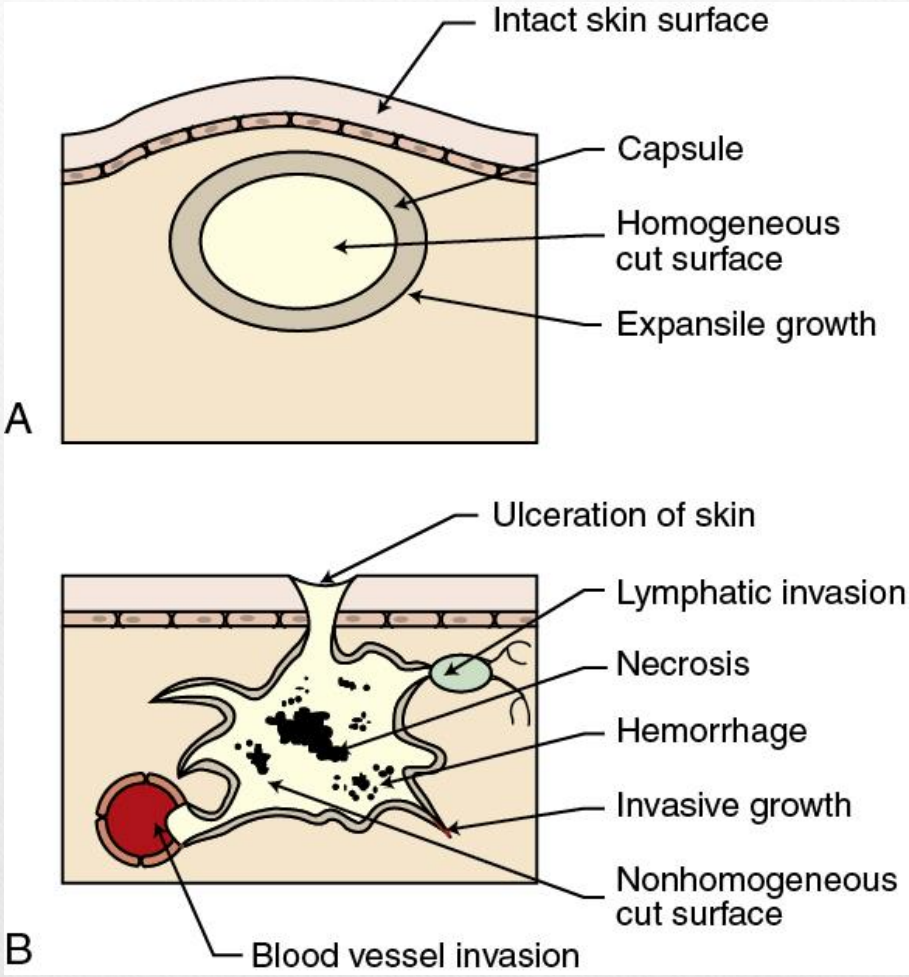
Abnormal tissue growths resulting from uncontrolled cell division called hyperplasia result in a neoplasm or tumor.

Tumors can cause a variety of physiologic disruptions.

A tumor is named according to its tissue type; a lipoma, for example, is a benign tumor of adipose (fat) tissue.

Benign and Malignant Tumors

Benign tumors push normal tissue aside, while malignant tumors invade tissue. Malignant cells might also metastasize or travel to form secondary cancerous masses .



Factors in Development of Cancer

Age

Carcinogens

Environment

Genetic factors

Warning Signs of Cancer

Sores that do not heal

Unusual bleeding

A change in a wart or mole

A lump or thickening in any tissue

Persistent hoarseness or cough

Chronic indigestion

A change in bowel or bladder function

Early detection of cancer is important because it is during the development of primary tumors, before metastasis and the development of secondary tumors have begun, that cancer is most easily treatable.

Inflammatory Response

Inflammation

- Changes in blood circulation
- Changes in vessel wall permeability
- White blood cell response
- Release of inflammatory mediators

The body's first response to injury is to change blood flow. Redness, swelling, and warmth accompany increased blood flow.

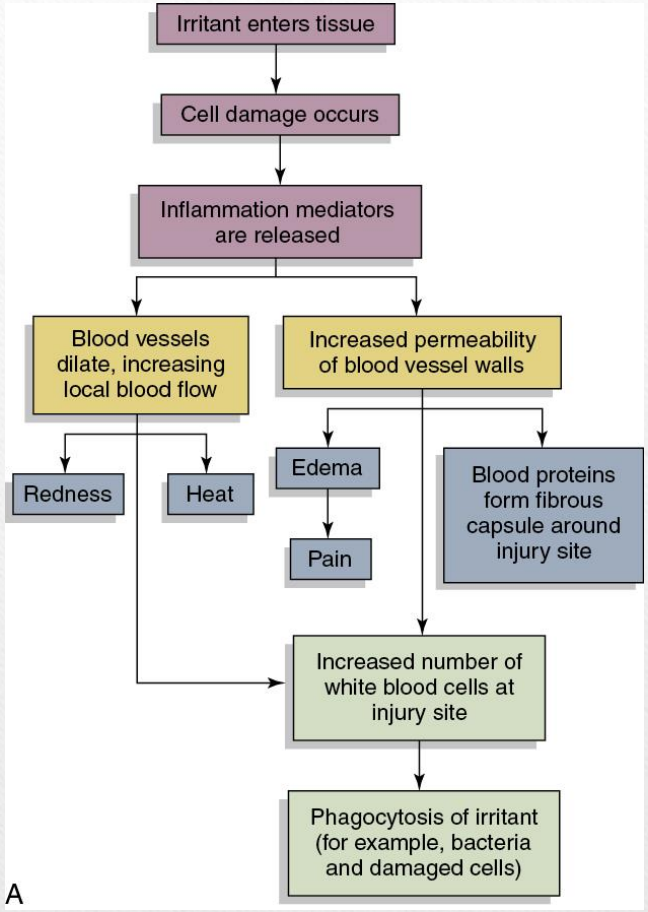
Histamine causes dilation of capillaries, a decrease in blood pressure, an increase in the secretion of gastric juice, and constriction of smooth muscles of the bronchi and uterus.

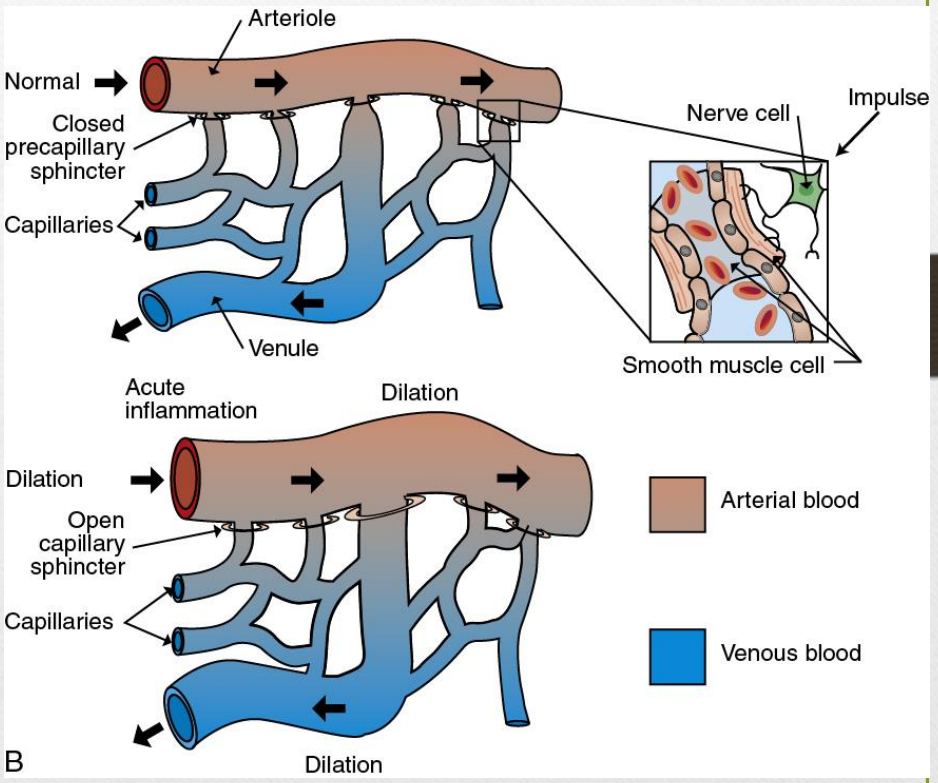
Four signs:

- Heat
- Redness
- Swelling
  - Serous exudates
  - Fibrous exudates
  - Pur/Purulent exudates
  - Hemorrhagic exudates
- Pain

The fluid that accumulates in inflamed tissue is called inflammatory exudate and has the beneficial effect of diluting the irritant that is causing the inflammation. Inflammatory exudates are removed slowly by lymphatic vessels.

Inflammation





A – Inflammatory response

B – Circulatory changes in inflammation

Tissue Repair and Inflammatory Disease

Tissue repair

- Cells regenerate, but at different rates.

Inflammatory disease

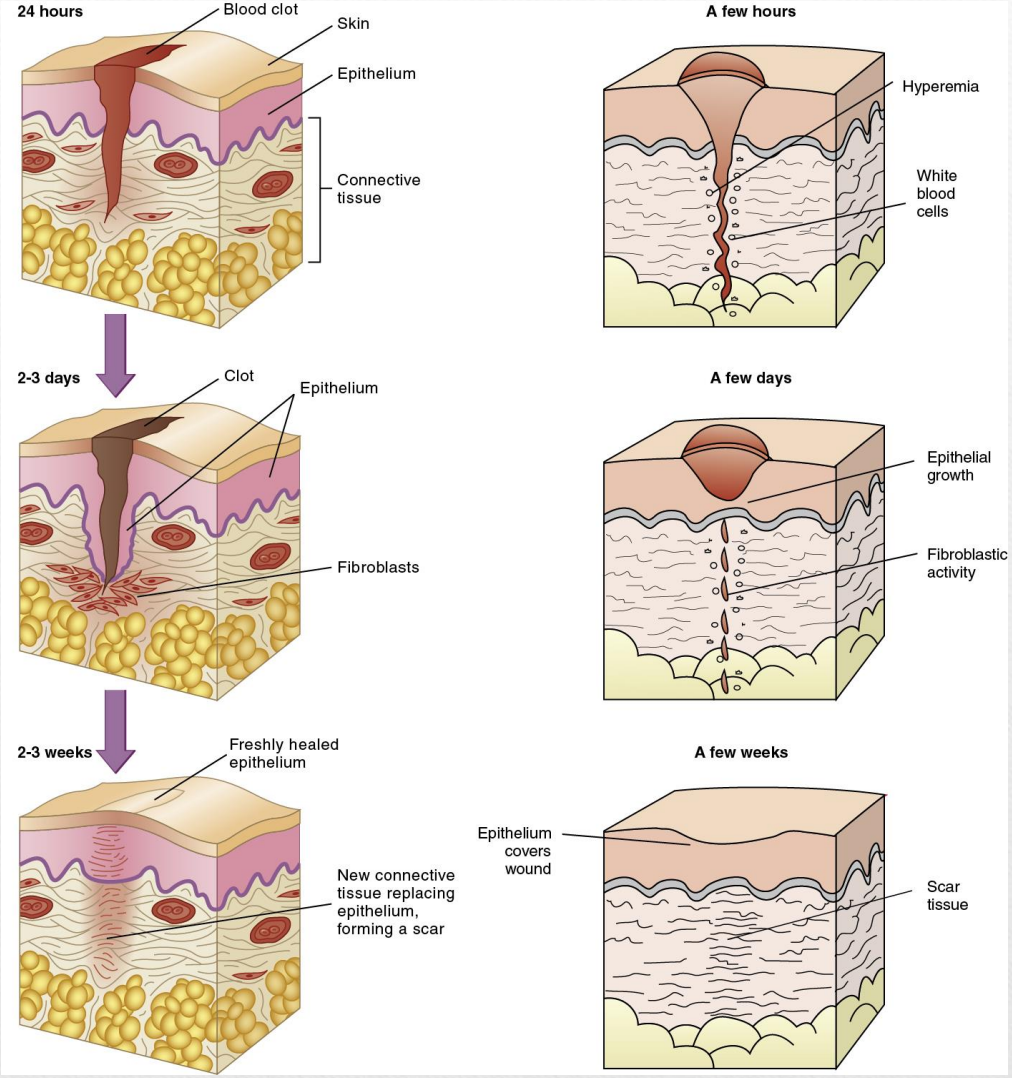
- Chronic inflammation
- Treatments

Intestinal cells (1 to 2 days), liver cells (3 to 5 days), and kidney cells (7 to 14 days) all regenerate fairly quickly.

Nerve and muscle cells do not regenerate well. The process takes months.

Skin Wound Healing

Healing of skin wounds reflects the way in which healing occurs more generally.



Tissue Healing and Massage Intervention

Stages of Tissue Healing and Massage Interventions

	Stage 1: Acute Inflammatory Reaction	Stage 2: Subacute Repair and Healing	Stage 3: Maturation and Remodeling
Characteristics	Vascular changes Inflammatory exudates Clot formation Phagocytosis, neutralization of irritants Early fibroblastic activity	Growth of capillary beds into area Collagen formation Granulation tissue; caution necessary Fragile, easily injured tissue	Maturation and remodeling of scar Contracture of scar tissue Collagen aligns along lines of stress forces
Clinical signs	Inflammation Pain before tissue resistance	Decreasing inflammation Pain during tissue resistance	Absence of inflammation Pain after tissue resistance
Massage intervention	Protection Control and support effects of inflammation: Use PRICE methods Promote healing and prevent compensation patterns: • Passive movement midrange • General massage and lymphatic drainage with caution Support rest with full-body massage 3 to 7 days	Controlled motion Promote development of mobile scar: • Cautious and controlled soft-tissue mobilization of scar tissue along fiber direction toward injury • Active and passive, open- and closed-chain range of motion, midrange Support healing with full-body massage 14 to 21 days	Return to function Increase strength and alignment of scar tissue: • Cross-fiber friction of scar tissue coupled with directional stroking along the lines of tension away from injury • Progressive stretching and active and resisted range of motion; full range Support rehabilitation activities with full-body massage 3 to 12 months

Pain and Stress Management and the Life Cycle

Pain

#1 symptom that causes people to seek health care

Management and measurement are challenges.

Pain Sensations

Pain receptors (nociceptors)

- Respond to stimuli
- Adapt slightly or not at all
  - If adaptation occurs, irreparable damage could result.

Pain can provide our bodies with the information needed to prevent extensive tissue damage. It spurs us to seek medical assistance, which may prevent further damage.)

Hurt and Harm: What Does Pain Mean?

Pain hurts.

Pain should occur when body is harmed.

Harm means there is danger and potential damage.

- Acute pain – indicates harm
- Chronic pain – hurts, but not productive (nonbeneficial pain)

The experience of pain is both conscious and subconscious, allowing us to decide what the pain means.

Pain is often more about hurt than actual harm, which is confusing in a chronic pain situation.

Acute Pain

Usually temporary

Sudden onset

Easily localized

Can be described

Acute pain is a symptom of a disease condition or a temporary aspect of medical treatment.

Chronic Pain

Persistent or recurring

Frequently has an obscure onset

Character and quality change over time

Usually diffuse

Intractable pain

> Chronic pain persists even when treatment is provided or when chronic pain exists without active disease.

Chronic pain is a symptom that persists or recurs for indefinite periods, usually for longer than six months.

Chronic pain is a major health problem.

Specific Types of Pain

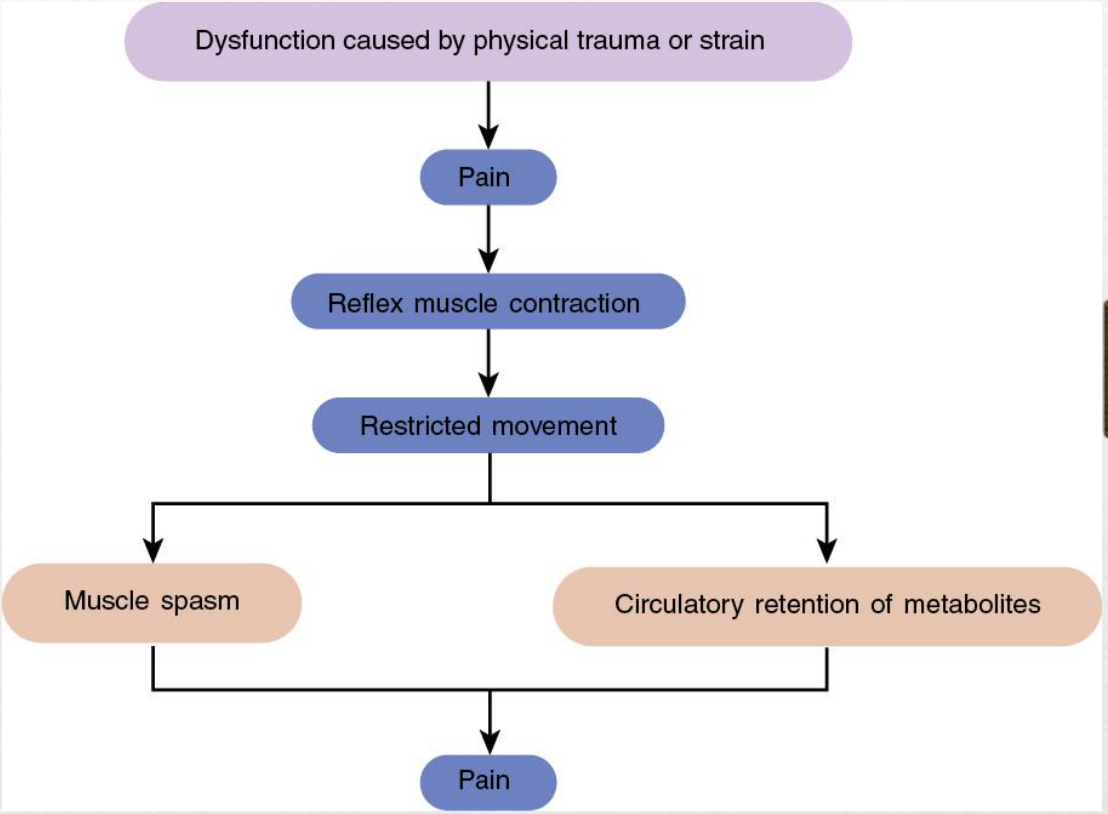
Pricking or bright

Burning

Aching

Deep

Muscle



Deep pain can spur the pain-spasm-pain cycle.

Somatic and Visceral Pain

Somatic pain

- Superficial – arises from stimulation of receptors in the skin
- Deep – arises from stimulation of receptors in skeletal muscles, joints, tendons, and fasciae

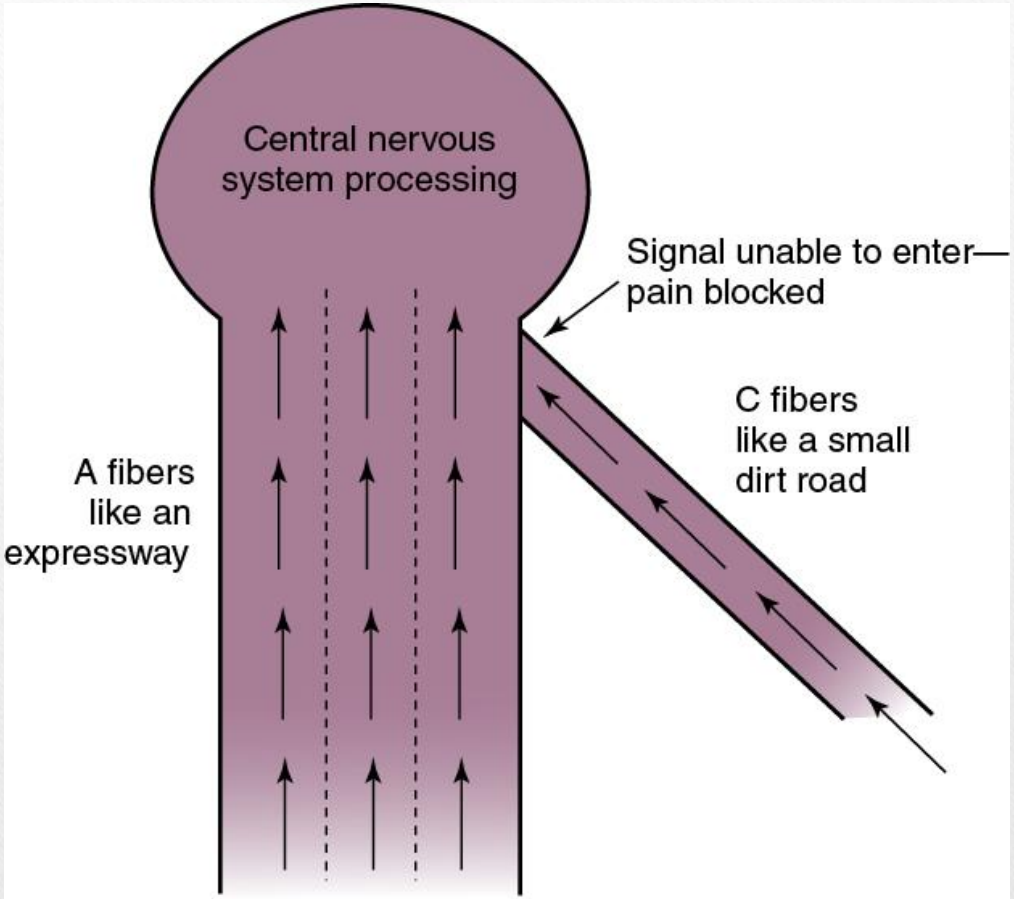
Visceral pain

- Results from the stimulation of receptors in the viscera (internal organs)

Superficial somatic pain is transmitted along myelinated A delta nerve fibers at a fast rate, whereas deep somatic pain is transmitted slowly by unmyelinated C nerve fibers.

A delta nerve fibers are finely myelinated (fatty insulation), and C nerve fibers are unmyelinated (no insulation).

Methods of touch and pressure and most methods of movement are transmitted on A fibers; any stimulus of this type increases A-fiber transmission, blocking pain signals. Treating pain in this way is called counterirritation.

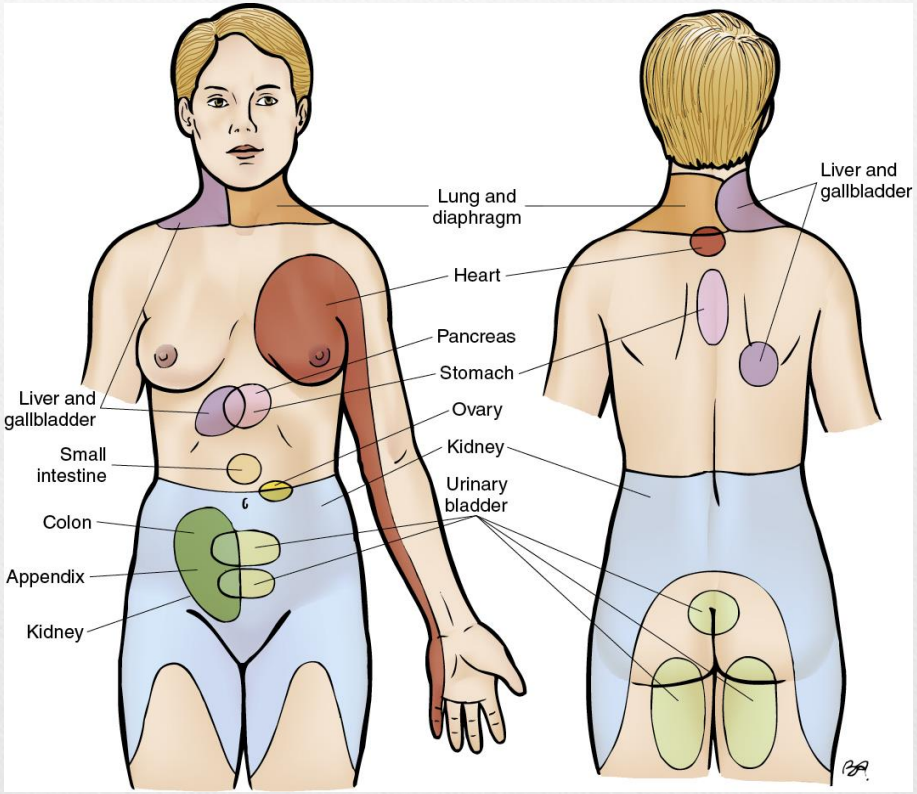


Touch, pressure, movement, or moderate acute pain purposefully applied = counterirritation, which may provide hyperstimulation analgesia

Referred Pain

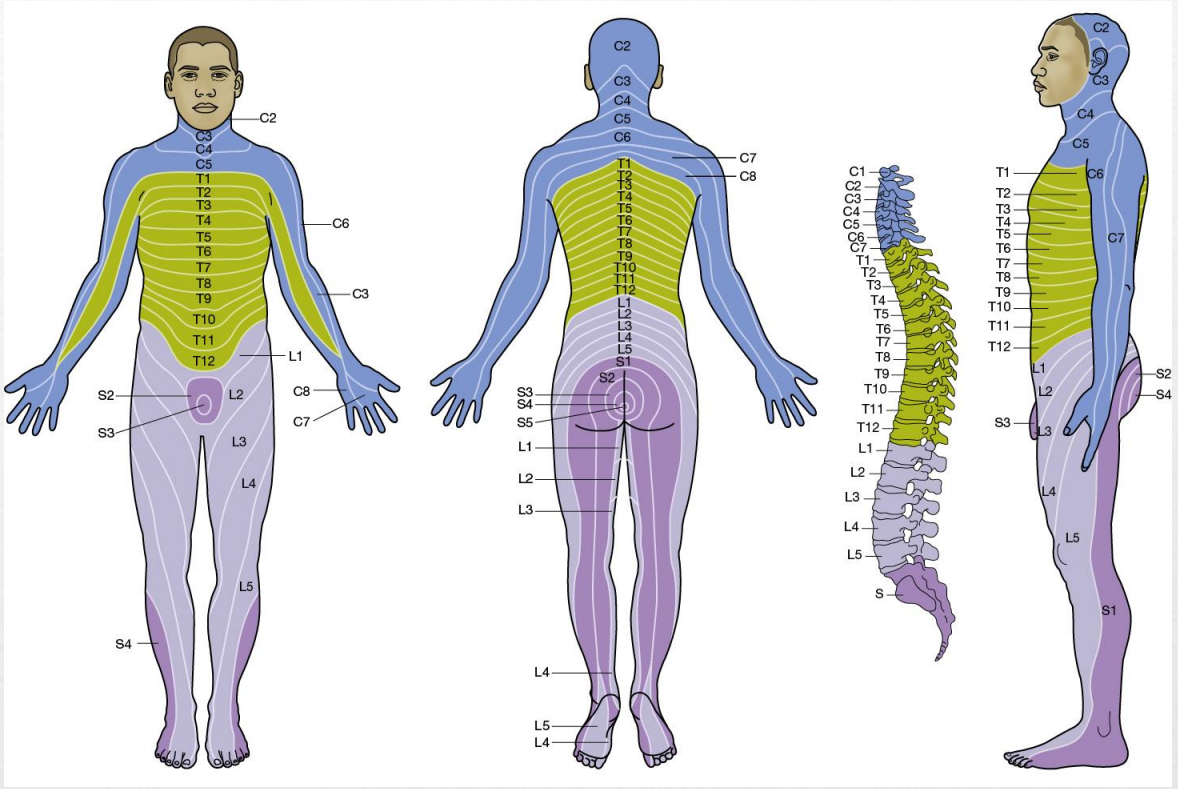
Pain may be felt in a surface area far from the stimulated organ.

A heart attack is not felt in the heart itself. The pain radiates down the left arm.



Dermatomal map and cutaneous nerve distribution

When pain is referred, the reference is usually to a structure that developed from the same embryonic segment or is located in the same dermatome (nerve map) as the structure in which the pain originates.



Phantom Pain

Phantom pain

- Commonly experienced by persons who have undergone limb amputation
  - Experience of pain or other sensations in the extremity as though the limb were still there

Phantom pain is believed to occur because the remaining proximal portions of the sensory nerves that previously received impulses from the limb are being stimulated by the trauma of the amputation.

Stimuli from these nerves are interpreted by the brain as coming from the nonexistent (phantom) limb.

Pain Threshold and Tolerance

What causes pain?

Mechanical, electrical, thermal, or chemical stimuli

Everyone has a similar pain threshold, but pain tolerance varies widely.

Pain tolerance varies widely and has a lot to do with cultural and psychological factors. Think of how children perceive pain in comparison to normal adults.

Massage therapy is contraindicated locally over a trauma area until healing is complete.

Pain Management – PRICE

Box 2-11 PRICE

Protection prevents further injury
Rest speeds up healing
Ice numbs pain receptors, constricts blood vessels, and reduces swelling (edema)
Compression reduces bleeding, if any, and edema
Elevation allows gravity to help with lymphatic drainage and reduces edema

Acute pain usually is caused by tissue injury. Inflammation is commonly present.

In many instances the PRICE type of treatment is used, especially if the injury is minor.

Pain Management

Transcutaneous electric nerve stimulation

Acupuncture

Acupressure

Placebo response

Distraction and imagery

Biofeedback

Aromatherapy

Music therapy

Hypnosis

Heat

Cold

Massage

Medication and surgery

These pain management strategies can be used alone or in combination for both acute and chronic pain.

Many massage therapists rely on music, aroma, and massage at the same time.

Practical application for massage

- Counterirritations trigger release of endorphins and enkephalins.
- Massage may help reduce need for pain medication.
- Massage may provide temporary moderate pain relief.

If clients experience persistent pain, they should be referred to a physician.

Mechanisms of Health: Stress

Health supported by a balanced lifestyle

Influenced by many factors:

- Lifestyle
- Activity level
- Rest
- Relationships
- Exercise
- Diet
- Self-esteem

By understanding their own bodies, minds, and spirits, individuals can take an active role in maintaining their own health.

Stress and Stress Management

Stressor not always a negative event

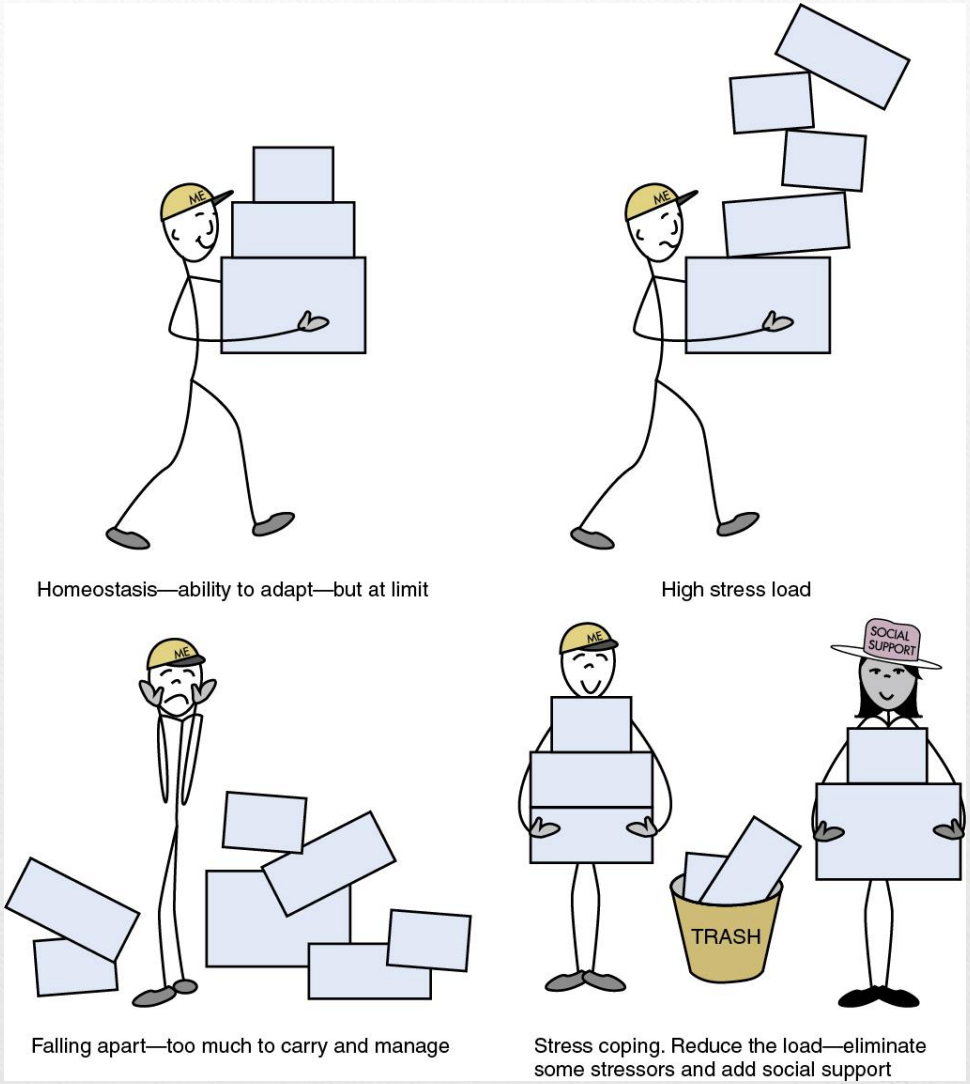
Hans Selye's general adaptation syndrome (stages of stress)

- Alarm reaction (fight-or-flight)
- Resistance reaction
- Exhaustion reaction

Hans Selye began working on stress in the 1930s. His most influential work was The Stress of Life, published in 1956.

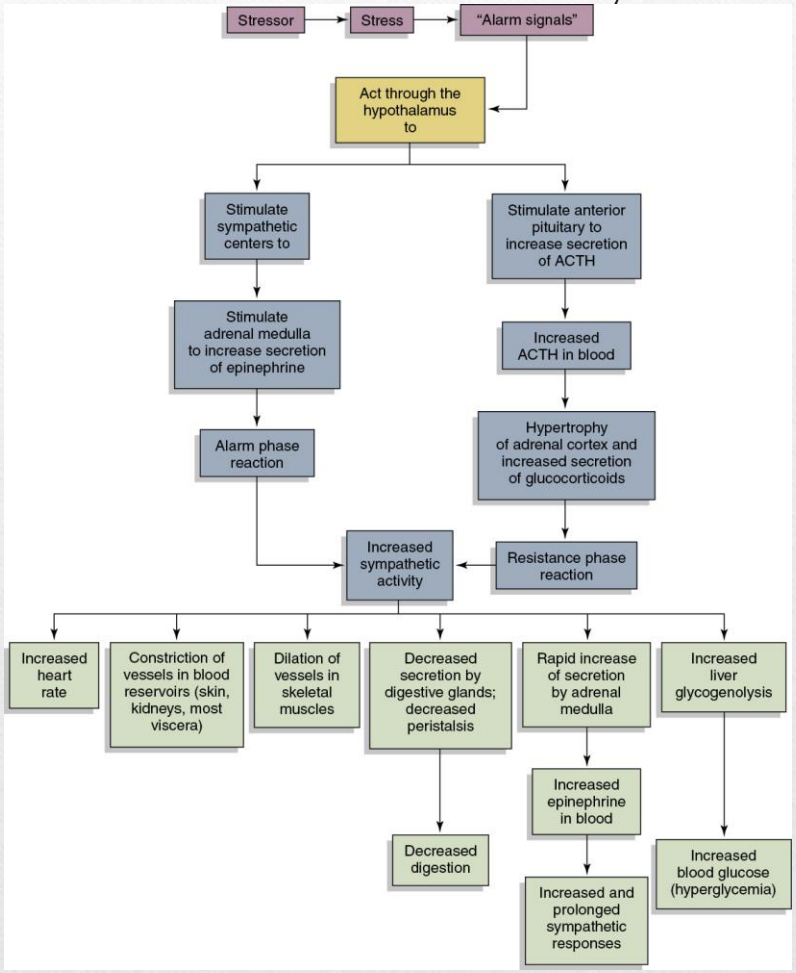
Stress Load

Family, friends, and social organizations, such as softball teams and religious groups, can all help reduce stress.



Stress Response: Increased Sympathetic Activity

Stress refers to any stimulus that directly or indirectly stimulates neurons of the hypothalamus to release corticotropin-releasing hormone.



Perception of Stress

Stressed individuals may experience

- Overbreathing/breathing pattern disorders
- Panic attacks
- Sleep disorders
- Depression
- Decrease in memory and ability to concentrate
- Impaired immune function
- High blood pressure
- Mood and behavior disruptions

An individual's perception of stress is significant. Anything that is perceived as a threat, whether real or imagined, arouses fear or anxiety.

How a person responds to stress is influenced by other conditions, some of which are under conscious control and some of which are not.

A consequence of chronic stress is stress-induced disease, although the exact cause-and-effect relationship is often unclear.

Box 2-13 Stress-Induced Disease

Digestive tract: Diseases that may be caused or aggravated by stress include gastritis, stomach and duodenal ulcers, ulcerative colitis, and irritable colon.

Reproductive organs: Stress-related problems include infertility or difficult conception, menstrual disorders or absence of menstrual periods in women, and impotence and premature ejaculation in men.

Bladder: A common stress response is sensitivity or irritability in the bladder, causing bladder urgency, bed-wetting, or incontinence.

Brain: Many mental and emotional problems—including anxiety, psychosis, and depression—may be triggered by stress.

Hair: Some forms of hair loss and baldness have been linked to high levels of stress.

Mouth: Sores, ulcers, and oral lichen planus (thrush) often seem to develop under stress.

Lungs: Asthma symptoms often worsen under high levels of mental or emotional stress.

Heart: Heart rate disturbances and angina attacks often occur during or after periods of stress.

Muscles: Muscle tension and its associated pain are often the result of stress, as are muscle twitches and nervous tics. The muscular tremor of Parkinson's disease is also more marked at such times.

Stress Management

Adaptation

- Better health = better ability to adapt

Medical assistance

Additional stress management techniques

- Acupuncture, meditation, relaxation methods, exercise, and other forms of movement therapy

The primary reason for stress may require a multidisciplinary approach for resolution or effective long-term management, and massage modalities can play a part.

The Life Cycle

Conception

Birth

Growth

Adult

Elderly

Death

It might help to think of the life cycle in terms of the following dualities (yin and yang):

Conception/death

Gestation/dying

Birth/living

The Aging Process

Muscle atrophy

Loss of elasticity of the skin

Changes in the cardiovascular, respiratory, and skeletal systems

Decreased functioning of many physiologic control mechanisms

Advancing age creates changes in cell numbers and their ability to function effectively.

Longevity

Life span approx. 80-100 years

This number will increase in future.

Women between 80 and 100 are the fastest growing segment of many populations.

Any behavior that supports cellular function enhances longevity.

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