Ontario College of Reflexology

N201 - Hand Reflexology Course

Ver. 2.0

Chapter Summary

History of Reflexology

- Oldest documentation of reflexology was found in Egypt in approx. 2,500 BC in an ancient papyrus scene depicting reflexology. Figure 1-1.
- A hand chart from India, circa 1900, depicts the zones which are known as cross-points of the cosmos and also as chakras. Figure 1-2.
- Dr. William Fitzgerald, "*father of modern reflexology*," introduced reflexology in the United States.
- Dr. Fitzgerald worked mainly on the hands and then the feet later on.
- Foot reflexology became more popular than hand reflexology.
- Dr. Fitzgerald used instruments such as a comb.
- A noted tenor claimed to relieve throat tightness by squeezing the lateral aspect of the forefinger and the thumb.
- Dr. Fitzgerald was able to help morning sickness, upset stomach, and thyroid problems.
- Early pioneers of Hand Reflexology include Dr. Harvey Lampell and Dr. Joe Shelby Riley.
- Eunice Ingham and Mildred Carter have also published books on hand reflexology.
- Dr. Lampell recommends that the reflexologist start on foot or hand of the side of the body with the least symptoms. Figure 1-3.
- Dr. Joe Shelby Riley was taught zone therapy by Dr. Fitzgerald.
- Dr. Riley developed detailed diagrams and drawings of the reflexes on the feet and hands. Dr. Riley added to Dr. Fitzgerald's longitudinal zones with his discovery of 8 horizontal divisions which also govern the body. Figures 1-4 and 1-5.

Hand Reflexology

Hand Reflexology shares the same theory and benefits as Foot Reflexology in the N101 Foot Reflexology course.

What Is Reflexology?

Reflexology is a focussed pressure technique, usually directed at the feet or hands. It is based on the premise that there are zones and reflexes on different parts of the body which correspond to and are relative to all parts, glands and organs of the entire body.

How Does It Work?

When the reflexes are stimulated, the body's natural electrical energy works along the **nervous system** to clear any blockages in the corresponding zones. A reflexology session seems to break up deposits (felt as a sandy or gritty area beneath the skin) which may interfere with the body's electrical energy in the nervous system.

Manipulating specific reflexes removes stress, activating a parasympathetic response in the body to enable the blockages to be released by a physiological change in the body. With stress removed and circulation enhanced, the body is allowed to return to a state of homeostasis.

Homeostasis is the "*automatic*" process that the body incorporates to bring it back to the "*normal*" state. For example, if the blood pressure is abnormal, the kidneys will secrete the enzyme *renin* which is involved with blood pressure, and the hormone *erythropoietin* that increase the rate of red blood cell production.

Four (4) Benefits of Reflexology:

1. Relaxation with the removal of stress.
2. Enhanced circulation.
3. Assists the body to normalize the metabolisms naturally.
4. Complements all other healing modalities.

Reflexologists Do Not:

1. Diagnose medical conditions unless qualified to do so.
2. Prescribe medications unless qualified to do so.
3. Treat for specific conditions except in emergencies.
4. Work in opposition to the medical or other fields.
5. Encourage the client to cease taking their prescribed medication.

Reflexologists do not diagnose medical conditions unless qualified to do so. The only diagnosis made is a **"tender reflex**." A reflexologist will refer to other qualified health care practitioners when services required are outside the reflexologist's scope of practice.

Similarly, **reflexologists do not prescribe medications unless qualified to do so**. The therapeutic intervention is limited to "*working the reflexes*."

Indications and Reasons for Referral:

- Types of people seeking reflexology sessions are of all ages but approx. 70% are female.
- Referrals are made in conjunction with other existing forms of therapy to supplement ongoing medical treatments.
- Reflexology has been known to help clients deal with physiological symptoms such as cancer chemotherapy.
- Reflexology can be performed on everyone.

Practical Applications:

When to Use Hand Reflexology:

- Hand Reflexology can be used alone or in conjunction with a foot reflexology session.

Hand Reflexology Can Be Used:

- as an alternate or referral area where a foot condition exists that should not be worked on;
- as a supplement to a foot reflexology session in cases such as an amputated foot or feet;
- as an adjunct to complement foot reflexology or other health modalities;
- as "*assigned homework*" as suggested for the client to help alleviate his or her condition(s) between reflexology sessions.

Frequency of Visits:

- The benefits of a session usually will go on working for 5 or more days.
- The client decides on the frequency of visits based on the client's requirements and expectations.

Length of Session:

- A complete session is performed on both hands unless it is used as an adjunct to a foot reflexology session. A complete hand session will last between 45 and 60 minutes. If used as an adjunct, factor in approx. 15 to 30 minutes to a regular foot reflexology session.

Pressure:

- Work within the client's pain tolerance with exerted pressure which ranges from 0 to 10 or 20 pounds.
- A firm pressure is used when working the reflexes on the palmar side of the hands. **Less pressure is used on the dorsal side** because of the number tendons present which can become painful if worked on too hard.
- The client should tell the reflexologist their threshold level of tender reflexes.
- Reflexes are worked according to the body's requirements.

Tenderness:

- Stress
- Surgery
- Injury and illness
- Drugs
- Hand conditions - eczema, callouses, arthritis, etc.

Therapy Setting:

- Optimum location is a quiet, relaxing environment.
- A recliner chair is most suitable for eye-to-eye contact.
- Use a pillow for the client's arm to rest comfortably on.
- Reflexology can be administered anywhere and anytime.

Client's Responsibility:

1. Client practises cleanliness.
2. Client removes hand jewellery if possible.
3. Client sits comfortably in a reclining chair for eye-to-eye contact with the reflexologist.
4. Client gives the reflexologist a **completed and signed Reflexology Health Record** (with consent given) and **accepts responsibility for the session**.

5. Client tells the reflexologist the pain tolerance threshold.
6. Client is encouraged to rest upon returning home while the body is in the *parasympathetic response*.
7. It is suggested that the client drink a glass of water to help cleanse toxins released from a session.
8. Client is encouraged to practise "*assigned homework*" as suggested by the reflexologist between sessions.

Reflexologist's Responsibility:

1. Practises hand cleanliness.
2. Keeps finger nails trimmed.
3. Keep long hair under control and is aware of any jewellery that may retard the session.
4. Provides a professional and comfortable environment.
5. Provides warmth, tissues and wet-cloths for the client's requirements if necessary.
6. Relaxing music may be played.
7. A **Reflexology Health Record** is taken and the client **signs a consent on the form accepting responsibility for the session.**
8. All client records and sessions are kept **confidential**. Records are to be dated and recorded in ink only.
9. The client's bare hands are worked on (feet where necessary).
10. A thorough hand examination is done by the reflexologist.
11. Conversation is encouraged and the reflexologist is a good listener. (*Reflexologists are not psychologists*).
12. Works within a time frame by which the client does not feel rushed and has time for questions.
13. Use of oils or creams on the hands **are discouraged** due to possible allergies and common usage of the hands.
14. The results of the reflexology session are documented.

Occupational Hazards:

1. The finger nails of a reflexologist's hands usually grow faster than normal due to the stimulation of the fingers during a session.
2. Contagious disease can be collected beneath the reflexologist's finger nails if not washed properly after each session.
3. Long finger nails can inflict scratches or cuts on the client's hands.
4. Cuts or open sores on the reflexologist's hands could expose the reflexologist to any pathological conditions that may be present on the client's hands.
5. **Carpal Tunnel Syndrome** can result if the reflexologist strains the hands, fingers and wrists. Take frequent breaks and exercise as often as necessary.
6. Improper posture will result in discomfort or pain in the shoulders, neck and arms.
7. Lack of back support can result in low back and/or hip pains.
8. Cleanliness of the work environment and supplies are very important to prevent contamination of both reflexologist and client.

Hand Notes

Chapter Summary

Conventional Zone Theory Figures 2-1 to 2-3

- Conventional Zone Theory is the foundation of Hand and Foot Reflexology.
- Zones are a system for organizing relationships between various parts, glands and organs of the body and of the reflexes.
- There are 10 equal longitudinal or vertical zones running the length of the body.
- 5 zones on the right side and 5 on the left.
- Numbering 1 to 5 from the medial side to the lateral side.
- Each finger and toe falls into one zone; the left thumb and the left toe being Zone 1.
- 5 zones travel up each leg, through the body's trunk and also up each arm.
- Note how the zones intersect with each other in the shoulder, collar bone (clavicle), neck.
- 10 longitudinal zones of the body correspond to the 10 longitudinal zones of the hands.
- Zone 1 represents and starts with the thumb and runs the vertical length of the medial side of the hand.
- Zones 2, 3, 4, and 5 start with the fingers, also running the vertical length of the hand.
- Zones of the right side of the body are represented and stimulated by the reflexes in the corresponding zones in the right hand. The zones on the left side of the body are also represented and stimulated by the reflexes in the corresponding zones in the left hand.
- The thumb represents one specific zone, Zone 1.
- The thumb **also** has 5 zones representing the zones of the head.
- Each thumb (Zone 1) corresponds to **half** of the head and its zones.

3-D Aspect of Reflexes:

- Every part, gland or organ of the body represented in a zone can be stimulated by working any reflex in that same zone.
- Pressure applied to any part of a zone will affect the entire zone.
- Reflexes are considered to pass through the body. (3-D aspect.)
- **Note: Reflexology Zones** are not to be confused with *acupuncture or acupressure meridians*.

Transverse Reflex Areas Figure 2-4

Transverse Zones can be used to group major areas. The five commonly used transverse zone areas used, alone or in conjunction with the transverse zone lines, are as follows:

- *pelvic area* (below transverse pelvic line.)
- *lower abdominal area* (between transverse pelvic and waist lines)
- *upper abdominal area* (between transverse waist and diaphragm lines)
- *thoracic area* (between transverse diaphragm and neck lines)
- *head area* (above transverse neck line.)

Internal Organs and the 3-D Aspect of the Body

- Internal organs lay on top, over, behind, between and against each other.
- Reflexes of the internal organs overlap as well.
- The 3-D aspects of the body makes understanding the hand chart easier.

Exception to The Zone Theory

- In the central nervous system, the right half of the brain controls the left side of the body and vice versa. In any disorders or problems that affect the brain or the CNS, emphasize the reflexes or areas of the disorder on the opposite hand.

Referral Areas Figure 2-5

- There are reflexes throughout the 10 zones of the body.
- Working a reflex in one zone can affect other reflexes in the same zone.
- **Avoid working on areas of the hand that are injured**. Use referral area reflexes instead.
- Problems in the arms can be helped by working the same general areas on the legs.
- Some *Referral Area* examples are: arm to leg; hand to foot; wrist to ankle; elbow to knee; and shoulder to hip.
- Common problems such as carpal tunnel syndrome and sprains in the wrists can be helped by working the same general areas on the ankles.
- Referral areas can give insights into problem areas by showing the relationships to the areas in the same zone(s). For example, a shoulder problem may be due to a hip problem in the same zone.

Note #1: In *Zonal Theory*, the thumbs are positioned toward the body, unlike that of medical anatomical charts. See *Appendix C for Anatomical Terms - Positions and Directions*.

Note #2: Medical Anatomical Charts position the thumbs away from the body, making the Reflexology Dorsal view of the hands and forearms in the Posterior Anatomical Position. The Palmar View of the hands and forearms are then in the Anterior Anatomical Position. *See* Figure 2-2, page 2.

Figure 2-2 Longitudinal Zones of the Hands

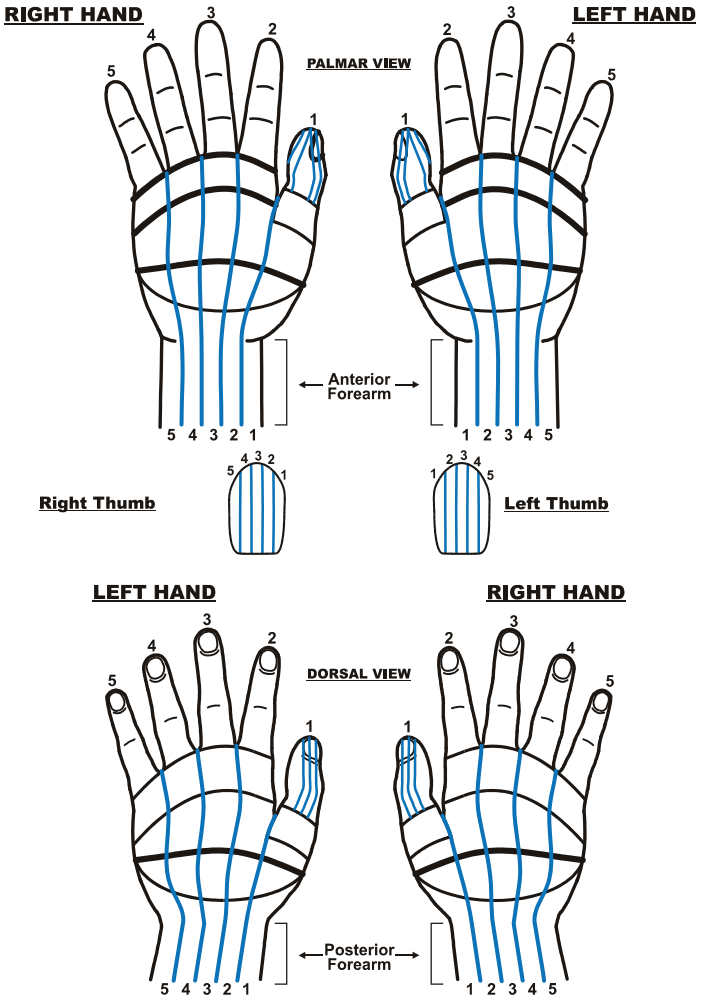


Figure 2-5 Zone Related Referral Areas

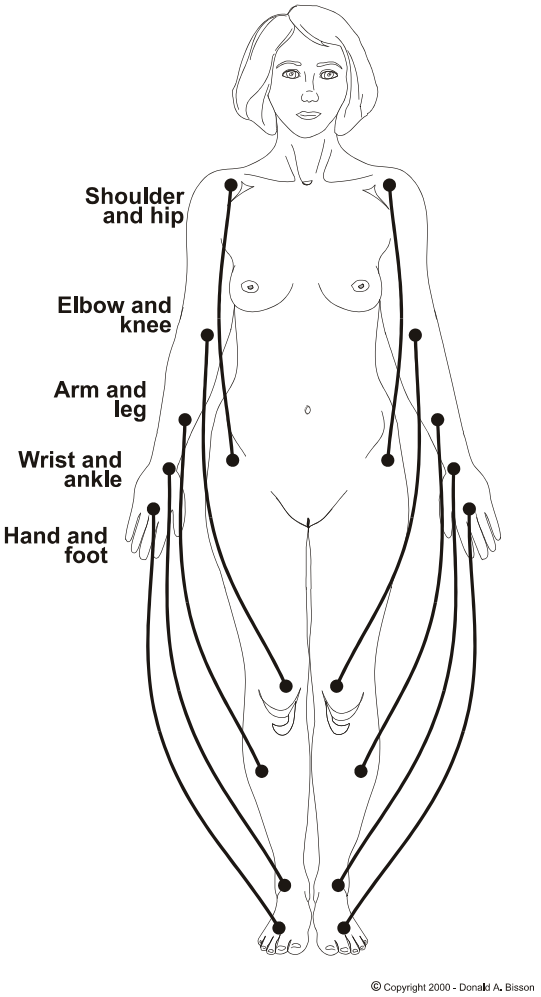
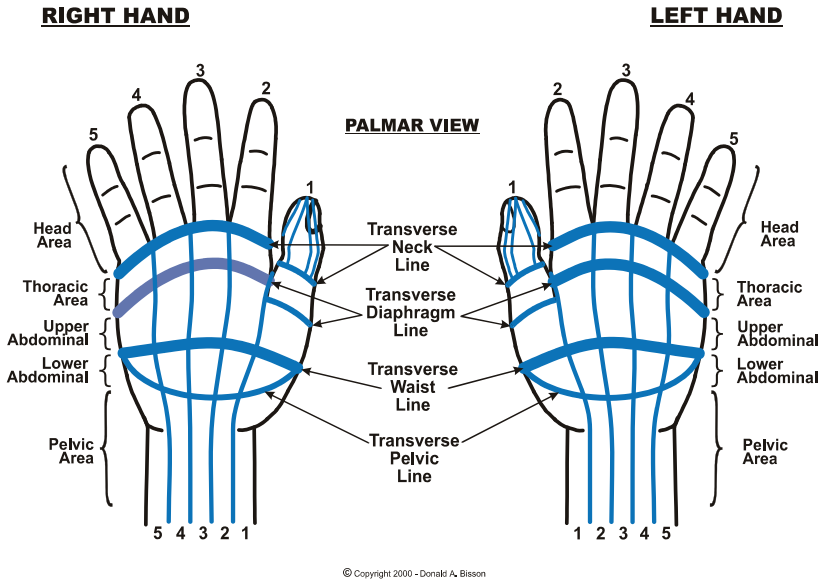


Figure 2-4 Transverse Zones of the Hands



Chapter Summary

Hand Characteristics - Figures 3-1 to 3-3

- Each finger on the hand has its own particular characteristics that add to or limits the flexibility of the hand.
- The middle finger (longest finger) is the most limited in motion by its attachment to the 5 metacarpal bones between the wrist and fingers.
- The forefinger or index finger (2nd longest finger) has the greatest range of independent movement. Due to its flexibility, it is used for pointing and beckoning.
- The ring finger does not bend or straighten without being accompanied (at least partially) by one or both of the fingers on either side because its tendons are connected on either side by a band of fibres. Became the choice for wearing rings because this finger is protected in movement by fingers on either side.
- The little finger (pinkie) cannot bend or flex on its own which is a protection for its position and size as it is susceptible to hard knocks. "*Pinkie*" is a Dutch word, *pinkje*, which means "*little finger*."
- The thumb has a range of varied movements. Its position on the hand, in opposition to the other fingers, allows it to grasp and pick up objects. This allows a strong, firm grip and the dexterity and precision to hold an object in any position, to touch it from all sides, and to release it.

Hand Surfaces - Figure 3-4

- The skin functions as a protective shield. With a high number of nerve endings, the skin responds to a number of sensations such as touch, pressure, temperature, and pain. It also allows sensory perceptions such as tickle, wetness, softness, and hardness as well as surface texture, form, force, and weight.
- The **stratum corneum** is the outermost layer of the epidermis and it is made up of flat, toughened cells. This layer is the last stage in the life cycle of a skin cell, before it is shed.
- The stratum corneum keeps the bodily fluids in and environmental fluids out. It also protects the cells from injury, dryness, and attacks by bacteria and chemicals.
- A thin coating of **sebum** (fatty, oily substance) helps to keep the stratum corneum soft, pliable, and waterproof.
- The **epidermis** is the self-repairing, self-renewing layer of skin that includes and lies below the stratum corneum.
- The epidermis is made up of scalelike cells composed of a waxy, waterproof protein called **keratin**. These skin cells live for 15 to 30 days before being flattened and pushed upward by new cells produced below.
- The epidermal skin on the palms of the hands and soles of the feet is normally thicker than elsewhere on the body.
- **Melanin**, a skin pigment, is formed at the lowest layers of the epidermis.
- Melanocyte cells manufacture the melanin that produces the intensity of the skin and hair colour according to the genetic DNA. Differences in skin colour are due to the amount, type, and arrangement of the melanin within the epidermis.
- The protective purpose of melanin is to absorb ultraviolet rays from the sun.
- The **dermis** (true skin) is a spongy, connective tissue whose major components include collagen (for structure) and elastin (for elasticity) proteins.
- The dermis houses the hair follicles, which function as ultra sensitive touch receptors.
- The dermis is directly connected to the nervous system, the glands that produce sebum and sweat, lymph vessels, and 25% of the body's blood supply.
- The skin surface texture changes according to age, health, climate, and the environment.
- **Dorsal skin** on the back of the hand is thin and pliable. It is easily separated or pinched away from the underlying tissues which is essential for the movement and flexibility of the fingers.
- **Volar skin** on the palm of the hand is thick and hairless. It is rich in sensory receptors, and supplied with sweat glands to lower the body's temperature and eliminate toxins. This skin is firmly attached and is designed to grasp and hold objects.
- On the back of the hand are fine, soft **hairs** of which there are 120 hairs per square inch (15 to 20 hairs per cm^2). The hairs function as protective warning devices that when bent, hair follicles activate the sensitive touch receptors.
- **Fingernails** protect the upper surface of the fingertips and help to grasp, scratch, and pinch. Nails also provide a form of stability for the softer skin around the fingertip.
- Places on the body where there are a large number of nerve cells close the surface of the skin includes the cheek, back of hand, bottom of feet and between shoulder blades.
- The number of skin capillaries is greater in the soles of the feet and the palms of the hands. The primary function of capillary circulation is to provide substances for cell metabolism and growth, and to carry away waste products.

Fingernail Structure - Figure 3-5

- The primary purpose of fingernails is to shield the nerve endings at the tips of the fingers. It also contributes to the precision and sensation of touch, temperature, and pain.

Cuticles

- The **cuticle** is a small piece of skin that sometimes overhangs the nail body. It protects the nail matrix, the tissues and cells below the nail body that are actively forming the hard nail.
- Vigorous pushing back of the cuticles, trimming, or use of chemical solvents will cause ridges in the nail. Once the nail is damaged, the watertight space under the nail is open to moisture and is exposed to bacteria, yeast infections, and deformed nails.

Nail Matrix

- Nail growth begins in the nail matrix and it is composed of a tough protein called **keratin**.
- Matrix cells produce the keratin that becomes the visible, strong fingernail.
- The nail matrix contains the nerves, lymph vessels, and blood vessels, required for the nourishment of the fingernails.

Lunula

- The **lunula** or '*half-moon*' is the milky white crescent that is formed at the base of the nail, crossed by the cuticle.
- The lunula is a semi-transparent window to the nail matrix and nail bed underneath.

- The lunula is easiest to see on the thumb and the hardest to see on the little finger.

Nail Bed and Nail Body

- The **nail bed** is the bed of skin on which the **nail body** and nail matrix rest or grow.
- As keratin forms in the nail matrix, it pushes forward onto the nail bed to harden and becomes the exposed nail body.
- The tough nail body does not contain any nerves or blood vessels that are found in the nail bed. It is no longer a living tissue and it appears to be in one piece, but is constructed in layers.

Nail Fold

- The **nail fold** is a layer of skin that covers the edges of the nail body on all sides except the tip which holds the nail in place. It is often the primary site of nail fungus infections.

Nail Growth

- Nail growth is different from person to person and from finger to finger.
- The middle finger nail grows the fastest and the nail on the little finger grows the slowest.
- Nails grow from 0.05 to 1.2 millimetres per week.
- If a nail is lost, it may take 7 months to grow out fully.
- Usually, nails of babies and the elderly grow more slowly than those of teenagers.
- The length of the finger and the size of the lunula suggest the speed of growth of the nail (thumb is exception).
- Biting fingernails, while detrimental to their health in other ways, is thought to make them grow faster.
- Fingernails grow faster than toenails.
- Nails grow more quickly in the summer than in the winter. Heat increases the rate of all metabolic processes.
- Nails grow faster during the day than at night due to the body rhythms.
- Men's nails grow faster than women's but women will experience a spurt in nail growth before menstruation and during pregnancy due to hormonal activity.
- Reflexologist's fingernails usually grow at a faster rate than normal due to stimulation during a session.

Fingernail Observations

- Hippocrates taught as early as 400 BC that the nails reflect the condition of the inner body.
- Abnormalities of the nails can often provide early clues to common medical problems or severe systemic diseases.
- Observations of the nails can assist the reflexologist to determine which reflexes to work on during a session.
- The fingernail is colourless and translucent. The central portion of the nail appears pink because the nail bed below the nail body is rich in capillaries, and the nail body is close-fitting.
- The lunula appears white because it is not firmly attached to the nail body.
- Normal, healthy nails grow in a variety of shapes, determined by a person's genetics.
- Common fingernail problems are most often focussed on soft or brittle nails and split or pitted nails. These conditions are generally related to the effects of the environment, nail-biting, age, or heredity. However, changes in the nails can signal other internal health problems which can result from a variety of causes.

Lines and Ridges on the Fingernails

- Longitudinal lines on the nails are considered to be due to age although it is speculated that it may due to poor absorption rates of vitamins and minerals or anemia.
- White lines are common but sometimes are indicative of liver or kidney disease.
- Ridges are caused by an inflammation or irritation around the area of the nail matrix which disturbs the growth pattern of the nail body. This will usually produce a lengthwise furrow on the nail.
- Cuticle manipulation can cause fingernail ridging.
- **Beau's lines** are horizontal ridges that cross the nail like wavy furrows which indicate that the nail growth was interrupted by such conditions as high fever, nutritional deficiencies, drug reactions, painful menstruation, childbirth, or trauma from surgery. When the nail begins to grow again (nail matrix begins to produce keratin again), a groove develops at the location.

Discoloured Fingernails

- Normally, the colour of fingernails is uniform and of a lighter tone than the skin on the back of the hand.
- The nail bed will show a pinkish colour through the nail body for the fair-skinned and a creamy beige for darker skin tones.
- Discoloured nails can give clues to internal body imbalances.
- Toxicity to certain medications can also discolour nails.

Hand Examination

Reflexologists do not diagnose hand conditions.

Allergy

- A disorder in which the body becomes hypersensitive to allergens which provoke characteristic symptoms.
- The reaction of an allergen leads, as a side effect, to cell damage, inflammation, and all symptoms of the particular allergy.
- **Do not use** any creams or lotions on the hands during a session.

Blister

- A swelling containing watery fluid (serum) and sometimes also blood (blood blisters) or pus, within or just beneath the skin.
- Commonly develop as a result of unaccustomed friction on the hands or feet or at the site of a burn.
- Avoid all blisters and refer for medical attention.

Boutonnière Deformity - Figure 3-6

- A condition of the bent-down (flexed) position of the middle joint of the finger from a cut or tear of the extensor tendon.
- Treatment involves splinting the middle joint.

Brown Spots

- Also known as "*age spots*" and sometimes **incorrectly** called "*liver spots*."
- Usually appear on the backs of the hands.
- Caused by the cumulative effects of sunlight or chronic bruising of the skin.

Bruise

- Also known as "*black-and-blue*" marks.
- Usually caused by an impact that causes bleeding in the small blood vessels beneath the skin.
- Those with bleeding disorders and people taking aspirin, estrogen, or cortisone-type medications may be more prone to bruising.
- Avoid working on or near bruises and refer to medical attention for serious bruises.

Burn

- Burns result in tissue damage caused by heat, chemicals, electricity, sunlight, or nuclear radiation.
- **1st degree burns** affect only the *epidermis* (outer layer) of the skin.
- **2nd degree burns** involve both the *epidermis* and the *dermis*.
- **3rd degree burns** involve damages or destruction of the skin to its full depth and damage to the tissues beneath. 3rd degree burns usually require skin grafting.
- Burns cause swelling and blistering, due to the loss of plasma from damaged blood vessels and can be susceptible to infections.
- Refer any serious burns for immediate medical attention.

Callous

- Also known as **callosity**.
- It is an area of hardened skin that forms a protection for body parts that suffer pressure or friction, commonly on the hands and feet.
- If large in size and thickness, may be painful to work on. Avoid working on affected area and refer to qualified professional.

Candida Nail Infection

- A form of a yeast-like fungus that can cause candidiasis or infection.
- It has similar symptoms of the *Tinea Fungal infection* (ringworm) but may also have a creamy discharge.
- **Avoid any infected areas** and refer for medical attention.
- **Take all necessary precautions to prevent contamination** of work area, other people and self.

Carpal Tunnel Syndrome - Figure 3-7

- Characterized by a combination of *paresthesia* (pins & needles), numbness, burning, and pain affecting all of the hand except the little finger. There may be a weakness of the thumb.
- Caused by pressure on the median nerve as it passes through the wrist which may result from any continuous repetitive movement of the hand, such as typing.
- Avoid working on any painful areas and refer for medical attention.

Chilblain

- Also known as *pernio*.
- Characterized by a dusky red round itchy swelling of the skin, occurring generally on the fingers or toes in cold weather.
- Refer to a medical doctor.

Clubbing

- Clubbing is the abnormal enlargement of the tips of fingers and toes so that the normal angle between the nail and the digit is filled in. The nail becomes convex in all directions and in extreme cases, the digit end becomes bulbous like a club or drumstick.
- It is a syndrome of chronic lung disease and is common in patients with cyanotic heart disease.
- If respiratory or circulatory disorders are present, refer to medical attention.

Cold Hand

- Caused by poor circulation either of blood or lymph.
- Possible causes include arteriosclerosis, hypothyroidism, anemia, iron deficiency and Raynaud's Disease.

Deformities

- There are many variations of hand deformities which include claw hand, lobster hand, and preacher's hand.

Dermatitis

- An inflammation of the skin caused by an outside agent.
- The skin is red and itchy and small blisters may develop.
- In most cases, it is associated with certain typical changes in the skin that result from direct irritation by a substance such as solvent or detergent.
- Not to be confused with eczema which is a disease in which agents do not play a primary role.
- Sometimes, *dermatitis* and *eczema* are used interchangeably erroneously.

Dupuytren's Contracture - Figure 3-8

- A condition in which the layer of the tough fibrous tissue that lies under the skin on the palm of the hand, thickens and shrinks. The shrinkage eventually causes the ring finger and the little finger to be permanently bent at the knuckles.
- Some also have thickened skin pads over other knuckles on the balls of the feet. Common in men over 40 years.

Eczema

- It is a superficial inflammation of the skin affecting mainly the epidermis.
- Causes itching, with a red rash often accompanied by small blisters that weep and become crusted. Subsequent scaling, thickening, or discolouration of the skin may occur.

- Sometimes, *dermatitis* and *eczema* are used interchangeably and it may be classified as *eczema dermatitis* which results from external factors and *endogenous eczema*, occurring without any obvious external cause.
- Avoid working near affected areas and refer for medical attention.

Freckle

- A small brown spot on the skin commonly found on the back of the hands, arms, and face of red-haired or blond people with a fair complexion.
- Harmless freckles appear where there is an excessive production of the pigment *melanin* without any increase in the number of melanocytes after exposure to sunlight.

Frostbite

- **A very serious condition**. In frostbitten areas, the blood, nerve, and soft-tissue cells are frozen.
- Symptoms include a waxy bluish-white skin appearance and there is a burning pain in the affected area.
- Untreated, it may develop into gangrene. Amputation is sometimes necessary.
- **Do Not Treat**. Refer for **immediate** medical attention.

Ganglion - Figure 3-9

- An abnormal but harmless swelling or *cyst* that sometimes forms in the tendon sheaths, especially at the wrist.

Gangrene

- Gangrene is the death of the tissue in one part of the body.
- Dry gangrene is due to loss of blood supply to the part affected.
- Gas gangrene is a complication of severe wounds in which the tissue is crushed and infection sets in due to bacteria.
- Common causes are: frostbite, arteriosclerosis, severe burns, uncontrolled diabetes, persistent infections, a crushing injury or an embolism, and Raynaud's Disease.
- Amputation is sometimes necessary. **Do Not Work** on the affected area and refer for **immediate** medical attention.

Hang-Nail

- Hang-nail is the splitting of the skin or *cuticle* at the side of a finger nail.
- Usually caused by trauma in manual workers, but ischaemia of the fingers (see Raynaud's Syndrome) may predispose to the condition.
- Secondary infection and inflammation may make hang-nail a very tender condition.

Heberden's Nodes - Figure 3-10

- A bony thickening or bony knobs on the sides of the end, or distal joints of the fingers in osteoarthritis.
- Often inherited. Avoid working on painful areas.

Hives

- Also known as **urticaria**.
- An acute or chronic allergic reaction in which red round wheals (raised skin surfaces) develop on the skin, ranging in size from small spots to several inches across. It itches intensely and may last for hours or days.
- Cause is sensitivity to certain foods or other allergens, including medication.
- Refer to medical attention for serious conditions.

Keloid

- Also known as **cheloid**.
- An overgrowth of fibrous scar tissue following trauma to the skin.

Mallet Finger - Figure 3-11

- A condition in which a finger (usually index finger) is bent downward at the tip, due to avulsion or evulsion (tearing or forcible separation) of the long extensor tendon from the bone.
- Treatment usually consists of splinting the tip of the finger for at least 6 weeks.
- Baseball Finger is the injury caused by a direct blow to the fingertip from a baseball, football, volleyball, etc.

Onychia

- Inflammation of the matrix of the nail, which results in the loss of the nail.

Onychogryphosis

- Gross thickening and hardening of the nail, which becomes clawlike, elongated, and deformed.
- Unknown cause.

Onycholysis

- The separation or loosening of part or all of a nail from its bed.
- May occurs in psoriasis, dermatitis, and in fungus infection of the skin and nail bed.
- Avoid working on or near the affected nails and refer for medical attention.

Onychomycosis

- A fungus infection of the nails, usually caused by *epidermophyton* or *candida*.
- Nails become white, opaque, thickened, and brittle.
- Take all necessary precautions to prevent contamination.

Osteoarthritis

- Osteoarthritis develops when the cartilage in and around the joint, wears down and is not replaced. There is not enough cartilage to buffer the bones that come together at the joint (grinds together). The friction irritates the thin protective membrane covering the bones (*periosteum*). The periosteum responds by stimulating the growth of bony outcropping.

Osteoporosis

- The loss of bony tissue or calcium from the skeleton, resulting in bones that are brittle and liable to fracture.
- Common in the elderly and in women following menopause.

Polydactylism

- More than the normal number of fingers or toes.
- Extra digits are commonly undersized and are usually surgically removed shortly after birth.

Psoriasis

- A skin disease that can affect either skin or nails, or both.
- Characterized by itchy, scaly, red patches and most often on bony protuberances.
- Do not work on affected areas and refer to a medical doctor.

Raynaud's Syndrome

- Sometimes called *Raynaud's Phenomenon*.
- A painful spasm of the blood vessels in the fingers and toes due to lack of or inadequate blood flow (*ischemia*).
- If left untreated, can lead to gangrene.
- The fingers or toes can change very quickly from a healthy skin tone to a pale or even bluish colour (*acrocyanosis*).
- Serious underlying causes are called *Raynaud's Disease*.

Rheumatoid Arthritis - Figure 3-12

- A painful condition caused by the body's immune system that mistakes the joints for foreign matter and attacks the joint tissues or synovium to destroy them.
- Tissue becomes swollen and covers the joints, destroying bone and cartilage.

Ring-Finger Rash

- A rash under a ring due to an irritation.
- Some causes include soaps, detergents, wax, polish, or cosmetic creams that accumulate under the ring and causes dermatitis.
- In other cases, minerals found in the rings, such as nickel in costume-jewellery and gold may react with the skin.
- Pregnant women may experience finger swelling, which causes finger rings to become tighter and traps household chemicals and abrasives beneath.

Skier's Thumb

- A torn ligament of the thumb that is common among skiers.

Sprain

- The twisting or wrenching of a joint with partial damage to its attachments but without dislocating bones.
- Symptoms include rapid swelling, feeling of heat, and difficulty in movement of the joint.
- **Do not work** on a sprained joint.

Syndactyly

- Also known as *finger webs*.
- A congenital fusion (a birth defect marked by the growing together) of the fingers or toes.
- Varies in severity from no more than marked webbing of 2 or more fingers to virtually complete union of all digits.
- Usually, surgical separation and skin grafts may be required.

Tendinitis

- A painful inflammation, with or without swelling, of a tendon caused by unusual and excessive use.

Tenosynovitis - Figure 3-13

- Also known as *peritendinitis* or *trigger finger*.
- The inflammation of a tendon sheath, producing pain, swelling, and an audible creaking or clicking on movement.
- Refrain from working on this condition and suggest medical care.

Tinea Unguium

- Also known as *ringworm* (tinea).
- A **contagious** fungus infection of the nails.
- The infection will begin at the ends of the nails and then spread to occupy the entire nail bed.
- Most common form of ringworm is *athlete's foot* (tinea pedis) which affects the skin between the toes.
- Those who tend to pick up athlete's foot may also be prone to develop tinea infections on their fingernails.
- Take all necessary precautions to prevent contamination and refer to a medical doctor for treatment.

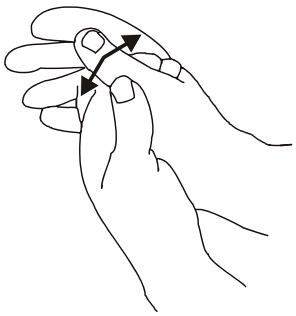
Warts

- Caused by a virus in the blood and are small benign skin tumours.
- Use caution when working around warts.

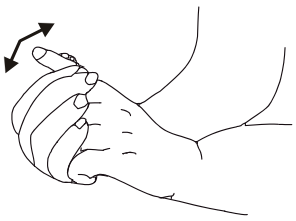
Chapter Summary

Basic Techniques

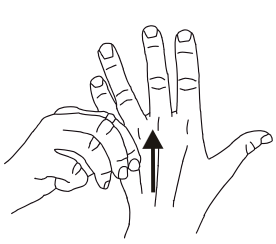
Thumb Walking - flex the first joint up and down while applying pressure over a reflex area.

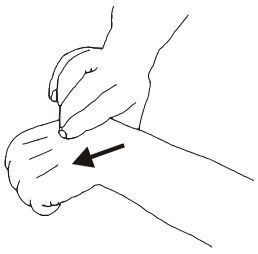


Finger Walking - flex the first joint up and down while applying pressure over a reflex area.

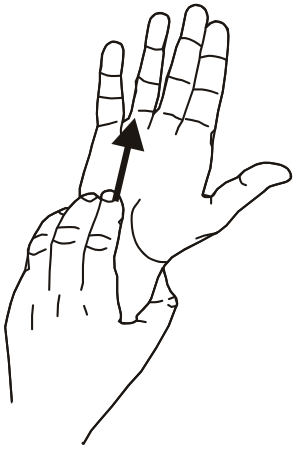


Metacarpal Walking Technique - work between the dorsal tendons by finger- walking upwards to the fingers or by drawing and finger-walking upwards.

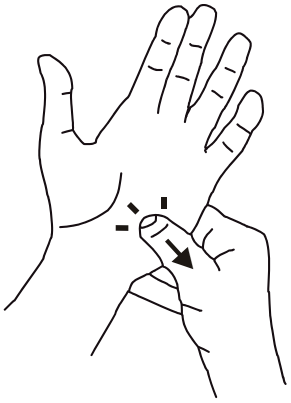




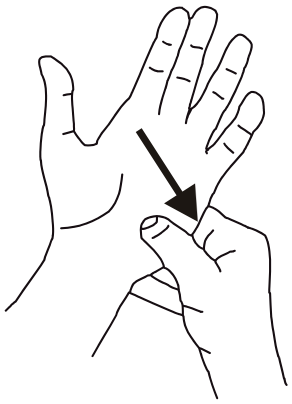
Four Finger Walking Technique - to work a large area reflex, finger-walk with four (4) fingers at the same time upwards to the fingers.



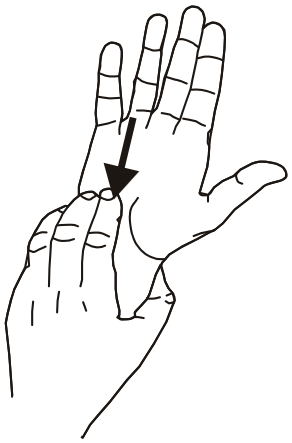
Reflex Hooking - push inward on the reflex and pull back or draw sideways while the thumb is still depressed.



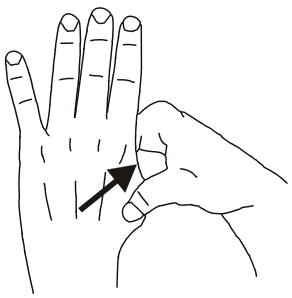
Finger/Thumb Draw Technique - using a finger or thumb, press in and draw across the reflex.



Four Finger Draw Technique - same as above but using four (4) fingers at the same time while drawing across the reflex.

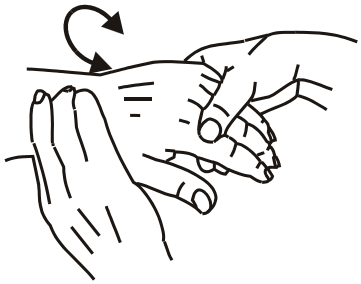


Pinch Technique - gently pinch the web between forefinger and thumb and finger/thumb-walk upwards to the end of the web.

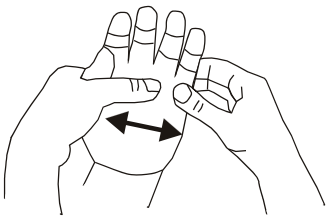


Relaxation Techniques

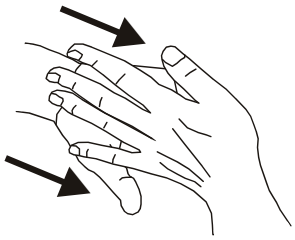
Wrist Rotation Technique - rotate the hand gently in a circle at the wrist in both directions three (3) times.



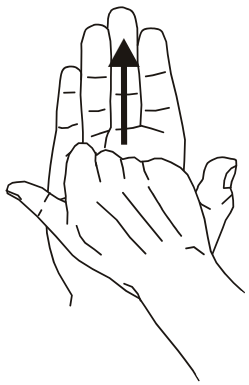
Chest Stretch Technique - stretch and draw your thumbs in opposite directions horizontally to open the dorsal and palmar thoracic area reflexes.



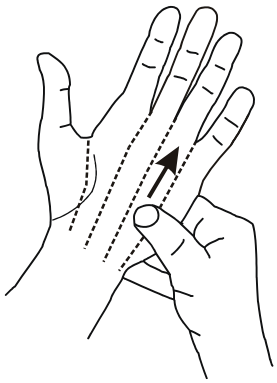
Clean-Out Technique - stroke the reflex area from the bottom upward to release tension with the palm of the hand, index finger or thumb.



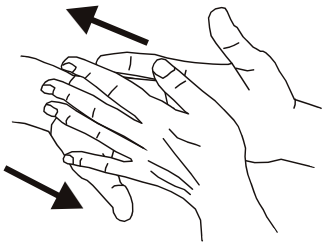
Knuckle Draw / Roll Technique - press in and draw the fist or roll the knuckles upward from the bottom of the palm to the finger tips several times.



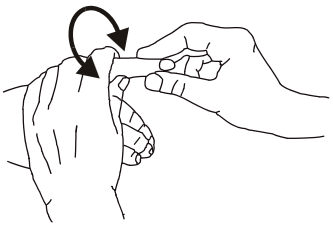
Longitudinal Zoning Technique - thumb-walk from the bottom of the palm upward to and including the fingers and thumb in all 5 zones of the hand. Also, thumb-walk the thumb from the base of the thumb upward in all 5 zones of the thumb.



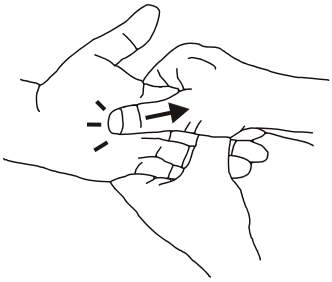
Palmar/Dorsal Rub Relaxation Technique - use both palms of the hands in a back and forth rolling motion, rubbing each side of the hand.



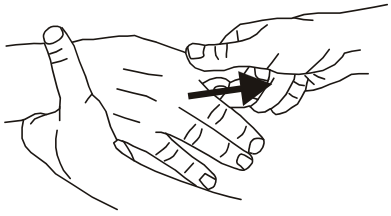
Finger/Thumb Rotation Technique - **gently** rotate the finger or thumb slowly and evenly with a slight upward pull three (3) times in a circle in both directions.



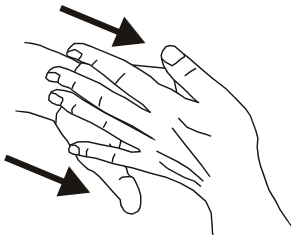
Solar Plexus Push Technique - push inward on this reflex in Zone 3 with the thumb and lift up three (3) times while holding the fingers without bending.



Finger/Thumb Tug Technique - **gently** tug each finger or thumb. **Do not pull too hard**.



Feather Touch - **stroke very lightly** with the fingertips and the palms of the hands.



For a complete explanation on the Reflexology Procedure, methods and terminology, see the chapter on **Reflexology Hand Procedure.**

Hand Notes

Sample Reflexology Health Record

Note: This form to be completed on the **first visit only.**

Name: Doe, John A.

Today's Date: Sept. 1/2000 (Month/Day/Year)

Address: 33 Town St. - Apt.6

Tel. Res: (905) 444-4444

Town: Sugarville

Tel. Bus: (905) 334-3333

Prov./State: Ontario PC/Zip: V6V 2D2

Birth Date: 06/11/1957 (Month/Day/Year)

Last Medical Visit: Spring 2000

Findings (Medical): High cholesterol

Have you had any accidents?	No ☐	Yes ☑	What/When?	'80 - Skiing, torn knee
Do you have any serious illness?	No ☑	Yes ☐	What/When?	N/A
Have you been hospitalized recently?	No ☑	Yes ☐	Why/When?	N/A
Have you had any broken bones?	No ☐	Yes ☑	What/When?	Left ankle - 1978
Have you had any surgery?	No ☑	Yes ☐	What/When?	N/A
Are you on medication?	No ☑	Yes ☐	What/Why?	N/A
Do you have any heart problems?	No ☑	Yes ☐	What/When?	N/A
Do you have a pacemaker?	No ☑	Yes ☐	Where/When?	N/A
How is your blood pressure?	Normal ☐	Not Normal ☑	Why?	Stress, long work hours
Do you have any circulatory problems?	No ☑	Yes ☐	What?	N/A
Are you pregnant? (female only)	No ☑	Yes ☐	Trimester?	N/A
Any history of cancer?	No ☑	Yes ☐	What/When?	N/A
Do you have diabetes?	No ☐	Yes ☑	What/When?	Type 2 Non-insulin
Do you have epilepsy?	No ☑	Yes ☐	What/When?	N/A
Do you wear any prostheses? (artificial limbs, hearing aids, etc)	No ☑	Yes ☐	What/Where?	N/A
Do you smoke / have allergies?	No ☑	Yes ☐	What/When?	N/A
Are you taking other therapies?	No ☐	Yes ☑	What?	Nutrition counsel, vitamins
Have you had Reflexology before?	No ☐	Yes ☑	Who/When?	1980-85 - Jane Doe

Who referred you to us? Sister-in-law

What is your occupation? Office worker

Who is your doctor? Dr. Brown

Doctor Tel. #: (416) 555-1212

Present Problems: High cholesterol, chronic fatigue.

Consent for Reflexology Session:

I understand and accept that the sessions received are of therapeutic value only and fully accept responsibility for the same.

Signature: (parent/guardian) Mr. John Doe

Date: Sept. 1/2000

Volunteer Client: *Mr. John Doe*

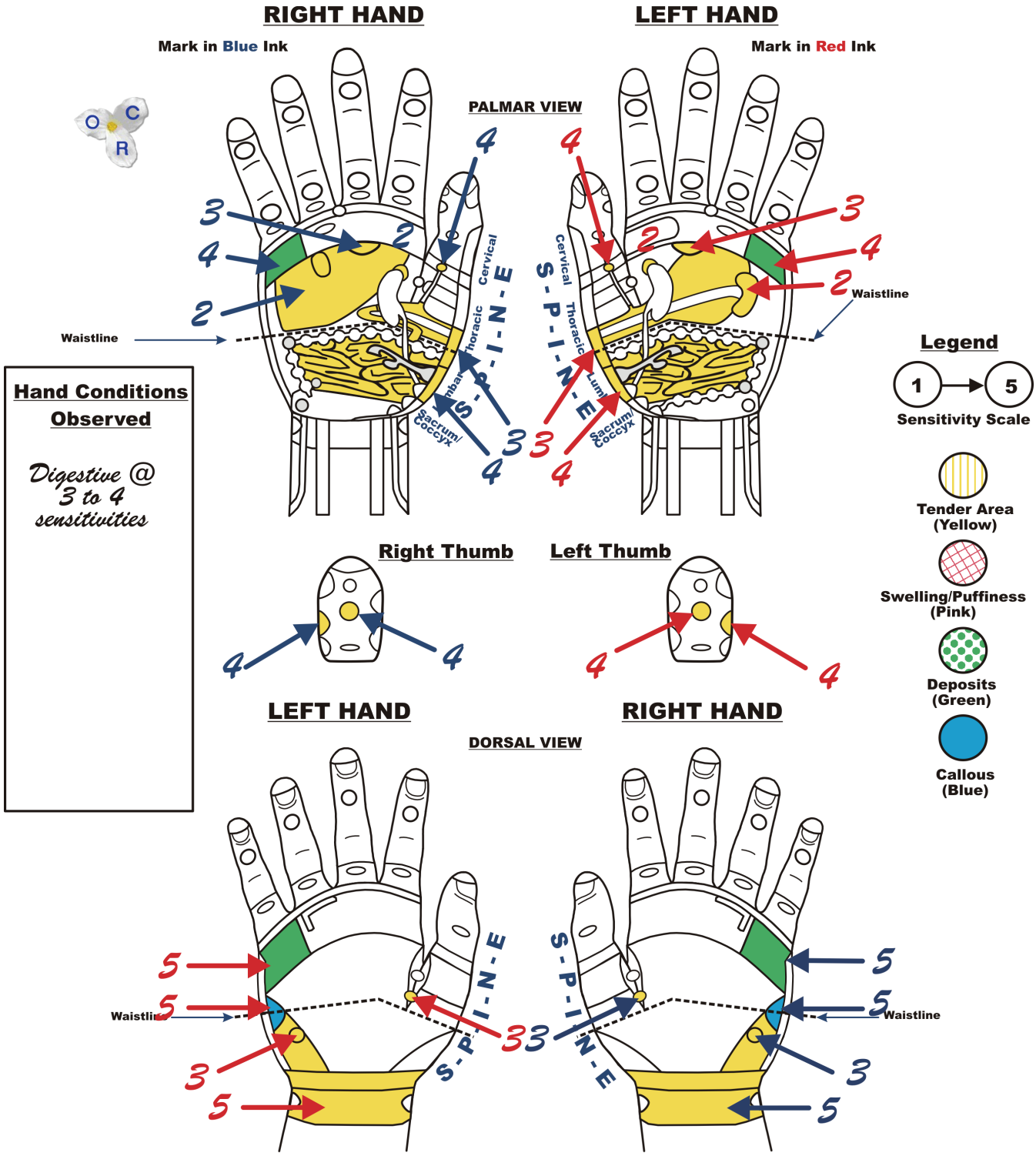
Date	Observations: (Sample)
09/01/2000	*Enjoyed the first session very much. An enjoyable gentleman. Dorsal, Zones 4&5 is sensitive. Holds stress in the shoulders. Digestive system requires greater attention.*
10/01/2000	*Had more energy 1st week after session. Still tired. Zones 4&5 still sensitive. Deposits in shoulder reflexes are considerably less. Digestive system - gall bladder. Pain in Upper Abdominal area. Changes in diet affecting digestion.*

Sample Hand Reflexology Session Record

Note: This form is to be completed by the Reflexologist for each session

Date of Session: 09/01/2000 (mm/dd/yy)

Session Number: 01 Volunteer Client: Doe, John A.



All charts are based on the premise that there are zones and reflexes on different parts of the body which correspond to and are relative to all parts, glands and organs of the entire body.

Reflexologists **do not** diagnose, prescribe for, or treat specific conditions. Reflexologists **do not** work in opposition to the medical or other fields, but instead complement and enhance them.

Chapter Summary

Overview

- The primary organs of the skeletal system are the **bones** along with **joints**. The bones provide a rigid framework and support structure for the body.
- Bones are *living organs* that can change and help the body to respond to a changing environment.
- Movement is possible by the way bones are joined by joints and attached muscles, tendons, and ligaments.

Divisions of Skeleton - Figures 6-1 & 6-2

The skeleton is composed of the following divisions and their subdivisions:

A. Axial Skeleton

1. Skull
2. Spine
3. Thorax
4. Hyoid bone - used to anchor the tongue.

B. Appendicular Skeleton

1. Upper Extremities

a. shoulder (pectoral) girdle
b. arms
c. wrists
d. hands

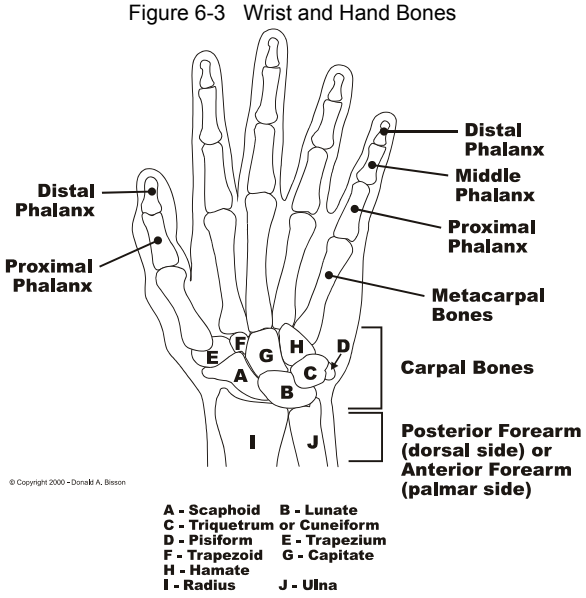
2. Lower Extremities

a. hip (pelvic) girdle
b. legs
c. ankles
d. feet

Hand and Wrist Bones - Figure 6-3

- The hand is located in the upper limb, below the wrist.
- The hand is highly developed in structure than the corresponding part in animals.
- The human race is distinguished from the animals by the possession of a thumb which can be '*opposed*' to other fingers for grasping objects.
- The hand is connected with a large area on the surface of the brain and is capable of the highest degree of education or dexterity.
- The wrist and hand have more bones for their size than any other part of the body.
- The hand has:
  a. 8 small **carpal** bones in the wrist;
  b. 5 **metacarpal** bones in the fleshy part of the hand;
  c. 3 **phalanges** in each finger (2 in each thumb);
  d. a total of **27 bones**.
- Carpal bones are arranged in 2 rows: distal (a,b,c,& d) and proximal (e,f,g,& h) from the fingers.
- The presence of many small bones in the hand and wrist and the many movable joints make the hand highly manoeuvrable.
- Forces transmitted from a fall on the hand to the wrist pass largely through the scaphoid, lunate, and radius. Fractures of the scaphoid and distal radius are common.

Figure 6-3 Wrist and Hand Bones



Note: Medical Anatomical charts position the thumbs away from the body, unlike that of the Reflexology Zone and Reflex charts. See Chapter 2 and Appendix C with regards to the hand and forearm anatomical positions.

Chapter Summary

Overview

- Muscles produce movement, maintain body posture and generate heat.
- A tendon is stimulated by a nervous impulse that shortens or contracts the muscle tissue.
- Muscles contribute 40% to 50% of the body weight.
- Muscle cells shorten or contract by converting chemical energy obtained from food into mechanical energy that is translated into movement.

Movements Produced by Skeletal Muscle Contractions - Figure 7-3

Types of movement that may produce a muscle contraction at any joint depend largely on the shapes of the bones involved and the joint type. Muscles acting on some joints produce movement in several directions, whereas only limited movement is possible at other joints. The terms most often used to describe body movements are:

- **Flexion**
- **Extension**
- **Abduction**
- **Adduction**
- **Rotation**
- **Supination** and **pronation**
- **Dorsiflexion** and **plantar flexion**.

Flexion is a movement that makes the angle between two bones at their joint **smaller** than it was at the beginning of the movement. Most flexions are movements commonly described as bending.

Extension movements are the opposites of flexions. They make the angle between two bones at their joint **larger** than it was at the beginning of the movement. Therefore, extensions are straightening or stretching movements rather than bending movements.

Abduction means moving a part **away** from the midline of the body, such as moving the arm out to the side.

Adduction means moving a part **toward** the midline, such as bringing the arms down to the sides from an elevated position.

Rotation is movement around a longitudinal axis. The head is rotated by moving the skull from side to side.

Supination and **pronation** refer to hand positions that result from the rotation of the forearm. (Prone = body lying face down. Supine = lying face up). Supination results in a hand position with the palm turned to the anterior position and pronation occurs when the palm of the hand is turned so that it faces posteriorly.

Dorsiflexion and **plantar flexion** refer to foot movements. In dorsiflexion, the dorsum is elevated with the toes pointing upward. In plantar flexion, the bottom of the foot is directed downward so that in effect, the person is standing on their toes.

Note that flexors produce many of the movements used for walking, sitting, swimming, typing, and many other activities. Extensors also function in theses activities but perhaps play their most important role in maintaining an upright posture.

All muscles of the forearm and hand can be classified as either **intrinsic** or **extrinsic**. An intrinsic muscle is a muscle that is contained entirely within the organ or part it acts on. An extrinsic muscle has its origin some distance from the part it acts on.

A muscle is classified as a **prime mover** if it acts directly to produce a desired movement. A **synergist** assists the prime mover in producing a movement, while an **antagonist** opposes the movement. As prime movers and synergist muscles at a joint contracts, the antagonists relax. When antagonist muscles contract, they produce a movement opposite to that of the prime movers and their synergist muscles.

A skeletal muscle is an organ composed mainly of striated muscle cells and connective tissue. Most skeletal muscles attach to two bones that have a movable joint between them. One of two bones is usually more stationary in a given movement than the other. The muscle's attachment to this more stationary bone is called its **origin**. Its attachment to the more movable bone is called the muscle's **insertion**. The rest of the muscle (except its two ends) is called the **body** of the muscle.

Tendons anchor muscles firmly to bones. It is made of dense fibrous connective tissue in the shape of heavy cords. Tendons have great strength and do not tear or pull away from the bone easily.

Chapter Summary

Overview: Figure 8-1

- The endocrine system is composed of specialized glands that secrete chemicals known as **hormones** directly into the blood.
- Sometimes called *ductless glands*, the organs of the endocrine system perform the same general functions as the nervous system.
- The nervous system provides *rapid control* by nerve impulses and the endocrine system provide *slower* but *longer-lasting control* by hormone secretion.
- Besides controlling growth, hormones are the main regulators of metabolism, reproduction and other body activities. They play important roles in maintaining *homeostasis* - fluid and electrolyte balance, acid-base balance, and energy metabolisms.
- All organs of the endocrine system are glands, but not all glands are organs of the endocrine system.
- Of the 2 types of glands in the body - **exocrine glands** and **endocrine glands**, only endocrine glands belong to this system
- *Exocrine glands* secrete their products *into ducts*.
- *Endocrine glands* are *ductless glands*. They secrete hormones *directly into the bloodstream*.
- The endocrine glands are widely distributed throughout the body. The **pituitary gland**, **pineal gland**, and **hypothalamus** are located in the skull. The **thyroid** and **parathyroid glands** are in the neck, and the **thymus gland** is in the thoracic cavity. The **adrenal glands** and **pancreas** are found in the abdominal cavity. The **ovaries** in the pelvic cavity of the female and the **testes**, externally located in the male also function as endocrine glands.

Hand Notes

Chapter Summary

Overview:

- Urinary system includes the **kidneys**, **ureters**, **bladder** and **urethra**.
- The kidneys clear or clean the blood of waste products produced by the metabolism of foodstuffs in the body cells.
- The kidneys also play an important role in maintaining the electrolyte, water, and acid-base balances.
- Waste product produced by the kidneys is called **urine**.
- Urine flows from the kidneys through the ureters and is stored in the urinary bladder. Urine is expelled from the bladder via the urethra.
- Male urethra passes through the *penis* which has dual functions: urinary and reproductive. The female urinary passage is separate.
- Help regulate blood pressure by the enzyme *renin* and the hormone *erythropoietin* (rate of control of the red blood cell formation) secreted by the kidneys.
- Regulates absorption of calcium by activating Vitamin D.
- Regulates the pH balance of body fluids.

Hand Notes

Chapter Summary

Overview:

- Reproductive system ensures the survival of species, the human race.
- Production of hormones allows sexual characteristics.

Male:

- **Gonads** called **testes** which produce **sperm**.
- Genital duct called the **vas deferens** (ductus deferens).
- **Prostate gland**.
- **Genitalia** include the **penis** and **scrotum**.
- The **urethra**, which is part of the urinary system, serves as a genital duct that carry sperm to the exterior.
- **Sperm** produced by the testes travels through a number of ducts with the prostate and other glands adding fluid and nutrients to it on its way to the exterior into the female reproductive tract.

Female:

- **Gonads** are **ovaries**.
- Organs include **uterus**, **uterine** or **fallopian tubes**, and **vagina**.
- **Vulva** is the external genitalia.
- **Breast** or **mammary glands** are part of the reproductive system.
- Female reproductive system produces ova, receives male sperm, permits fertilization and transference of a fertilized ovum to the uterus, and allows for development, birth and nourishment of offspring.

Male Reproductive System

- Male reproductive system consists of the **testes**, **vas deferens** and the **prostate gland**.
- The **external genitals** consist of the **penis** and **scrotum**.
- Male genital system is designed to produce **sperm** and deposit them in the female.

Female Reproductive System

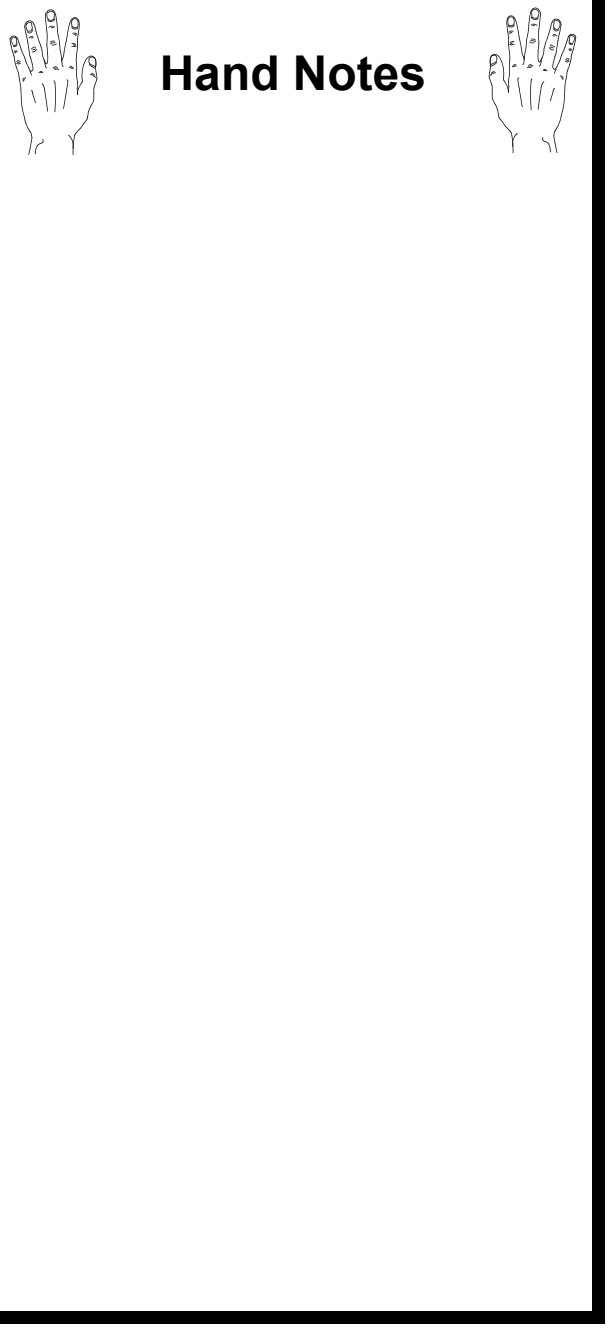
- Female reproductive system consists of **ovaries**, **uterus**, **fallopian tubes** and **vagina**.
- Receives sperm, produces ova (eggs) for fertilization and nurtures a fertilized egg (ovum) to develop a fetus (baby).
- External genital is the **vulva** (clitoris, labia majora and labia minora).

Hand Notes

Chapter Summary

Overview:

- The organs of the digestive system are separated into two groups: **primary organs** and **secondary** or **accessory organs**.
- *Primary organs* include:
  - mouth
  - pharynx
  - esophagus
  - stomach
  - small intestine
  - large intestine
  - rectum
  - anal canal
- *Accessory organs* include:
  - teeth
  - salivary glands
  - tongue
  - liver
  - gallbladder
  - pancreas
  - appendix
- The primary organs form a tube, open at both ends called the **gastrointestinal** or **GI tract** (also called the **alimentary canal**) which is 9 metres or 29 feet long in adults.
- Food enters the tract and is *digested*, its nutrients are *absorbed* and partly digested residue is *eliminated* from the body as **feces**.
- Accessory organs help in the mechanical or chemical breakdown of food.
- Breakdown of food is both *mechanical* and *chemical* in nature.
- *Teeth* are used to break down food and the **stomach** churns the food to continue the mechanical breakdown process.
- Chemical breakdown results from the digestive enzymes and other chemicals acting on food as it passes through the GI tract.
- In chemical digestion, large food molecules are reduced to smaller molecules that can be absorbed through the intestinal wall lining and distributed to the body cells.
- The process of altering the chemical and physical composition of food is called *digestion*.
- The digestive system also functions as an *organ of elimination*, eliminating waste or *feces*.
- Foods undergo three (3) kinds of processes: **digestion**, **absorption**, and **metabolism**.
- The *appendix* is physically attached to the digestive tube and classified as an accessory organ. It is not functionally important in the digestive process.
- Table 11-1, page 2 - Organs of the Digestive System.



Chapter Summary

Overview:

- The **circulatory system** consists of the **heart** (muscular pumping device) and a system of vessels made up of **arteries**, **veins**, **capillaries**, and **blood**.
- The terms *circulatory system* and *cardiovascular system* are sometimes used interchangeably. The *cardiovascular* system is sometimes associated to the heart and its blood vessels in the thoracic cavity.
- The primary function of the circulatory system is transportation.
- The heart functions as a muscular pump that forces blood through blood vessels.
- The **blood** serves as a fluid for transporting oxygen, nutrients, hormones and waste. It carries oxygen from the lungs and nutrients from the digestive system to all body cells. It also transports hormones from endocrine glands to destinations and waste from the body cells to the excretory organs.
- The circulatory system helps regulate body temperature.
- Certain cells can become involved in the immunity process.

Pulmonary Circulation

- Pulmonary circulation refers to *blood flow through the lungs* beginning from the right atrium to the right ventricle of the heart, to the pulmonary artery, to both lungs. Oxygenated blood returns to the left atrium, entering the left ventricle to be pumped throughout the body.

Systemic Circulation

- Systemic circulation refers to movement of blood from the left ventricle of the heart and throughout the body as a whole.

Hepatic Portal Circulation

- Hepatic portal circulation refers to the *blood flow through the liver*. Veins from the spleen, stomach, pancreas, gallbladder, and intestines do not move blood directly to the inferior vena cava. Blood flow is sent to the Hepatic Portal vein first, then through to the liver before emptying into the inferior vena cava.

Arteries and Veins of the Upper Limb

Figures 12-4 and 12-5 show the arteries and veins of the upper limb.

The arteries shown in Figure 12-4 are major arteries and their multiple branchings are not shown to avoid visual congestion. Although the basic arterial route from the heart to the fingers is uncomplicated, the existence of *collateral* (alternate) routes of flow should be noted. In the event of a subclavian or axillary (pectoral girdle) obstruction, blood can still flow to the distal extremities.

The veins of the upper limb are variable in their number and pattern, as are most veins. There are generally two (2) sets of veins in the limbs: **deep** and **superficial**. The deep set follows the arteries and often travels in pairs. The superficial veins of the hand and forearm are drained by the *basilic* and *cephalic veins* that travel in the superficial fascia (found immediately beneath the skin.) The superficial veins of the elbow are frequent sites for blood sampling and administration of intravenous medication.

Hand Notes

Chapter Summary

Overview Figures 13-1 and 13-2

- The lymphatic system is composed of **lymph nodes**, **lymphatic vessels** and specialized organs such as **tonsils**, **thymus**, **spleen**, and **appendix**.
- The thymus has dual functions: lymphatic and endocrine.
- Lymph is a whitish, watery fluid that contains **lymphocytes**, proteins and fatty molecules and does not contain red blood cells.
- Lymph is formed from fluid around body cells and diffuses into lymph vessels.
- Lymph does not circulate repeatedly through a closed circuit but eventually enters the circulatory system via the subclavian veins, including the **right lymphatic** and **thoracic ducts**, which connect with veins in the upper thoracic cavity.
- Functions of lymphatic system include movement of fluids and certain large molecules from tissue spaces around cells and movement of fat-related nutrients from the digestive tract back to the blood.
- The lymphatic system is also involved with the immune system which plays a critical role in the defence mechanism of the body against disease.
- Lymphatic system is similar to circulatory system but does not have a muscular pump. Lymph is moved through vessels against gravity by muscular contractions of the body.

Hand Notes

Chapter Summary

Overview

- Organs of the **respiratory system** include the **nose**, **pharynx**, **larynx**, **trachea**, **bronchi**, and **lungs**.
- Respiratory organs permit movement of air into lung sacs called **alveoli**. In the alveoli, **oxygen** is *exchanged* for **carbon dioxide** which is carried to the lungs by the blood for elimination.
- The respiratory system is designed to perform 2 functions:
  - **air distributor**
  - **gas exchanger**
- The respiratory system ensures that **oxygen** is *supplied* to and **carbon dioxide** is *removed* from the body's cells.
- The respiration process is an important **homoeostatic mechanism** which maintains a constant environment for body cells to function effectively.
- The respiratory system also **filters**, **warms**, and **humidifies** air as it is breathed into the body.
- Some parts of the respiratory organs, such as the **sinuses**, also influence speech or sound production and make possible the sense of **smell** or **olfaction**.

Hand Notes

Chapter Summary

Overview

- The organs of the **nervous system** consist of the **brain**, **spinal cord**, **nerves** and **specialized sense organs** such as the *eyes* and *ear*, and microscopic sense organs such as the *skin*.
- Control of the body's cells is accomplished by two communication systems:
  - **Nervous system** - transmit information *very rapidly* by nerve impulses from one body area to another.
  - **Endocrine system** - transmit information more slowly by hormones secreted by ductless glands into the bloodstream and circulate from the glands to other parts of the body.
- Nerves extend from the brain and the spinal cord to every area of the body which make it possible to perform its primary functions that include:
  - *Communication* between body functions
  - *Integration* of body functions
  - *Control* of body functions
  - *Recognition* of sensory stimuli.
- The above functions are accomplished by specialized signals called **nerve impulses** that results in rapid activity that usually last for a short duration of time. Some impulses permit the rapid and precise control of body functions. Other impulses cause glands to secrete fluids.
- The nervous system can recognize certain **stimuli**, such as heat, light, pressure, or temperature, that affect the body and impulses are generated to convey this information to the brain, where it is analysed and appropriate action is initiated.

Divisions of the Nervous System

- The nervous system consists of **two principal divisions** called the **Central Nervous system** (**CNS**) and the **Peripheral Nervous system** (**PNS**). A subdivision of the PNS, called the **Autonomic Nervous system** (**ANS**) consists of structures that regulate the body's automatic or involuntary functions. Figure 15-2.

Central Nervous System - CNS

- The 2 major structures of the CNS, the **brain** and the **spinal cord** are found along the longitudinal plane of the body (Figure 15-1).
- The brain is protected in the cranial cavity of the skull, and the spinal cord is surrounded in the spinal cavity by the vertebral column.

Division of the Brain

- The **brain**, one of the largest organs, consists of the following major divisions:
  1. **Brain stem**
     a. Medulla oblongata
     b. Pons
     c. Midbrain
  2. **Cerebellum**
  3. **Diencephalon**
     a. Hypothalamus
     b. Thalamus
  4. **Cerebrum**
     a. Cerebral cortex
     b. Corpus callosum

Peripheral Nervous System

- The **Peripheral Nervous system** (**PNS**) consists of the **cranial** and **spinal nerves** that *connect* the *brain* and *spinal cord* to peripheral structures such as the skin surface and the skeletal muscles.
- In addition, the Autonomic Nervous system (ANS) is part of the PNS that connect the brain and spinal cord to various glands in the body and to the cardiac and smooth muscles in the thorax and abdomen.
-

Autonomic Nervous System

- The **autonomic nervous system** (**ANS**) consists of certain motor neurons that conduct impulses from the spinal cord or brain stem to the following tissue:
  - Cardiac muscle tissue
  - Smooth muscle tissue
  - Glandular epithelial tissue (tissue covering)
- The ANS consists of parts of the nervous system that *regulate involuntary functions*.
- Motor nerves that control the voluntary skeletal muscles are sometimes called the *somatic nervous system*.
- The ANS consists of 2 divisions:
  - **Sympathetic Nervous system**
  - **Parasympathetic Nervous system**

Sympathetic Nervous System

- The **sympathetic nervous system** functions as an **emergency system** which take control of many internal organs during strenuous exercise and when strong emotions are present.
- **Under stress**, the sympathetic impulses **increase** to many visceral effectors (internal organs capable of responding to nerve impulses) to produce widespread changes within the body.
- The sympathetic responses allow a body to be ready for strenuous muscular work or for *fight or flight* which is known as the **fight-or-flight syndrome**.

Parasympathetic Nervous System

- The **parasympathetic nervous system** dominates control of many visceral effectors under normal conditions.
- Parasympathetic impulses are sent to slow heartbeat, increase peristalsis, and increase secretion of digestive juices and insulin.
-

Autonomic Nervous System as a Whole

- The function of the ANS is to regulate the body's *automatic, involuntary functions* to maintain or quickly restore **homeostasis**.
- Many internal organs are doubly innervated by the ANS because they receive fibres from the *parasympathetic* and *sympathetic divisions*. Parasympathetic and sympathetic impulses are continually sent that influence their function in *opposite* or *antagonistic ways*. For example, the heart receives sympathetic impulses that make it beat faster and parasympathetic impulses to slow it down. The ratio between the *two antagonistic forces* determines the actual heart rate.

Sense Organs

- Sense organs are often classified as:
  - **Special sense organs**, such as the eye, are characterized by large and complex organs or by localized grouping of specialized receptors in areas such as the nasal mucosa or tongue.
  - **General sense organs** are microscopic receptors widely distributed throughout the body that detect stimuli such as pain and touch.

Hand Notes