



Free Study Guide for the NASM CPT Exam

CHAPTER 1

National Academy of Sports Medicine Code of Professional Conduct

Professionalism:

Professionalism should be practiced during all client interactions. Use effective communication and ensure a safe environment. Maintain good hygiene and wear appropriate clothing. Always refer your clients to a doctor when unknown conditions arise.

Confidentiality

Secure client documents and respect the confidentiality of your client conversations.

Legal and Ethical

Obey all laws associated with your training location. Keep truthful records and take responsibility for their accuracy.

Business Practice

Keep adequate liability insurance and practice truth in appropriate advertising. maintain accurate financial and client records to pay all due taxes for **4 years**. Don't get sexually involved with your clients.

NASM does not recommend knowing any of the material from Chapter 1, but does ask about 3 questions from the chapter. Check out our [Study Guide for the NASM CPT](#) to see what you should focus on from this chapter.

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CHAPTER 2

Definitions

Human Movement

- Human Movement System:(Kinetic Chain) is composed of three related systems: Nervous(central and peripheral nerves), Muscular (muscles, tendons, ligaments and fascia), and Skeletal (joints) systems.

Nervous System

- Nervous System: the system of nerves and nerve centers in an animal or human, including the brain, spinal cord, nerves, and ganglia.
- Sensory Function: The human body's ability to recognize changes in the environment within the body or outside of the body.
- Integrative Function: the nervous system processes and interprets the sensory input and makes decisions about what should be done in each moment.
- Motor Function: The human body's ability to respond to the information received from the sensory nervous system.
- Proprioception: the total nervous system input to the central nervous system creating the awareness of the position of one's body
- Neuron: a specialized, impulse-conducting cell that is the functional unit of the nervous system, consisting of the cell body and its processes, the axon and dendrites
- Sensory (afferent) neurons: a nerve cell that conducts impulses from a sense organ to the central nervous system
- Interneurons: a nerve cell that transmits nerve impulses between neurons.
- Motor (efferent) neurons: a nerve cell that conducts impulses to a muscle, gland, or other effector.

- Central Nervous System: the part of the nervous system comprising the brain and spinal cord.
- Peripheral Nervous System: the portion of the nervous system lying outside the brain and spinal cord that includes the cranial and spinal nerves
- Mechanoreceptors: any of the sense organs that respond to vibration, stretching, pressure, or other mechanical stimuli.
- Muscle Spindles: a proprioceptor that conveys information on the state of muscle stretch or length, important in the reflex mechanism that maintains body posture.

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- Golgi Tendon
Organs: A proprioceptive sensory nerve ending embedded among the fibers of a tendon that is sensitive to muscle tension.
- Joint Receptors: sensory receptors in joint capsules that contribute (along with other sensory inputs) to awareness of joint position and movement (proprioceptive sensation).

Skeletal

- Skeletal System: The framework of the body, consisting of bones and other connective tissues, which protects and supports the body tissues and internal organs.
- Bones: the hard connective tissue forming the substance of the skeleton, composed of a collagen-rich organic matrix impregnated with calcium, phosphate, and other minerals.
- Joints: the movable or fixed place or part where two bones or elements of a skeleton join.
- Axial Skeleton: the skeleton of the head and trunk including the skull, vertebral column and rib cage.
- Appendicular Skeleton: The bones of the limbs, including the bones of the pelvic girdles.
- Remodeling: mature bone tissue is removed from the skeleton (a process called *bone resorption*) and new bone tissue is formed (a process called *ossification* or *new bone formation*).
- Osteoclasts: cells that take away or remove mature bone tissue.
- Osteoblasts: cells that are responsible for building up new bone tissue.
- Epiphysis: a part of a bone separated from the main body of the bone by a layer of cartilage and subsequently uniting with the bone through further ossification.
- Diaphysis: the long, narrow portion of a bone
- Epiphyseal Plate:
the disk of cartilage between the shaft and the epiphysis of a long bone during its growth.
- Periosteum: the normal investment of bone, consisting of a dense, fibrous outer layer, to which muscles attach, and a more delicate, inner layer capable of forming bone.
- Medullary Cavity: the small cavity in the shaft of a long bone where blood cell formation occurs and marrow is stored.
- Articular (hyaline) cartilage: a firm, elastic, flexible type of connective tissue that covers the end of a bone that makes up a joint.
- Depressions: a flat area of the bone
- Processes: a point in the bone used for muscular or ligamentous attachment
- Vertebral Column: the column of 24 bones making up the spinal column. (7 cervical, 12 thoracic, 5 lumbar)

- Arthrokinematics: Description of the movement of the joint surfaces when a bone moves through a range of motion.
- Synovial Joints: joins bones with a fibrous joint capsule that is continuous with the periosteum of the joined bones.
- Non Synovial Joints: non-movable joint that excludes the joint capsule, cartilage and ligaments.
- Ligaments: connects bone to bone and provides joint support.

Muscular

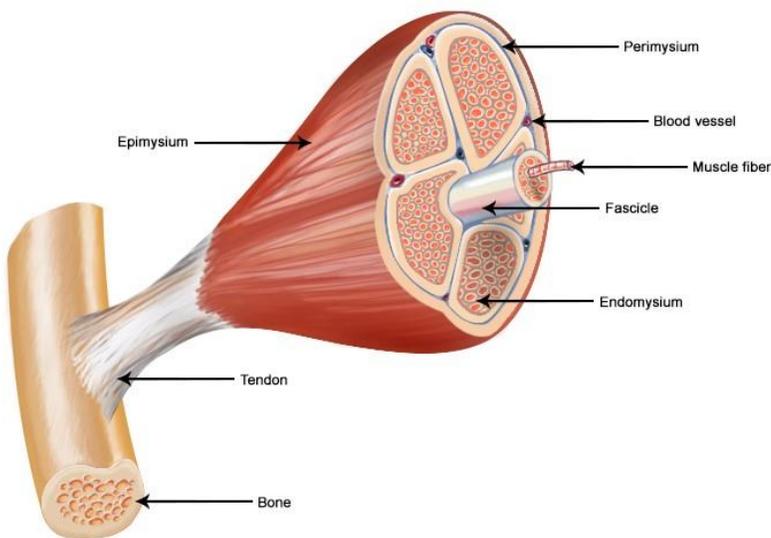
- Muscular System: All the muscles of the body collectively, especially the voluntary skeletal muscles.
- Epimysium: the outermost layer of muscular connective tissue that encompasses the muscle body.
- Perimysium: the middle layer of muscular connective tissue that encompasses the muscle fascicle.
- Endomysium: the deepest layer of muscular connective tissue that encompasses the muscle fiber.
- Tendons: a cord or band of dense, tough, inelastic, white, fibrous tissue, serving to connect a muscle with a bone.
- Sarcomere: like the neuron is to the nervous system the sarcomere is the functional unit of muscle or any of the segments of myofibril in striated muscle fibers; composed of actin and myosin.
- Neural Activation: the nervous system activation of a muscle fiber via the neuromuscular junction.
- Motor Unit: a motor neuron and the muscle fibers innervated by its axon.
- Neurotransmitters: any of several chemical substances, as epinephrine or acetylcholine, that transmit nerve impulses across a synapse to a post-synaptic element, as another nerve, muscle, or gland.

(Compare the above with definitions from the text)

Compare to Figure 2.34

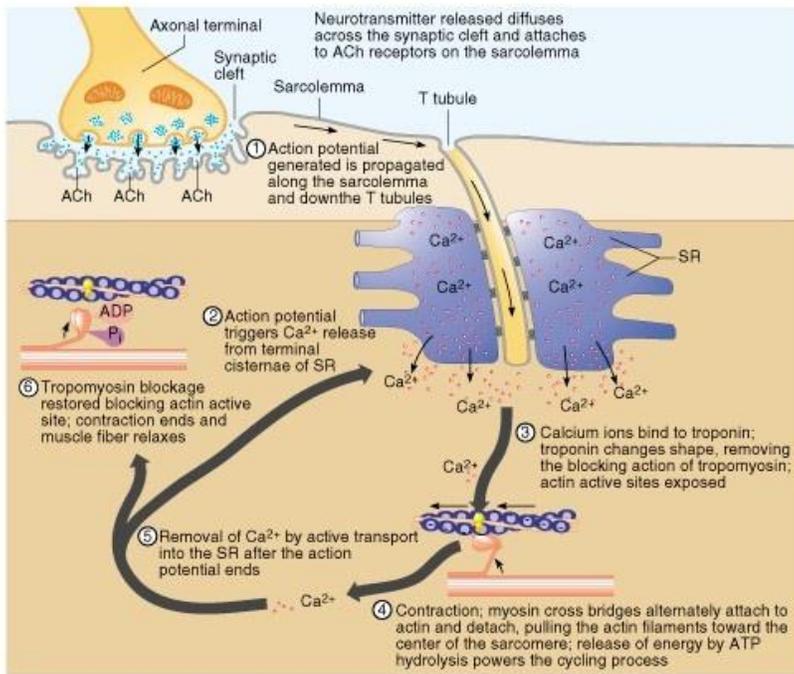
Skeletal Muscle

Structure of a Skeletal Muscle



This image from (SEER Training Modules, n.d.) is similar to the one you may find in the book. It shows how the bundles of muscle fibers can be broken down further as you explore more into the skeletal muscle.

Compare to Figure 2.38



Acetylcholine initiating the muscular contraction.

Excitation-contraction coupling is the process of the nervous system stimulating a muscle to contract. This is known as the sliding filament theory. In this figure shown in the book it gives 10 steps in the initiation and end of the contraction. Below the steps are more condensed to assist in understanding. Check out [Fitness Mentors Study Guide for the NASM CPT Exam](#) to learn what you need to know specifically about this chart.

1. The Neurotransmitter ACh is released and attaches to receptors generating an action potential down the T tubules.
2. Action potential triggers Calcium (Ca²⁺) release
3. calcium binds to troponin removing the blocking action of tropomyosin and exposing the actin active binding site.
4. Contraction occurs by the myosin cross bridges alternately attach to actin and detach, pulling the filaments closer to the center of the sarcomere. Detachment of actin from myosin requires ATP.
5. Removal of Calcium by active transport into the sarcoplasmic reticulum after the action potential ceases.
6. Tropomyosin restores its location, covering the actin active site so no more contraction occurs.

Compare to Table 2.5

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Characteristic	Type I	Type IIa	Type IIb
Contraction Speed	Slow	Fast	Fast
Fatigue Resistance	High	Intermediate/Low	Low
Force Production	Low	Intermediate	High
Aerobic Enzymes	High	Intermediate/Low	Low
Anaerobic Enzymes	Low	High	High
Fiber Diameter	Small	Intermediate	Large

Type I: Endurance fibers; small; more oxygen and mitochondrial density; less power.

Type II: Less enduring; less oxygen delivery; more power and force, larger than type I.

Compare to Table 2.6

Muscle as Movers

Muscle functions are categorized as an agonist, synergist, stabilizer or antagonist.

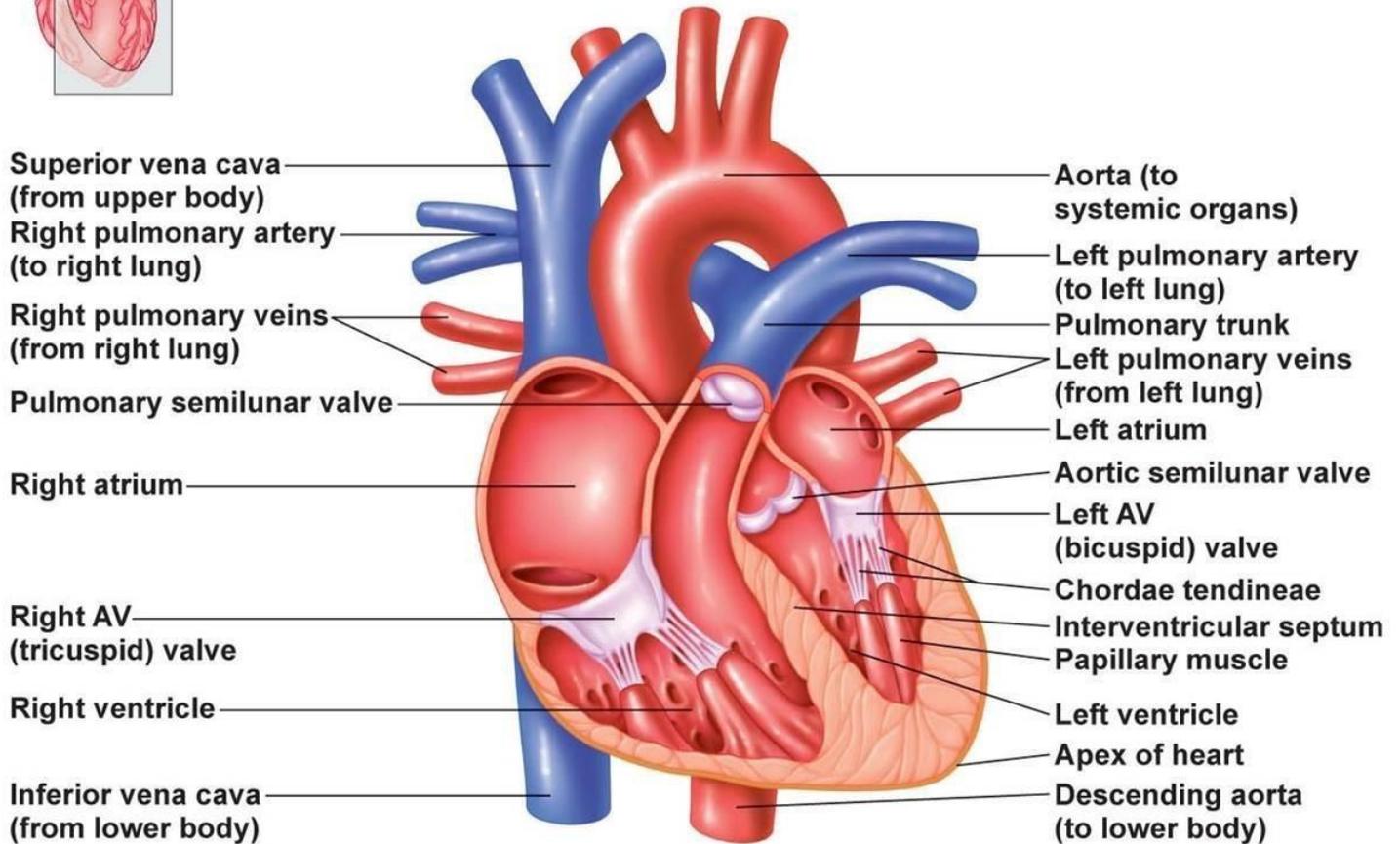
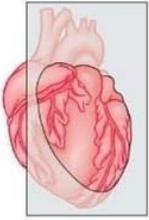
- Agonist muscles: prime mover
- Synergist muscles: assist the same movement as the prime mover
- Stabilizer muscles: Stabilize the joints of the body during the movement
- Antagonist muscles: relax to allow the prime mover to work efficiently

	Agonist	Synergist	Stabilizer	Opposite
Dumbbell Curl	Bicep	Brachioradialis	Rotator cuff	Tricep
Calf Raise	Gastrocnemius	Posterior tibialis	Intrinsic Muscles of the ankle, knee and hip	Anterior tibialis

CHAPTER 3

Compare to Figure 3.3 - Atria and Ventricles

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Atria and Ventricles

The heart has two pairs chambers called the Right atrium and ventricles. The functions of the chambers are as follows:

The atriums are located on either side of the heart. Right Atrium is designed to receive the blood that is coming to the heart from the whole body and the Left Atrium is designed to receive the blood that is coming to the heart from the lungs.

The ventricles are also located on either side of the heart. Right Ventricle have thin walls because of a low pump of blood that flows to the lungs which is a short distance from the heart. The Left Ventricle has much thicker walls because of a high pressure pump of blood that flows to the rest of the body.

Compare to Table 3.1 - Functions of Blood

The cardiovascular system.

Blood Functions

- Transportation: Blood transports oxygen and nutrients to cells, CO₂ and waste away from cells, hormones to target tissues
- Regulation: Helps maintain stable body temperature, pH, water and electrolyte levels
- Protection: Clotting prevents fluid loss, white blood cells protect body against disease

This slide above is provide from a presentation from share slide (stewart_j, n.d.). It is similar to the table that is shown in the book. NASM deems it important to understand the functions and support mechanisms of blood.

Table 3.2 - The Respiratory Pump - The abdominal and thoracic structures that contribute to the expansion and contraction of the lungs.

Muscles of the respiratory pump consist of:

Inhalation: Diaphragm, Scalenes, Pec Minor and Sternocleidomastoid.

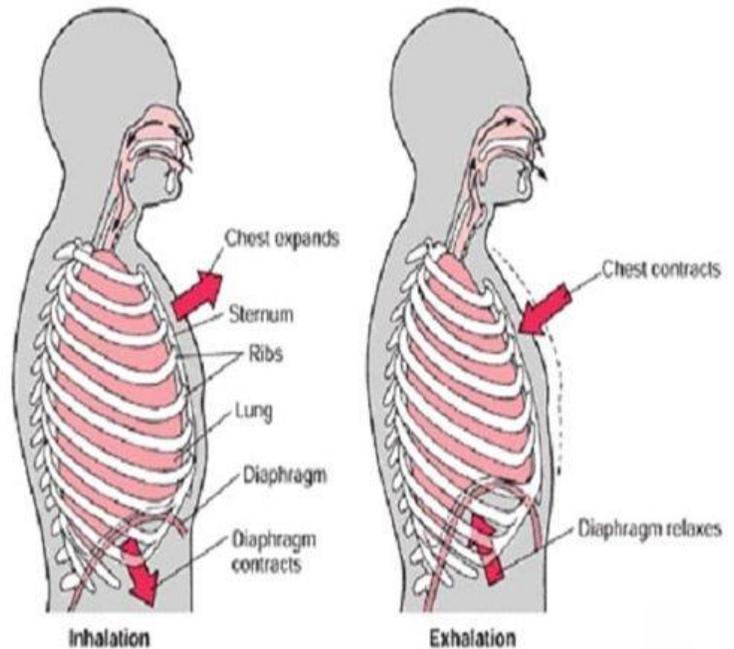
Exhalation: Abdominals and Internal intercostals.

How the respiratory pump works:

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Venous Return: Respiratory Pump

- With inhalation
 - Thoracic cavity expands
 - Pressure in pleural cavities drops
 - Pulls air into lungs
 - Also pulls blood into IVC and R atrium from smaller veins in abdominal cavity
- With exhalation
 - Pressure in pleural cavities rises
 - Pushes blood into R atrium
 - Important during heavy exercise



CHAPTER 4

Be Familiar with all definitions throughout the chapter

Exercise Metabolism and Bioenergetics definitions:

- Bioenergetics: the study of energy transformation in living systems.

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- Metabolism: the sum of the physical and chemical processes in an organism by which its material substance is produced, maintained, and destroyed, and by which energy is made available.
- Exercise Metabolism: the sum of all body processes under the stress of exercise.

Energy Metabolism

- Substrates: the substance acted upon by an enzyme.
- Carbohydrates: any of a class of organic compounds that are and that form the supporting tissues of plants and are important food for animals and people.
- Glucose: a sugar, $C_6H_{12}O_6$, having several optically different forms, occurring in many fruits, animal tissues and fluids, etc.
- Glycogen: a white, tasteless polysaccharide constituting the principal carbohydrate storage material in animals and occurring chiefly in the liver and in muscle.
- Fat: any of a group of organic compounds that are greasy to the touch, insoluble in water, and soluble in alcohol and ether: lipids comprise the fats and constitute, with proteins and carbohydrates, the chief structural components of living cells.
- Triglycerides: three fatty acids attached to a glycerol backbone that make up most fat storage in the body.
- Protein: 20 or more amino acids linked in a genetically controlled linear sequence into one or more long polypeptide chains
- Gluconeogenesis: glucose formation in animals from a noncarbohydrate source, as from proteins or fats.

Energy for Work

- Adenosine triphosphate: serving as a source of energy for physiological reactions, especially muscle contraction.
- Adenosine diphosphate: derived from ATP, and serving to transfer energy during glycolysis.
- Betaoxidation: a process by which fatty acids are degraded, involving oxidation of the beta carbons and removal of successive two-carbon fragments from the fatty acid.
- Excess postexercise oxygen consumption (EPOC): a measurably increased rate of oxygen intake following strenuous activity

(compare these definitions with those from the text)

CHAPTER 5

Know all definitions throughout the chapter

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- Biomechanics: the study of the action of external and internal forces on the living body, especially on the skeletal system.

Location Terminology

- Superior: referring to a point higher or above
- Inferior: referring to a point lower or below
- Proximal: referring to a point closer to the origin of a limb
- Distal: referring to a point farther from the origin of a limb
- Anterior (or ventral): referring to a point nearer to the front of the body
- Posterior (or dorsal): referring to a point nearer to the back of the body
- Medial: referring to a point nearer to the mid-line of the body
- Lateral: referring to a point further from the mid-line of the body
- Contralateral: referring to a point on the opposite side of the body
- Ipsilateral: referring to a point on the same side of the body

Planes of Motion, Axes and Joint Motions

- Anatomic position:
the erect position of the body with the face and gaze directed anteriorly, the upper limbs at the side, and the palms of the hands directed anteriorly.
- Sagittal plane:
a longitudinal plane that divides the body of a bilaterally symmetrical animal into right and left sections.
- Flexion: the act of bending a limb in the sagittal plane that typically decreases a joint angle.
- Extension: the act of extending a limb that typically increases a joint angle.
- Hyperextension: the extension of a part of the body beyond normal limits.
- Frontal Plane:
a vertical plane at right angles to a sagittal plane, dividing the body into anterior and posterior portions. Also called *frontal plane*.
- Abduction: the act of moving a limb in the frontal plane that typically moves the limb away from the mid-line of the body.
- Adduction: the act of moving a limb in the frontal plane that typically moves the limb back toward the mid-line of the body.
- Transverse Plane:
a plane across the body at right angles to the coronal and sagittal plane and perpendicular to the longitudinal axis of a body or object; also, a plane dividing the body into an upper and lower section.
- Internal Rotation: the act of rotating a limb in the transverse plane toward the mid-line of the body; or counter-clockwise when viewed from a superior view.

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- External Rotation: the act of rotating a limb in the transverse plane away from the mid-line of the body; or clockwise when viewed from a superior view.
- Horizontal Abduction: transverse plane movement similar to that of a rear deltoid fly.
- Horizontal Adduction: transverse plane movement similar to that of a chest fly.

- Scapular Retraction: the act of sliding the shoulder blades toward the mid-line of the body.
- Scapular Motion: the act of sliding the shoulder blades away from the mid-line of the body.
- Scapular Depression: the act of sliding the shoulder blades inferiorly
- Scapular Elevation: the act of sliding the shoulder blades superiorly

Muscle Actions

*Eccentric

- Eccentric muscle action: when a muscle contraction is accompanied by lengthening muscle tissue.

*Concentric

- Concentric muscle action: when a muscle contraction is accompanied by shortening muscle tissue.

*Isometric

- Isometric muscle action: when a muscle contraction is accompanied by no change in the length of the muscle tissue.

*Isokinetic

- Isokinetic muscle action: when a muscle maintains a constant speed during contraction.
- Force: movement that results in the slowing down or speeding up of an object.
- Length-Tension Relationships: optimal length of a muscle results in optimal force production.
- Force-Couple: a group of muscles that work together to produce force on a joint.
- Rotary Motion: rotational movement of the joints.
- Torque: something that produces or tends to produce torsion or rotation; the moment of a force or system of forces tending to cause rotation.

Motor Behavior

- Motor behavior: connecting the mind and body for an optimal performance response.

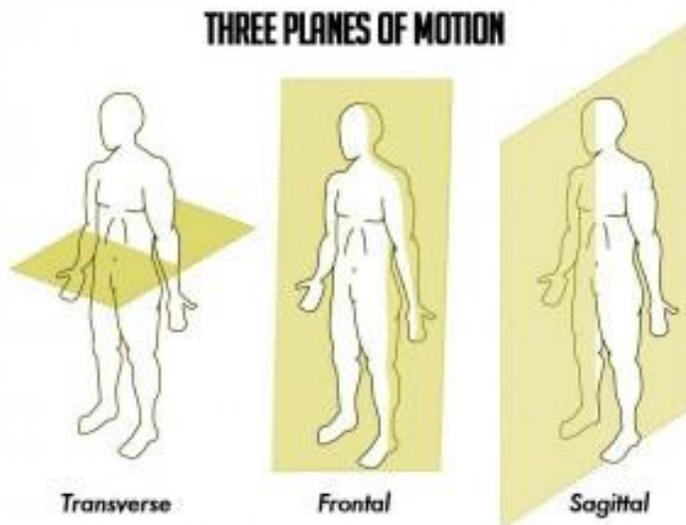
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- Motor control: is the process by which humans and animals use their brain/cognition to activate and coordinate the muscles and limbs.
- Motor learning: the process of improving motor skills through practice, with long-lasting changes in the capability for responding.
- Motor development: the growth of muscular coordination in an animal.
- Muscle Synergies: Muscles controlled by the CNS that act to produce the same movement.
- Proprioception: awareness of the position of one's body produced by all sensory receptors.
- Sensorimotor Integration: the cooperation of the nervous and muscular system in gathering and interpreting information and executing movement.

Motor Learning

- Feedback: a biological system in which the output or response affects the input, the sensory system collects input from the motor system to promote the learning of motor skills.
- Internal Feedback: what you feel during or after you have performed or practiced the skill. Your feelings provide you with information about the outcome of your motor response.
- External Feedback: is information you receive about your performance from various sources, usually verbal, visual or written.

Compare to Figure 5.3 - Three Planes of Motion



Compare to Table 5.1 - 5.7 - Planes, Motions, and Axes

Frontal

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- Divides the body into anterior and posterior portions
- Anterior-Posterior Axis
- Abduction and Adduction

Plane	Joint Motion	Axis of Rotation	Exercise
Frontal	Adduction/Abduction	Anterior-Posterior	Abduction:
	&		Barbell shoulder press Cable hip abduction
	Ankle Eversion/ Inversion		Adduction:
	&		Pull up, Cable hip adduction
	Lateral Flexion		

Transverse

- Divides the body into top and bottom portions
- Longitudinal or vertical axis
- Movements include all rotation, pronation, supination, horizontal abduction and adduction.

Plane	Joint Motion	Axis of Rotation	Exercise	
Transverse	Internal Rotation External Rotation	Longitudinal or Vertical	Internal Rotation: Band Internal Rotation	
	&		Trunk Rotation: Wood chop	
	Horizontal Adduction Horizontal Abduction		Horizontal Adduction: Cable Chest Fly	
	&		Horizontal Abduction: Rear delt fly machine	
	Pronation Supination			

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Sagittal

- Divides the body into left and right halves
- Coronal or medial-lateral axis
- Flexion and extension

Plane	Joint Motion	Axis of Rotation	Exercise
Sagittal	Flexion & Extension	Medial-Lateral A.K.A. Coronal	Flexion: Hamstring curl Barbell curl Extension: Quad Extension, Triceps Skull Crusher

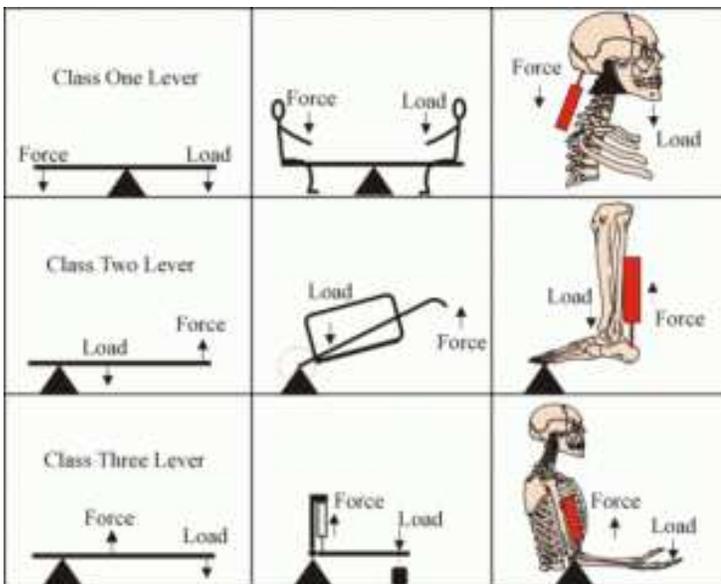
Compare to Table 5.3 - Common force couples

Muscles	Movement Created
Shortening of the biceps brachii, brachioradialis, and brachialis	Elbow flexion in a Bicep Curl
Shortening of the Psoas major and minor, rectus femoris and iliacus	Hip Flexion in a leg lift
Shortening of the Pectoralis Major, Subscapularis and latissimus dorsi	Shoulder internal rotation

Different muscles pull from different angles but all work to produce the same joint movement. The biceps, brachioradialis and brachialis muscle all insert into different locations, but all work to flex the elbow.

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Compare to Figure 5.15 - Levers



There are three types of levers.

A first-class lever is a stick where the fulcrum is between the weight and the energy moving the weight (your hands, for example). Some common first-class levers are see-saws, crowbars, pliers, scissors (which use two first-class levers together), and a hammer pulling a nail.

A second-class lever is a stick where the fulcrum is at one end of the stick, you push on the other end, and the weight is in the middle of the stick. Some common second-class levers are doors, staplers, wheelbarrows, and can openers.

A third-class lever is a stick where the fulcrum is at one end of the stick, you push on the middle, and the weight is at the other end of the stick. With a third-class lever, you have to put in more energy

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than you would just lifting the weight, but you get the weight to move a longer distance in return. Some common examples are a broom, a hoe, a fishing rod, a baseball bat, and our own human arms.

CHAPTER 6

Memorizing all of the below can be tough. Find out what you need to know in our [Study Guide for the NASM CPT Exam](#).

Compare with Table 6.1 - Guidelines for Health and Fitness Professionals

This table shown in the book discusses the guidelines for health and fitness professionals by displaying what a trainer should do if the client's health is of high-risk.

What should not be done:

- Counsel Clients
- Diagnose Injuries or Conditions
- Physical therapy or rehabilitation
- Give detailed diets / meal plans

What should be done:

- Coach Clients
- Identify past injuries and limit your exercises for the injury
- Recommend client to speak and get medical advice from physician
- General Nutrition Knowledge and refer them to a dietitian or nutritionist for detailed diets

Referenced

from: http://www.exerciseismedicine.org/assets/page_documents/ExPro_Action_Guide.pdf

Compare to Figure 6.1 - Subjective vs. Objective information

Gathering information is very important before starting any kind of workout program with a client. You want to know about their current and past state of health. Ask questions and note their answers to determine subjective information and perform assessments to determine objective information.

Subjective Information

- General Medical History
- Occupation
- Lifestyle (Hobbies, Diet, etc.)
- Personal Information

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Objective Information

- Body Analysis
- Blood Pressure
- Performance Assessments
- Postural Assessments
- Cardiorespiratory Assessments

Referenced from: Sports Medicine Essentials, 3rd ed. by Glover

Compare with Figure 6.2 - Sample Physical Activity Readiness Questionnaire

The physical activity readiness questionnaire also known as the PAR-Q is design to get the clients to answer specific health history questions. It will also give you the information needed for you to determine the possible risk of exercising with the client. If a client answers yes to any of the 7 questions on this form, they must acquire a doctors written permission to begin exercising with you.

Check out a PAR-Q here: <http://sportsmedicine.about.com/od/fitnessevalandassessment/qt/PAR-Q.htm>

Compare with Figure 6.3 - Sample Questions: client occupation

Occupational questions are asked to determine the amount of influence someones job has on their posture.

- Sitting causes tightness in the hip flexors and rounding of the upper back.
- High heels cause tightness in the calf musculature.
- Repetitive movements refers to the shoulder impingement caused by doing physical work over head. (Construction, electrician, volleyball player)
- Stress may cause shortening of the scalenes and upper trapezius creating upper crossed syndrome.

Compare with Figure 6.4 - Sample Questions: client lifestyle

Lifestyle questions give the trainer a chance to note what interests the client has in their everyday life. Recreational activities and active hobbies can be included in their cardiorespiratory training program.

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Compare with Figure 6.5 - Sample Questions: client medical history

Medical history allows the trainer to gauge the risk of any health related issues the client may be dealing with.

Pain should be noted and an exercise program should account for that pain.

Surgeries may limit range of motion or cause joint instability.

Chronic disease may need to be accounted for with all exercises.

Medications may affect exercise variables such as intensity.

Compare with Table 6.2 & Table 6.3

Table 6.2 & Table 6.3 show how common medications effect blood pressure and heart rate as well as show you the basic functions of the medications. It is reminded that as a personal trainer this is not our job to educate the client on any usage and effects of these prescribed medications.

Common Medication you will come across with potential clients are:

Antidepressants, Beta-Blockers, Calcium-channel blockers, Digitalis, Thyroid Medication, Nitrates, Diuretics, Bronchodilators, Vasodilators

Learn More Here: <http://www.exrx.net/ExInfo/Medications.html>

Heart Rate and Blood Pressure Assessments

Heart Rate can be recorded on the thumb-side of the wrist (radial pulse; preferred) or on the neck (carotid pulse, use with caution).

Blood pressure is measured using an aneroid sphygmomanometer which consists of an inflatable cuff, a pressure dial, a bulb with a valve and a stethoscope. It is highly recommended that anyone including personal trainers take a professional course in blood pressure assessment before assessing blood pressure with any clients.

See examples of all assessments here: <http://www.exrx.net/Testing.html>

Target Heart Rate Training Zones & Max Heart Rate Formula

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220 - age = Predicted max heart rate. Multiply by the suggested HR training zone of anywhere from 65-95% of Predicted HR max.

Training Zone One = Builds aerobic base and aids in recover

Training Zone Two = Builds aerobic endurance

Training Zone Three = Builds high end work capacity that is mainly anaerobic.

Reference: <http://www.active.com/fitness/articles/calculate-your-training-heart-rate-zones?page=2>

Body Composition Assessments

There are many methods used to estimate one's body composition.

- Skin Fold: Measurements are taken at different site on the right side of the body whole person stands straight but relaxed. The width of the skin fold is measured in millimeters with a specially calibrated caliper. The total for each site is marked and its added up to determined the person overall body composition.
- Bioelectrical Impedance: Better known as a Body Fat Analysis is a device that measures the strength and speed of the electrical signal sent through the body. It uses this measurement and information such as height, weight and gender to predict how much body fat a person has.
- Underwater Testing: Is a technique for measuring the mass per unit volume of a living person's body.

Refer to <http://www.exrx.net/Testing/BodyCompSites.html> for great skinfold site description.

Circumference Measurements

Circumference measurements measure the outer surface of the body which includes all tissue. They are some benefits in using the circumference measurement, which included tracking the progress of the clients loss (in inches), can be more comfortable to use on overweight clients, easy to afford, easy to record and not hard to learn the technique or make a mistake on it.

Measurements of the following areas are suggested:

1. Neck
2. Chest
3. Waist
4. Hips
5. Forearm
6. Thighs

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- 7. Calves
- 8. Arms

References: <http://www.exrx.net/Testing/Circumferences.html>

Body mass index (BMI)

BMI can be used to screen patients because the test is simple, correlates to fatness, and applies to both men and women. The BMI may not apply to some individuals with more than normal muscle mass and acceptable levels of body fat.

< 18.5	underweight
18.5 to 24.9	healthy
25 to 29.9	overweight
30 to 34.9	Obesity
>35	Severe obesity
≥40	Daaaammnnn

Know the above ranges provided by <http://www.exrx.net/Calculators/BMI.html>

YMCA 3-Minute Step Test - [pg 130]

This is a cardiorespiratory assessment to estimate an individual's cardiorespiratory fitness level. It is done in the time period of 3 min. The first thing you must have is 12-inch step and the client will begin to step up and down at 96 steps per minute. Having a metronome will come in handy to give the client a beat to follow along for the 3 minutes they will be performing this test. As the 3 minutes finish you must immediately find the recovery pulse, write it down and then refer to the text to determine the appropriate heart rate zone to start them at.

Rockport Walk Test - [pg 131]

This is another kind of cardiorespiratory assessment set to estimate a cardiovascular starting point. You will need to note your client's weight, age, gender at first before starting. Once you got all that noted you will need to go to a treadmill in where you will explain to your client that they will need to walk and only walk a mile as fast as they can. No jogging or running, they must walk as fast as they

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can for a mile. As they do that take note at the time they finish and immediately have them step off to the side so that you may record the heart rate. Now you have everything you need to determine the clients VO2 score by using the following formula.

$132.853 - (0.0769 \times \text{Weight}) - (0.3877 \times \text{Age}) + (6.315 \times \text{Gender}) - (3.2649 \times \text{Time}) - (0.1565 \times \text{Heart Rate}) = \text{Vo2 score}$ (Reference: <http://www.brianmac.co.uk/rockport.htm>)

Use the following calculator for a quick determination of the clients score: <http://www.exrx.net/Calculators/Rockport.html>

Compare with Table 6.9 - Pronation Distortion Syndrome

Pronation distortion syndrome is characterized by flattened feet and adducted knees. Pronation Distortion Syndrome can lead to pain and injury of the low-back and lower extremities, especially ACL injuries.

Short Muscles

- gastrocnemius
- soleus
- peroneals
- adductors
- iliotibial band
- hip flexor complex
- bicep femoris (short head)

Lengthened Muscles

- Anterior and Posterior tibialis
- vastus medialis
- gluteus maximus/ medius
- hip external rotators

Probable Injuries

- Plantar fasciitis
- Posterior tibialis tendinitis (shin splints)
- low back pain

Reference: <http://goldenfitness11.blogspot.com/2013/05/pronation-distortion-syndrome-and-how.html>

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Compare with Table 6.10 - Lower Crossed Syndrome Summary

Lower-Crossed Syndrome (LCS) is also referred to as distal or pelvic crossed syndrome. In LCS, tightness of the thoracolumbar extensors on the dorsal side crosses with tightness of the iliopsoas and rectus femoris. Weakness of the deep abdominal muscles ventrally crosses with weakness of the gluteus maximus and medius. This pattern of imbalance creates joint dysfunction, particularly at the L4-L5 and L5-S1 segments, SI joint, and hip joint. Specific postural changes seen in LCS include anterior pelvic tilt, increased lumbar lordosis, lateral lumbar shift, lateral leg rotation, and knee hyperextension. If the lordosis is deep and short, then imbalance is predominantly in the pelvic muscles; if the lordosis is shallow and extends into the thoracic area, then imbalance predominates in the trunk muscles.

Reference: Janda 1987, Human Kinetics

Compare with Table 6.11 - Upper Crossed Syndrome

(UCS) is described as a muscle imbalance pattern located at the head and shoulder regions. It is most often found in individuals who work at a desk or who sit for a majority of the day and continuously exhibit poor posture.

- TIGHT

rear neck and side neck

levator scapulae

scalenes

sternocleidomastoid

upper trapezius

shoulder internal rotators

subscapularis

teres major

anterior deltoids

pectoralis major

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pectoralis minor

- WEAK

upper-arm external rotators

infraspinatus

posterior deltoids

teres minor

deep-neck flexors

longus capitis

longus colli

Reference: <http://www.yogajournal.com/slideshow/fix-slouch-poses-upper-crossed-syndrome/>

CHAPTER 7

Compare to Figure 7.10 and Table 7.2 - Integrated Flexibility Continuum and Examples of Stretching

As a personal fitness trainer you must understand the different types of flexibility training. In the OPT model there are three different types of flexibility training.

Corrective Flexibility: this type of training is used to increase the joints range of motion, correct joint motion and help improve any muscle imbalances and posture. Hold the stretch for 20-30 seconds.

Static Stretching and Self-myofascial release promote this type of flexibility training.

Active Flexibility: this type of training is to prepare muscles for use during exercise. It not only stretches the muscles and tissues but it prepares the muscle by actively warming them up. Take the joint to the end range of motion and hold for 2 seconds; repeat 5 or so times.

Active-Isolated stretching and self-myofascial release promote this type of flexibility training.

Functional Flexibility: this type of training is commonly used in the power level of the OPT model. It has a high demand on the neuromuscular and soft tissue extensibility. Move the joint through a full range of motion while performing dynamic exercises like a lunge to side bend.

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Self-myofascial release and dynamic stretching promote this type of flexibility training.

Compare to Table 7.3 - Static Stretching Summary

Holding a static stretch for 30 seconds helps to relax the mechanoreceptors of the nervous system via autogenic inhibition, which allows for further ranges of motion to be achieved, acutely and chronically. Using this type of stretching to lengthen tight muscles can help to reduce and prevent postural deviations. The muscle spindle is turned off by stretching this way.

Compare to Table 7.4 - Active Isolated Stretching Summary

Holding a Active Isolated stretch for 1 to 2 seconds more than five times repetitively uses reciprocal inhibition to lengthen and prepare the muscles for activity in the short term. You can stretch all muscles in this manner, especially the overactive or tight muscles.

Compare to Table 7.5 - Dynamic Stretching Summary

Moving the body through a full range of motion during Dynamic Stretching uses reciprocal inhibition to increase the achievable ROM of the joint. Note the examples of this type of stretching and use it before performing a power level workout.

Mechanoreceptors: The Golgi Tendon Organ and the Muscle spindles are the most important mechanoreceptors to know. GTO responds to muscular tension while the Muscle Spindle responds to the length of a muscle. Think of the Muscle Spindle as what delivers the stretching sensation to your brain.

Compare to Table 7.6 - Muscle Imbalances

Lots of questions come from this chart on the exam. Memorizing it can be tough. Check out [Fitness Mentors Study Guide for the NASM CPT Exam](#) for more insight and how to dominate these questions.

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CHAPTER 8

Compare to the Overtraining Page

Overtraining can be defined by someone who tries to workout beyond the point of being able to recover. Your body needs enough time to recover between exercise bouts. Not only do you need rest days, but also varying the level of intensity is important. This is why the 3 stages have been created to ensure you don't push yourself beyond what you can recover from. The result of overtraining is a decrease in performance and the ceasing of performance improvement, in some situations one can even lose strength and muscle size.

Compare to General vs. Specific Warm Up

A General Warm up is meant to increase the readiness of the body to perform any and all exercise. It differs from the specific warm up by not targeting a specific area of the body or future movement to be performed. You can think of a specific warm up as a set of push ups before a bench press workout. A general warm up can be thought of as walking or jogging on a treadmill before a circuit training session.

Compare to the Cool Down Phase

A Cool Down is important to our bodies because it slowly transitions the body back to a state of rest. The benefits of doing a proper cool down are it slowly reduces the heart rate, prevents pooling of blood in the extremities, restores normal body temperature and re-optimizes muscle length.

Compare to FITTE Factors

FREQUENCY

Frequency refers to the number of training sessions or activity sessions for a given time frame. The time frame usually consists of a week. But, depending on the client and his or her goals, it may be one workout a day, a month, or a year. For general health requirements the recommended frequency of activity is preferably every day of the week, for small quantities of time. For improved fitness levels, the frequency is three to five days a week.

INTENSITY

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Intensity refers to the level of demand the activity places on the body. This is usually measured by heart rate. For general health requirements moderate intensity is preferred. This would be perceived as enough demand to increase heart and respiratory rates, but not cause exhaustion or breathlessness. Levels range from 65 to 95% of maximal heart rate (HR max).

TIME

Time refers to the length of time engaged in the activity. This is usually measured in minutes. For general health requirements, approximately 30 total minutes a day for 5 days a week is recommended.

TYPE

Type refers to the mode or activity used. This can be virtually any activity. For general health requirements, this may consist of:

- Using stairs
- Parking farther from the desired location
- Mowing the yard
- Raking leaves

For improved fitness levels, this may consist of:

- Treadmill, stationary bike, stepper, ARC trainer
- Aerobics class
- Sports
- Weight training

ENJOYMENT

Enjoyment refers to the amount of pleasure derived from the activity by the client. One of the most important components of a properly designed training program is that it must be enjoyable. This means that the program and its activities must coincide with the personality, likes, and dislikes of the client. This ultimately translates into compliance, and that will equal results.

Reference: <http://www.metropolitan-fitness.com/blog/2012/03/18/The-FITTE-Factors-General-Guidelines-for-Cardiorespiratory-Training.aspx>

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Compare to Table 8.9 - Training Zones

They are three different training zones for cardiorespiratory training programs. In these training zones you have three different heart rate zones as well. Each stage helps to build a strong cardiorespiratory.

Zone One

- Low Intensity
- Walking, Light jog, Yoga
- Max Heart Rate Zone 1 65% to 75%

Zone Two

- Moderate Intensity Training
- Group Classes, Dance, Spinning, Kickboxing, Step
- Max Heart Rate Zone 2 76% to 85%

Zone Three

- High Intensity Training
- Sprints, Maximal effort cardio
- Max Heart Rate Zone 3 86% to 95%

Compare to Circuit Training

Circuit Training is another beneficial form of cardiorespiratory training. In circuit training you perform strength and/or cardio training exercises one right after the other with minimal to no rest. It is also possible to add flexibility training into the circuit training routine. Like always you have levels in which you can place your clients based on their ability level.

- Stabilization Level
- Strength Level
- Power Level

CHAPTER 9

Know all definitions

Core: The muscles that attach to and/or cross the joints of the lumbo-pelvic hip complex.

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Draw-in maneuver: the ability to draw the belly button towards your spine in an attempt to create a stable core.

Bracing: Contracting the muscles of the core to increase stability. (Think Athletic Position)

Compare to Local Stabilization System

- Muscles attach directly to the vertebrae
- Primarily responsible for intervertebral and intersegmental stability, providing support from vertebra to vertebra
- Limits excessive compressive and rotational forces between spinal segments
- Aids in proprioception and postural control
- Consists of: Transverse Abdominis, Internal Oblique, Lumbar Multifidus, Pelvic floor muscles, Diaphragm

Compare to Global Stabilization System

- Muscles attach from the pelvis to the spine
- Transfers loads between the upper extremities (arms) and lower extremities (legs)
- Provides stability between the pelvis and spine
- Provides stabilization and eccentric control of the core during functional movements
- Consists of: Quadratus Lumborum, Psoas Major, External Oblique, Parts of Internal Oblique, Rectus Abdominis, Gluteus Medius, Adductor complex

Compare to Table 9.1 - Muscles of the Core

- Refer to the above sections for the muscles in all systems
- Muscles attach the spine and/or pelvis to the extremities (arms and legs)
- Primarily responsible for concentric force production (shortening of muscle) and eccentric deceleration (lengthening of muscle) during dynamic activities
- Consists of: Latissimus Dorsi, Hip Flexors, Hamstring complex, Quadriceps

Reference: <http://robinluthi.com/2012/10/02/muscles-of-the-core/>

Progress and Regress the core exercises

The best way to understand the progression and regression is to recognize the difference between the stages of the OPT Model. Check out our [Study Guide for the NASM CPT](#) to know what's most important to passing the test.

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Type of Exercise: Core and Compare to Table 9.3 - Core training program design

Stabilization exercise include anything with a stability ball or isometric hold. 12-20 reps, 1-4 sets, slow tempo, 0-90sec rest

Strength exercises include movement of the core. 8-12 reps, 2-3 sets, medium tempo, 0-60sec rest

Power exercises include throwing stuff. 8-12 reps, 2-3 sets, xxx tempo, 0-60sec rest

CHAPTER 10

Compare to Figure 10.2 Effects of joint dysfunction

Joint dysfunction leads to an incorrect sensory input which leads to an incorrect motor response.

The incorrect motor response is what is called muscle inhibition; the muscle is inhibited by the nervous system.

This leads to joint injury due to improper movement patterns caused by the muscle inhibition.

Injuries lead to swelling and inflammation which further inhibits the muscle leading to

Altered proprioception

Compare to Table 10.1 Balance training parameters

Understanding the different training and program design parameters in balance training will lead to more effective training.

For Progression you can always start a client out with an easy exercise and if they master it move them to a harder exercise. Same goes for simple to complex, stable to unstable and slow to fast.

For Proprioception the difference in the surface upon which someone is standing can be progressed from a basic floor all the way to a Bosu ball.

Use all planes of motion and understand that different body positions can lead to a more difficult exercise like going from two legs on a stable surface all the way to one leg on an unstable surface.

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OPT Level (adaptation): Stabilization, Strength, or Power & Type of Exercise: Balance & Compare with Table 10.2 Balance training program design

Progressing someone based on the stages of the OPT Model is important to understand. Know the difference between each phase as far as exercise selection.

Stabilization: Exercises involve no bending of the planted leg or hip (One leg Balance on a foam pad) with 12-20 reps (6-10 SL) at a slow tempo with 0-90sec rest.

Strength: Exercise involve bending of the planted knee or hip (Unilateral squat or toe touch) with 8-12 reps at a moderate tempo with 0-60sec rest.

Power: Exercises involve a hop of the planted leg (Single leg box jump) with 8-12 reps at a moderate tempo with 0-1 min rest.

CHAPTER 11

Compare with definitions throughout the chapter

Rate of Force Production: closely associated with power and maximal strength; this is a measure of how quickly you can reach peak levels of force.

Plyometric training: also known as "jump training" or "plyos", are exercises in which muscles exert maximum force in short intervals of time, with the goal of increasing power (speed-strength).

Integrated performance paradigm: The ability to properly decelerate, stabilize and accelerate in a performance based task.

Compare with Figure 11.1 - Integrated performance paradigm

All movement during performance activities requires the ability to decelerate active forces and accelerate to produce a new force. This requires stabilization of the core and intrinsic stabilizers of the joints.

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The phases of Plyometric Exercise

Phase 1 - Eccentric: In the first phase of plyometrics (the Eccentric Phase, also referred to as the “loading” or “cocking” phase), energy is stored in the muscle in preparation for the following phase.

Phase 2 - Amortization: In the second phase of plyometrics (the Amortization Phase), the muscle with the stored energy is stabilized in preparation for the final phase. For optimal performance, this stage is rapid in order to create a more powerful response.

Phase 3 - Concentric: The third and final phase is the Concentric Phase, also referred to as the unloading phase. This phase occurs immediately after the amortization phase which results in the use of the energy stored in that particular muscle.

Reference: <http://fitness.vpxsports.com/blog/bid/85152/3-Phases-of-Plyometric-Training>

Compare with Figure 11.2 - Program design parameters for reactive training

Understanding the program design parameters will assist you in developing effective programs.

For exercise selection know the progression continuum similar to that of the other types of training.

For exercise variables recognize how different variables affect exercise.

OPT™ Level (adaptation): Stabilization, Strength, or Power & Type of Exercise: Balance & Compare with Table 11.1 Plyometric training program design

Stabilization: Exercises involve a 3-5 second pause upon landing (Box Jump with stabilization) with 5-8 reps, steady tempo and 0-90sec rest.

Strength: Exercises involve a repetitive movement (Repeated squat jump) with 8-10 reps, moderate tempo and 0-60sec rest.

Power: Exercises involve quickly repeating the movement as fast as possible (Power step up) with 8-12 reps, xxx tempo and 0-60sec rest.

CHAPTER 12

Compare with definitions throughout the chapter

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Speed: moving in a straight line as fast as can be attained. Running speed is the interaction of stride frequency and stride length.

Stride rate: how fast one can move the legs back and forth per unit time while running.

Stride length: distance achieved per step.

Frontside Mechanics: refers to running positioning of the ankle, knee and hip all in flexion; also called triple flexion. Think of the front leg in a sprint.

Backside Mechanics: refers to running positioning of the ankle knee and hip all in extension; also called triple extension. Think of the back leg in a sprint.

Agility: the power of moving quickly and easily; in all directions with efficiency.

Quickness: the ability to react to a environmental stimulus requiring movement.

Compare to Table 12.1 Kinetic Chain checkpoints during running movements- pay attention to the foot/ankle complex

The Ankle is pointed straight ahead and landing on the heel is a priority. Avoid pronation or supination movements while running.

The Knee should be aligned with the second and third toe. Avoid abduction or adduction.

The Hips should be in a neutral position once maximal speeds are achieved. Avoid excessive low back arch during running.

The Head should be pointed straight ahead. Avoid the forward head positioning.

Compare with Table 12.2 SAQ Program Design

Stabilization exercises are composed of drills with mainly sagittal plane movements of 1-2 sets, 2-3 reps and a 0-60 sec rest.

Strength exercises incorporate more frontal plane movements but not maximally with 3-4 sets of 3-5 reps and 0-60 sec rest.

Power exercises incorporate all planes of motion with maximal effort using 3-5 sets of 3-5 reps and 0-90 sec rest.

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Chapter 13

General Adaptation Syndrome and Compare with Table 13.2 The general adaptation syndrome

The General Adaptation Syndrome is a model that describes the body's response to stress:

1. Alarm Stage

In this phase, the initial reaction of the body to stress is that it labels the stressor as a threat or danger to balance, that is why it immediately activates its fight or flight response system, and releases the “stress” hormones such as adrenaline, noradrenaline and cortisol. These hormones enable you to perform activities that you don't usually do. For instance, you lift weights of the first time in a while, your muscles are not familiar with the new stress and become damaged. They may become painful and sore.

2. Resistance Stage

After the body has responded to the stressor from the initial reaction, the stress level has been reduced due to the development of an adaptation brought on by the initial stress.

3. Exhaustion Stage

During this phase, the stress has been persistent for a longer period. The body starts to lose its ability to combat the stressors and reduce their harmful impact because the adaptive energy is all drained out. The exhaustion stage can be referred to as the gate towards burnout or stress overload, which can lead to health problems if not resolved immediately. An example would be too much exercise leading to sickness, injury or constant fatigue.

All in all, the General Adaptation Syndrome model by Hans Selye presents a clear biological explanation of how the body responds and adapts to stress.

Reference: <https://explorable.com/general-adaptation-syndrome>

Compare to Table 13.1 Adaptive benefits of resistance training

Physical and mental health benefits that can be achieved through resistance training include:

- improved muscle strength and tone – to protect your joints from injury. It also helps you maintain flexibility and balance and helps you remain independent as you age

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- weight management and increased muscle-to-fat ratio – as you gain muscle, your body burns more energy when at rest
- greater stamina – as you grow stronger, you won't get tired as easily
- prevention or control of chronic conditions such as diabetes, heart disease, arthritis, back pain, depression and obesity
- pain management
- improved mobility and balance
- improved posture
- decreased risk of injury
- increased bone density and strength and reduced risk of osteoporosis
- improved sense of wellbeing – resistance training may boost your self-confidence, improve your body image and your mood
- a better night's sleep and avoidance of insomnia
- increased self-esteem
- enhanced performance of everyday tasks.

Reference: <https://www.betterhealth.vic.gov.au/health/healthyliving/resistance-training-health-benefits>

SAID Principle

In physical rehabilitation and sports training, the SAID principle asserts that the human body adapts specifically to imposed demands. In other words, given stressors on the human system, whether biomechanical or neurological, there will be a Specific Adaptation to Imposed Demands (SAID).

Adaptations for resistance training

Stabilization encourages the adaptation of muscular endurance, improve joint stability, and improve balance.

Muscular endurance encourages joint and core stabilization mechanisms, core endurance, and a decrease in body fat.

Muscular Hypertrophy encourages the growth of muscle fibers due to increased protein development in the myofibril.

Strength encourages the increase in tension to overcome outside forces. This occurs by teaching the nervous system to properly recruit as many muscle fibers as possible at one point in time.

Power encourages the generation of the greatest force in the shortest time which can lead to an increase in projectile velocity.

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Compare to Table 13.3 Resistance training systems

single set: performing only one set for all exercises

multiple set: performing more than one set for all exercises

pyramid set: when you increase weight and decrease reps after you perform each set; you can also decrease weight and add reps

super set: one set performed immediately after another.

drop set: upon failing with one weight you drop the weight and continue with more reps

circuit training: multiple sets in a row of different exercises with little rest after one round has been completed

peripheral heart action: alternating upper and lower body exercises during circuit training

split routine: a typical body building strategy in which you workout certain muscle groups on certain days

vertical loading: completing one set of an exercise and moving on to another with intent to come back and do another set

horizontal loading: completing all sets of one exercise before moving to the next exercise

Compare with Table 13.4 Peripheral heart action system

Knowing the difference between the exercises you include in a PHA Circuit between stabilization, strength and power will matter. Notice that a stabilization PHA Circuit includes only stabilization exercises. Same with strength and power.

CHAPTER 14

Integrated Program Design and the Optimum Performance Training

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Tempo

NASM writes tempos this way “a/b/c”

It stands for a = eccentric

b = isometric

c = concentric

So a tempo of 4/2/1 on a repetition of a body weight squat would be:

a = 4 counts, controlled, deceleration, lowering the body down

b = 2 counts, controlled, holding the weight (bodyweight) in place

c = 1 count, on the push back [upward]

Training volume adaptations

The training phase and goal is what determines all the acute variables, repetitions, sets, intensity, rest and tempo. With all these combined you can also figure out the training volume one must be at. A high intensity or a low or moderate intensity. Each have their own benefits.

Compare to Table 14.7 Stabilization Endurance Training

This is Phase One in the OPT Model

Reps: 12-20

Sets: 1-3

Tempo: Slow 4/2/1

Rest: 0-90seconds

Intensity: 50-70% of 1RM

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Frequency: 2-4 times out of the week

Duration: 4-6 weeks

Tempo for Core: 4/2/1

Compare to Table 14.8 Strength Endurance Training

This is Phase Two in the OPT Model

Reps: 8-12

Sets: 2-4

Tempo: Medium 2/0/2

Rest: 0-60seconds

Intensity: 70-80%

Frequency: 2-4 times out of the week

Duration: 4 weeks

Tempo for Core: Medium

Compare to Table 14.9 Hypertrophy Training

This is Phase Three in the OPT Model

Reps: 6-12

Sets: 3-5

Tempo: Medium 2/0/2

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Rest: 0-60seconds
Intensity: 75-85% of 1RM
Frequency: 3-6 times out of the week
Duration: 4 weeks
Tempo for core: Medium

Compare to Table 14.10 Maximal Strength Training

This is Phase Four in the OPT Model

Reps: 1-5
Sets: 4-6
Tempo: x/x/x
Rest: 3-5 min
Intensity: 85-100%
Frequency: 2-4 times out of the week
Duration: 4 weeks
Tempo for core: Medium 1/1/1

Compare with Table 14.11 Power Training

This is Phase Five in the OPT Model

Reps: 1-10

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Sets: 3-6
Tempo: X/X/X
Rest: 3-5 min
Intensity: 10% BW
Frequency: 2-4 times out of the week
Duration: 4 weeks
Tempo for core: x/x/x

CHAPTER 15

Introduction to Exercise Modalities

Be familiar with all the different types of modalities that are used as a Personal Trainer.

- Machines
 - Less intimidating to a beginner client
 - Does not require a spotter
 - Extra support to special-needs clients
 - Different weight and intensity provided
- Free Weights
 - Challenges core stabilization
 - Used by a variety of populations for different performance goals
 - Being able to perform multijoint movements
 - Improves postural stability
 - Proper exercise technique is required
- Bands and Rubber Tubing
 - inexpensive alternative to training with resistance
 - multiple planes of motion
 - Variety of color, thickness and shape
 - Greater range of motion (ROM)
- Medicine Balls
 - Come in different color and weight
 - Use to increase endurance, muscular strength, endurance, power

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- Dynamic Power Benefits
- Use many different planes of motion, movement and intensity
- Kettle Bell
 - Helps with coordination and balance
 - Core stability
 - Helps improve grip strength
 - Proper exercise technique is required
- Body Weight Training
 - Uses own weight as a resistance
 - Proper exercise form is required
 - Does not require any equipment
 - Train in all planes of motion
- TRX suspension training
 - Helps modify exercises for clients with special needs
 - Intensify muscle activation
 - Proper exercise technique is required

CHAPTER 16

Age Considerations

- Children and adolescents should get 1 hr or more of physical activity daily.

Physiologic Differences between Children and Adults

- Children do not exhibit plateau in oxygen uptake, peak oxygen uptake is more appropriate.
- Children less efficient, tend to exercise at higher percentage of peak oxygen uptake during submaximal exercise.
- Do not produce sufficient levels of glycolytic enzymes to sustain bouts of high-intensity exercise.

Resistance Training for Youth

- 1-2 sets of 8-12 reps at 40-70% of 1 RM 2-3 days per week
- Resistance training is both safe and effective in children and adolescents.
- Untrained children can improve strength by 30 to 40% in 8 weeks.

Seniors

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- 1-3 sets of 8-20 reps at 40-80 % of 1 RM 3-5 days/week
- Older adults with and without other chronic health conditions can and do respond to exercise much in the same manner as apparently healthy younger adults.
- Walking is one of most fundamental functional activities affected with degenerative aging.
- Musculoskeletal loss not entirely related to aging.
- Progression should be slow, well monitored, based on postural control. Exercises should be progressed if possible toward free sitting or standing. If client cannot tolerate SMR perform slow rhythmic active or dynamic stretches.

Obesity

- 1-3 sets of 10-15 reps 2-3 days/wk
- Flexibility exercises should be performed from standing or seated position, using standing hip flexor stretch rather than kneeling hip flexor stretch, standing hamstring stretch, wall calf stretch.
- Core and balance training important for obese individuals.
- May find it difficult to use machines, dumbbells, cables, exercise tubing work quite well.

Diabetes

- 1-3 sets of 10-15 reps 2-3 days/wk
- Most important goal is glucose control. Exercise improves insulin sensitivity. Positive effect on prevention of type 2 diabetes.
- Take care to prevent blisters and foot microtrauma that could result in foot infection.
- Daily exercise recommended. Flexibility exercises recommended.
- Follow exercise guideline for obese adults. Lower impact exercise modalities.

Hypertension

- 1-3 sets of 10-20 reps 2-3 days/wk
- Important to monitor body position of clients with hypertension at all times. Body position can have dramatic effect on blood pressure response before, during, and after exercise in clients with hypertension.
- Avoid heavy lifting and valsalva maneuvers. Do not let client overgrip weights or clench fists. Modify tempo to avoid extended isometric and concentric muscle action. Perform exercises in standing or seated position. Allow client to stand up slowly to avoid possible dizziness. Progress client slowly.

Coronary Heart Disease

- 1-3 sets of 10-20 reps 2-3 days/wk
- Monitor pulse to stay below safe upper limit of exercise.
- Clients may have other diseases to consider as well, such as diabetes, hypertension, peripheral vascular disease, or obesity

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- Modify tempo to avoid extended isometric and concentric muscle action
- Avoid heavy lifting and Valsalva maneuvers
- Do not let client overgrip weights
- Perform exercises in standing or seated position

Osteoporosis

- 1-3 sets of 8-20 reps <85% of 1 RM 2-3 days/wk
- Progress should be slow, well monitored, based on postural control
- Exercises should be progressed if possible toward free sitting(no support) or standing
- Focus exercises on hips, thighs, back, and arms
- Avoid excessive spinal loading on squat and leg press

Arthritis

- 1-3 sets of 10-12 reps 2-3 days/wk
- Avoid heavy lifting and high reps
- Stay in pain-free ranges of motion
- May be need to start out only with 5 mins of exercise and progressively increase

Cancer

- 1-3 sets of 10-15 reps 2-3 days/wk
- Avoid heavy lifting in initial stages of training
- Allow for adequate rest intervals and progress client slowly
- Only use SMR if tolerated, avoid SMR for clients undergoing chemo or radiation

Exercise and Pregnancy

- 1-3 sets of 10-15 reps 2-3 days/wk
- Avoid exercises in prone or supine position after 12 weeks
- Avoid SMR on varicose veins and areas of swelling
- Plyometric training not advised in second and third trimesters

Chronic Lung Disease

- 12-15 reps 2-3 days/wk
- Allow for sufficient rest between sets

Intermittent Claudication/Peripheral Arterial Disease

- 1 set of 8-15 reps 2-3 days/wk
- Allow for sufficient rest
- Progress slowly

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- Treadmill walking preferred.
- Primary limiting factor is leg pain.

CHAPTER 17

Know all Definitions throughout the chapter

Nutrition: the process of providing or obtaining the food necessary for health and growth.

calorie: the energy needed to raise the temperature of 1 gram of water through 1 °C (now usually defined as 4.1868 joules).

Calorie: the energy needed to raise the temperature of 1 liter of water 1 °C.

Kilocalorie: One thousand of the above definition.

Protein: large biomolecules, or macronutrient, consisting of one or more long chains of amino acids.

Carbohydrates: sugars, starch, and cellulose that contain hydrogen and oxygen in the same ratio as water (2:1) and typically can be broken down to release energy in the animal body.

Lipids: any of a class of organic compounds that are fatty acids or their derivatives and are insoluble in water but soluble in organic solvents. They include many natural oils, waxes, and steroids.

Compare definitions to Chapter 17 in the textbook.

Compare to Table 17.4 Know all of the Essential Amino Acids

Essential amino acids: Leucine, Isoleucine, Valine (BCAA's)

Lysine, Methionine, Tryptophan, Threonine, Phenylalanine

Compare to Table 17.6 Recommended Protein Intake

Inactive adults need about .8 grams per kilogram bodyweight

Athletes need more protein: Endurance athletes 1.2-1.4 g/kg and Strength Athletes need 1.2-1.7 g/kg

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Daily recommendations for fiber

Adults need about 38g of fiber per day. The minimum recommended is 25g per day.

Specific recommendations for endurance athletes

Endurance Athletes need more carbohydrates to fuel their activities. This is because they need to build the storage of glycogen in their muscles and liver which will not only enhance recovery but drive their performance upward. Carbohydrates are recommended at 6-10 g/kg per day.

Fatty acids

Know the difference between the three types of fatty acids.

Monounsaturated Fatty Acid: Increase good cholesterol (HDL) and have one double bond in their carbon chain - Mono meaning 1.

Polyunsaturated Fatty Acid: Increase good cholesterol and are composed of essential fatty acids which cannot be made by the body. More than one double bond in their carbon chain - Poly meaning more than 1.

Saturated Fatty Acid: Saturated fats increase bad cholesterol (LDL) levels and have no double bonds in their carbon chain - which is why they are called saturated.

Lipids in the body

What are the functions of lipids in the body?

Lipids have several roles in the body, these include acting as chemical messengers, storage and provision of energy and so forth.

Chemical messengers

All multicellular organisms use chemical messengers to send information between organelles and to other cells. Since lipids are small molecules insoluble in water, they are excellent candidates for signalling. The signalling molecules further attach to the receptors on the cell surface and bring about

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a change that leads to an action. The signalling lipids, in their esterified form can infiltrate membranes and are transported to carry signals to other cells. These may bind to certain proteins as well and are inactive until they reach the site of action and encounter the appropriate receptor.

Storage and provision of energy

Storage lipids are triacylglycerols. These are inert and made up of three fatty acids and a glycerol. Fatty acids in non esterified form, i.e. as free (unesterified) fatty acids are released from triacylglycerols during fasting to provide a source of energy and to form the structural components for cells. Dietary fatty acids of short and medium chain size are not esterified but are oxidized rapidly in tissues as a source of 'fuel'. Longer chain fatty acids are esterified first to triacylglycerols or structural lipids.

Maintenance of temperature

Layers of subcutaneous fat under the skin also help in insulation and protection from cold. Maintenance of body temperature is mainly done by brown fat as opposed to white fat. Babies have a higher concentration of brown fat.

Membrane Lipid Layer Formation

Linoleic and linolenic acids are essential fatty acids. These form arachidonic, eicosapentaenoic and docosahexaenoic acids. These form membrane lipids. Membrane lipids are made of polyunsaturated fatty acids. Polyunsaturated fatty acids are important as constituents of the phospholipids, where they appear to confer several important properties to the membranes. One of the most important properties are fluidity and flexibility of the membrane.

Cholesterol formation

Much of the cholesterol is located in cell membranes. It also occurs in blood in free form as plasma lipoproteins. Lipoproteins are complex aggregates of lipids and proteins that make travel of lipids in a watery or aqueous solution possible and enable their transport throughout the body.

Reference: <http://www.news-medical.net/health/Lipid-Biological-Functions.aspx>

Daily recommendations and importance of water

Drink 3.0 liters of water if you are male or 2.2 liters of water if you are female. Drink more water if you are trying to lose weight. Water is important as it improves body functions including liver, endocrine, and metabolic. It maintains blood volume and regulates body temperature.

Compare to Table 17.11 The effects of dehydration

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Mild to Moderate Dehydration	Severe Dehydration
Dry, sticky mouth	Extreme thirst
Sleepiness or tiredness	Irritability and confusion
Dry skin	Sunken eyes
Headache	Dry skin that doesn't bounce back when you pinch it
Decreased sweat rate	Low blood pressure
Dizziness or lightheadedness	Rapid heartbeat
Few or no tears when crying	Rapid breathing
Water retention	No tears when crying
Decreased blood pressure	Increased body temperature
Muscle cramps	Little or no urination, and any urine color that is darker than usual
Sodium retention	In serious cases, delirium or unconsciousness

Reference: <http://articles.mercola.com/dehydration-symptoms.aspx>

Be familiar with guidelines for altering body composition

These guidelines stick to your general "law of thermodynamics" recommendations.

Lose weight: Eat less, exercise more, choose whole grains and avoid processed foods. Drink lots of water and avoid alcohol.

Gain weight: Eat more frequently, intake more than you expend, eat lots of carbs and fat.

Calorie count for proteins, carbohydrates, fats

PRO = 4kcal/gram

CHO = 4kcal/gram

FAT = 9kcal/gram

Alcohol = 7

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CHAPTER 18

Compare to Table 18.2 - Dietary Reference Intake Terminology

The Dietary Reference Intake (DRI) is used by the Food and Nutrition Board (FNB) to evaluate

Recommended Dietary Allowance (RDA)

- The RDA, the estimated amount of a nutrient (or calories) per day considered necessary for the maintenance of good health by the Food and Nutrition Board of the National Research Council/ National Academy of Sciences

Adequate Intake (AI)

- The recommended average daily intake level based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people that are assumed to be adequate-used when an RDA cannot be determined.

Tolerable Upper Intake Level (UL)

- The highest level of nutrient intake that is likely to pose no risk of adverse health effects for almost all individuals in the general population. As intake increases above the UL, the risk of adverse effects increases

Units of measured used on dietary supplement labels

Dietary Supplement Labels contain the Nutritional Facts and the Supplement Facts that most of us then to look at before purchasing items. The product information is expressed in quantities of mg, or mcg or IU. Also they provide “% Daily Value” for each nutrient listed.

Adverse effects of excess for specific vitamins and minerals

The most likely vitamins and minerals people consume excessive amounts of the following

- . Vitamin A
- . Vitamin D
- . Iron

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. Zinc

Ergogenic Aids and Dosage

Legal: Creatine dosage - 5-7 days of 20g/day then 2-5g/day for maintenance. Caffeine - 3-6mg/kg 1 hour before exercise.

Illegal: Prohormones and Steroids

CHAPTER 19

Compare with Figure 19.1 Stages of Change Model and Know the stages of Change

Precontemplation:

- No intention of change
- Does not exercise
- No intention to start within 6 months
- Information and Education is best with this stage

Contemplation:

- Thinking about being active in the next 6 months
- Listen to what they need
- Still need information and education before starting anything

Preparation:

- They exercise at times but want to commit to an exercise program within 1 months time
- No set routine
- Have unrealistic goals
- Help them clarify their goals (SMART)

Action:

- Started to exercise
- Has not maintain behavior for 6 months
- Keep providing them with education
- Develop steps for overcoming any obstacles they may have

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Maintenance:

- Change has been in place for 6 months or more.
- Still can be tempted by old habits

Be familiar with the initial session

You have 20 seconds to make a great first impression. Body language is the first thing they notice from the trainer. It is important to keep moving on a positive note, by building a relationship with the client. Discuss their health concerns and also when setting goals, make sure to verbalize and write down SMART goals. Reviewing previous exercise history is also very important. Finalizing the program expectations to help clients anticipate the process that will take place.

Effective Communication skills

Effective communication is important as it helps to enhance the client experience. Ensuring they are aware of what will be expected of them during their time in the gym and out, will lead to a more successful outcome. Also this will help them to understand your policies and training style.

Nonverbal communication: What you think and feel is worn by your body at all times. Be attentive with your body in order to create the positive environment for communication.

Active Listening: Listen to what the client has to say and respond appropriately. When the client knows you are listening you prove to them you care about their thoughts and feelings.

Ask Questions: Responding to your clients with appropriate questions will ensure effective communication. Open-ended questions give the client a chance to express their views while closed-ended questions require a one word answer.

Reflecting: A reflection reiterates what a client has said to ensure them you understand what they are communicating.

Summary: A summary is a complete recap of what was meant to be said over the course of a conversation.

Goal setting- SMART Goals

Specific:

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- Anyone can understand the goal
 - I want to lose 10lbs

Measurable:

- I will you record the progress, what will you use to keep track on the goal?
 - Scale, Circumference Measurements, Body Analyze

Attainable:

- Is it scientifically possible for the client to get this goal? You want to challenge the client and push them but you don't want to make it impossible.

Realistic:

- Will they put in the effort to finish the goal? Basically can the client commit for the goal they are trying to reach.

Timely:

- Deadline, Due Date. By creating this you push them to stay on track and keep them focus for the final day.
 - 3 months

Example of a SMART GOAL

- I want to lose 10lbs of my total weight in 12 weeks

Cognitive Strategies and Positive Self talk

They are three forms of if strategies that can be found Positive Self Talk, Psyching Up and Imagery. These strategies are to help clients mind and attitude change positively to do a certain workout or an activity they don't want to try or are too afraid to even give it an attempt.

Positive Self Talk: Find things that they like and try for them to feel the same way when it comes to working out. In the fitness world many people have negative thoughts about exercises, workouts and even the equipment. Creating a list with the client to keep handy when a negative situation comes across, focus more on the positive then the negative.

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Psyching Up: Find the motivation that drives your clients. Even if it's something that pumps them up outside of fitness. A song that they can't help my jam too or an event they want to get ready for. Finding the ability to keep your client motivated during workouts especially a new client will change the emotion they have towards doing exercises. If they are happy and enjoying them when they are with you then slowly they will adapt that feeling when doing another physical activity as well.

Exercise Imagery

Imagery: Using the imagination can also help, by having the clients picture themselves doing something over and over again they start to believe they can. Eventually finally giving the exercise a try. Using the mind isn't something commonly seen but it's very affective.

CHAPTER 20

Providing uncompromising customer service

Personal trainers must never think of a client as an interruption. Some clients have many questions and might ask them in inconvenient times but you never want to give a bad impression. They are priority and are the reason an entire business was built. Be sure that you build a good impression on the professional relationship being created. Vocal tone, verbal communication and even body language are key factors in this. Presenting yourself in the correct matter will give them the personal trainer they want to have. If for any reason they might have a complaint or suggestion about anything in training or personal attitude, take ownership, fix it and show them they were heard and understood.

Know who your customers are

One thing you should take into account is that you are your own product. Everywhere you go you represent your personal training brand. So never overlook anyone because everyone is a potential client. Don't be afraid to greet or approach potential clients on your day to day routines. Greet everyone you come across and make eye contact, always carry yourself with confidence and open body language so people feel that they can approach you. If you already have in mind who you would like to work with, such as teen, college students, mothers, fathers, male, female, and many others, present yourself to their liking. Make sure to put yourself in the environment where your potential clients will be. Getting out there and being approachable will pay off in the long run, never be afraid to sell yourself because you know the value of the work you do.

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Ten steps to success

Number one thing you must do is create a plan in where you know how much you need to work. How many clients do you need? How much will I charge? People might think these are simple questions to answer but when this becomes your career you need to sit down and think some questions through. What times schedule do you want to work? I much money do I need to survive? How will I get my clients? These are just a few questions you need to start thinking about. Make a plan, set your questions up by importance and build your plan from the answers you have. Be sure to memorize the ten steps from the book as a test question will be asked about it.

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