

# FITNESS AND TRAINING CONCEPTS

## Benefits of Physical Fitness

- ✓ Increased energy levels
- ✓ Increased self-esteem and confidence
- ✓ Stronger and more efficient heart
- ✓ Increased capacity to do physical work, including sport performance
- ✓ Injuries are less frequent, less severe, and recovery time is shorter
- ✓ Improved appearance
- ✓ Improved emotional control
- ✓ Sleep better (therefore you have more energy during the day)
- ✓ Body fat stays within normal healthy range
- ✓ Increased life expectancy/enjoy more healthy years
- ✓ Improves overall health

**Five Health Related Fitness Components:** The following are lifelong fitness components necessary to ensure the body can perform normal daily tasks.

1. **Cardiovascular Endurance:** the ability of the heart, blood vessels, and lungs to supply oxygen to the working muscles. Cardiovascular endurance can be tested by completing the mile run, 1.5 mile run, step test, PACER, 12 minute cycle, or the 12 minute swim.
2. **Muscular Strength:** the ability of the muscles to exert a force. The maximum amount of force that a muscle can generate in a single effort. Muscular strength in the upper body is tested by the maximum bench press and the lower body by the maximum leg press.
3. **Muscular Endurance:** the ability to efficiently use muscles over a longer period of time. The ability of a muscle to repeatedly contract or sustain continuous contraction involving less than maximum force. Muscular endurance can be tested by performing the one minute sit-up test or push-up test.
4. **Flexibility:** the ability to move at the joints through a full range of motion. The range of motion through which the body's joints are able to move. Flexibility is evaluated with a sit and reach test, arm and shoulder flexibility test, and prone trunk test.
5. **Body Composition:** the amount of body weight that is fat compared to muscle, bones, and other body tissues. Body fat percentage can be estimated by four different testing protocols: skinfolds, hydrostatic weighing, bioimpedence analysis, and BMI (Body Mass Index).

**Skill Related Fitness Components:** The following components are related to sport/athletic performance and they can be argued to be improved by one's training (inherent to or improved by training).

1. **Speed:** also referred to as movement time, the ability to move the body or parts of it very quickly. (40 yd. Dash/20 yd. Dash)
2. **Power:** the ability to exert muscular strength quickly, strength and speed combined.(standing long jump, vertical jump)
3. **Agility:** the ability to start, stop and change direction quickly and with precision. (shuttle run, jingle jangle, 3 cone drill)
4. **Balance:** the ability to maintain a certain posture or to move without falling. (balance beam activities)
  - a. **Static balance:** maintain equilibrium in a stationary position.
  - b. **Dynamic balance:** maintain equilibrium when moving the body.
5. **Reaction Time:** also referred to as quickness, the period from when a stimulus is perceived to when movement begins. (starting a race, tennis ball drop)
6. **Coordination:** the ability to use your senses together with your body parts; ability to use two or more body parts at the same time (hitting a tennis ball, hand-eye coordination/timing)

## Cardiovascular Endurance

**Cardiovascular endurance** is the ability of the heart, lungs, and circulatory system to supply oxygen and nutrients to working muscles efficiently. It allows activities that involve large muscle groups (walking, running, swimming, biking, etc.) to be performed over long periods of time. From a health standpoint, cardiovascular or aerobic fitness is generally considered to be the most important of the fitness components.

### **Benefits of Cardiovascular exercise activities**

- ✓ Reduce your risk of heart disease
- ✓ Stronger and more efficient heart (increase stroke volume)
- ✓ Lower heart rate at rest, during exercise and recovery
- ✓ Lower blood pressure at rest, during exercise, and recovery
- ✓ Lower cholesterol (lower total, raise HDL)
- ✓ Improved body composition, burn fat
- ✓ Help you look and feel better
- ✓ Improved ability to perform work, faster recovery
- ✓ Maintenance of a healthy heart and cardiovascular system
- ✓ Increase circulation and improve performance of your heart and lungs

#### 4 Characteristics of Cardiovascular Activity

1. Large Muscle Groups – the larger the muscle mass involved, the better the activity.
2. Rhythmic – you can regulate the pacing of the activity (slow down or speed up) and still perform the exact task.
3. Continuous – the activity is sustained over time.
4. Aerobic – the nature of the activity is dependant upon the strength and efficiency of the heart supplying oxygen.

#### F.I.T.T. Principle

When developing a personalized plan to improve ones cardiovascular fitness (towards optimal health), the FITT plan should be followed.

<b>F</b>	=	<b>Frequency</b>	5 days a week
<b>I</b>	=	<b>Intensity</b>	60%-85% of your maximum heart rate (in your target HR zone)
<b>T</b>	=	<b>Time</b>	at least 30 minutes continuously
<b>T</b>	=	<b>Type</b>	Aerobic activities using large muscle groups

#### Aerobic Activity vs. Anaerobic Activity

Aerobic endurance is the ability to perform large muscle, whole body physical activity of moderate to high intensity over extended periods of time. Aerobic activity depends upon the heart, lungs, and blood vessels to transport oxygen to the muscles. Aerobic means doing activities “with air.”

Anaerobic exercise refers to high intensity exercise like all-out sprinting or very heavy weight lifting. After 90 seconds, you begin gasping for air and you feel a burning sensation in your lungs. It is activity done in short bursts of intense movement whereas the body cannot supply blood and oxygen to the muscles as fast as the muscles use it. The oxygen demand for the activity is beyond what the body can sustain.

Aerobic Activities: done for at least 30 minutes continuously, in your Target Heart Rate Zone	Anaerobic Activities: typically short, start/stop activities
Bicycling Swimming Cross Country Skiing Step Aerobics Rowing Roller Blading Running or Jogging Power Walking	Tennis Basketball Football Golf Baseball Softball Volleyball Ping-Pong

## **The Exercise Program**

A good total exercise program has 6 components. Programs should be individualized to meet your personal needs. Your needs may not be the same as another person due to age, physical build, physical and medical condition. An exercise program should consist of:

1. Warm-up and stretching activities (3-4 times per week)
2. Endurance training (3-5 times per week)
3. Flexibility training (best when done after endurance training)
4. Recreational activities (for enjoyment and relaxation)
5. Resistance training (2-3 days per week)
6. Cool-down and stretching activities (3-4 times per week)

**Target Heart Rate (THR)** – This is the training zone you should workout in. It is important to train in your zone in order to allow for the greatest benefits possible. By training in your zone you will be able to sustain the workout for a longer period of time.

To find your Target Heart Rate:

Subtract your age from 220 (the average maximum number the heart beats per minute). Subtract your resting heart rate. Then multiply that answer by 60% and 85% depending on what intensity of workout you desire. A beginner should use the lower percentage and increase intensity as their fitness levels increase. Finally add your resting heart rate to determine ranges. *For an example see Training Heart Rate page in the back of this study guide.*

**Resting Heart Rate (RHR)** – the number of times your heart beats in one minute while at rest, a good indicator of your general fitness level. The best time to find your RHR is before you get out of bed in the morning. Count your heart rate for 15 seconds and multiply by four or count your heart rate for an entire minute. The average resting heart rate is between 60 and 80 beats per minute.

**Maximum Heart Rate** – the highest heart rate value attainable during an all-out effort to the point of exhaustion. Subtract your age from 220 to compute your maximum heart rate.

**Recovery Heart Rate** – recovery heart rate is the heart's ability to return to a normal heart rate after exercise. A quick recovery time indicates a high level of fitness.

**To take your heart rate either:**

1. Place your index and middle fingers on the thumb side of your wrist (radial pulse)

**OR**

2. Place your fingers gently at the carotid artery on either side of your neck (carotid pulse)

**AND**

3. Count for 6 seconds and add a zero (multiply by 10).

## **Related Vocabulary**

**Blood pressure** – the pressure exerted by the blood against the walls of blood vessels. Blood pressure depends on the strength of the heartbeat, thickness and volume of the blood, the elasticity of the artery walls, and general health. Sometimes blood pressure is measured for a quick evaluation of a person's health. Adult blood pressure is considered normal at 120/80 where the first number is the systolic pressure and the second is the diastolic pressure. Keeping your blood pressure within this normal range will greatly reduce your chances of having a heart attack or stroke. The American Heart Association recommends having your blood pressure checked on a regular basis. There are two different measures of blood pressure: systolic (higher number) and diastolic (lower number)

**Systolic blood pressure** – the force on your arteries when your heart contracts forcing a large volume of blood into your arteries.

**Diastolic blood pressure** – the measure of the force on the arteries when the ventricles are relaxed and your heart is filling with blood.

**Hypertension** – high blood pressure, occurs when pressure needed to circulate blood throughout the body increases above 140/90. High blood pressure generally has no symptoms but has serious and harmful effects on many organs of the body. It is important to have your blood pressure checked regularly. Hypertension is dangerous because it causes your heart and arteries to work harder than normal for a long period of time. This could lead to the heart getting larger. IF it becomes too large it may not be able to meet the demands of the body which could result in congestive heart failure. Hypertension also speeds up the process of atherosclerosis (narrowing of the arteries). Atherosclerosis can cause stroke, heart attack, or kidney failure. Factors that increase the risk of developing high blood pressure are family history, increases age, obesity, alcohol consumption, salt sensitivity, and oral contraceptives. To help control blood pressure you can: *eat a balanced diet* (avoid excess salt and dietary fats), *exercise regularly*, control your weight, don't smoke, effectively deal with stress, and consume alcohol in moderation.

**Atherosclerosis** –the progressive narrowing of the arteries. When the coronary arteries are involved, it is termed Coronary artery disease (CHD). Risk factors for CHD include: Cigarette smoking, obesity, physical inactivity, hypertension, high cholesterol, diabetes mellitus, age and family history.

**Warm-up:** a period of mild exercise that increases circulation and gets the body ready for rigorous exercise, improves joint flexibility and prevents injury. Warm-up time should be about 5-10 minutes.

**Pacing** – the ability to run an exact time for a specific distance when training for cardiovascular endurance.

**Recovery time** – one must allow recovery days for the body to rebuild itself after intense workouts.

**Cool-down:** a period of gentle exercise that allows for the body to gradually return to normal; reduces stiffness and muscle soreness due to exercise. Cool-down time should be 10-15 minutes.

**Overtraining** – the result of excessive training and inadequate recovery. Overtraining causes long term physical and mental fatigue. The first indication of overtraining is a decline in physical performance. Other signs of overtraining include: inability to train at levels previously reached, loss of coordination, increased muscle soreness, increased resting heart rate, insomnia, loss of appetite, headaches, decreased body fat, and increased susceptibility to illnesses (cold and flu), depression, apathy, loss of self-esteem, emotional instability, and fear of competition. The most effective cure for overtrained athletes is rest.

**Detraining** – Changes the body undergoes in response to a reduction or cessation of regular physical training.

## **Equipment, Activity Tips and Safety**

### **Aerobic Machines**

**Treadmills** – the motorized version of walking or running in place. Treadmill workouts burn the same number of calories as walking or running outdoors. They are the easiest aerobic machines to use.

Tips for using the Treadmill:

1. Stand up straight and in good posture.
2. Start slowly. Slowly increase the speed, as you warm up and become accustomed to the speed.
3. Use the handrails for balance only. You will move more naturally if you swing your arms.
4. Look straight ahead. Your feet will follow your eyes, so focus on what is in front of you.
5. Never go on the treadmill with bare feet.
6. Gradually reduce your speed. Just as you started slowly, slow down gradually. This gradual slowdown will be your cool-down.

**Stationary Bicycles** – these bikes come in two types: upright and recumbent. Upright bikes simulate a regular bike that you would ride outdoors. Recumbent bikes have a bucket seat so you pedal out in front of you. Both types work the same. The recumbent bike does offer more back support and might be more comfortable for people with lower back pain.

Tips for using stationary bicycles:

1. Set the seat eight correctly. Adjust the seat so that when the pedal is at the lowest position, your leg is almost, but not quite, straight. Your knees should not feel crunched when you are at the top of the pedal stroke.
2. Set your handlebars correctly. If you are tall or very short, handlebar adjustments are very important.
3. Pedal from the ball of your foot through your heel as you pump downward on the pedal and pull up with the top of your foot on the upstroke. Riding a bike with foot straps is more comfortable and efficient than pedaling without them.
4. Sit upright. Rounding your back can cause back and neck pain.

**Stair Climbers** – these machines are a big improvement over jogging up and down the bleachers. The machine eliminates most of the wear and tear on joints.

Tips for using stair climbers:

1. Rest your fingertips lightly on the bar in front of you or on the side rails. Do not grip the rails tightly. Never reverse your wrists so that your fingertips are pointing toward the ceiling and your elbows are turned toward the floor. You should only use the rail for balance.
2. Stand upright with a very slight forward lean at the hips. This will help you keep your knees from locking and protects your lower back from arching.

**Rowing Machines** – you use these machines by sitting in a seat and pulling the handle toward you. You slide the seat backwards as you push with your legs.

Tips for using the rowing machines:

1. Think legs, legs, legs. Think about starting the movement with your hips rather than your lower back. When you are completely extended, your knees will be slightly bent.
2. Keep your back straight. Do not round your back. Do not lean all the way back at the end of a stroke. You are in the proper position when your upper body is leaning backwards about 45 degrees.
3. Put the handle in a smooth continuous stroke. Try not to stop at the most stretched out and bent positions.

## **Aerobic Activities**

### **Walking**

Walking at a fast pace can be aerobic. It is the easiest and least expensive of all the aerobic activities. Walking burns fewer calories than jogging or other aerobic activities, but most people last longer on a walk than on a run. It is recommended individuals walk 10,000 steps per day.

Tips for walking:

1. Walk as fast as you comfortable can.
2. Walk over hilly terrain. You will burn more calories walking up a hill than on flat land.
3. Walk instead of drive. Walk up the stairs instead of taking the elevator.
4. Use proper form when you walk. Walk erectly with your head and chin up. Focus straight ahead.
5. Keep your hands relaxed when you walk. Swing your arms so they brush past your body. On the upswing, your hands should be level with your breast bone. On the downswing, your hands should brush against your hips. Keep your hips loose and relaxed.
6. Your feet should land firmly on the ground, your heel landing first. Roll through your heel to your arch, then to the ball of your foot, and then to the toes. Push off from your toes and the ball of your foot.

## **Running**

Running is a workout you can do anytime, anywhere.

Tips for running:

1. Wear a good pair of running shoes. The shoe that is best for you depends on your weight, the shape of your foot, and your running style.
2. Start by alternating periods of walking with periods of running.
3. Keep your head up and focus straight ahead.
4. Keep your shoulders relaxed, your chest open and your abdominal muscles pulled in tight.
5. Keep your arms close to your body rather than flailing them around. Swing your arms forward and back rather than across your body.
6. Keep your hands open and relaxed.
7. Lift your front knee and extend your back leg. Do not shuffle along like you are wearing cement boots. Let your feet do the work, not your shoes. Land heel first and roll through the entire length of your foot. Push off from the balls of your feet instead of running flat footed and pounding off your heels.

**Bicycling and swimming** are also great aerobic activities.



## Muscular Strength and Endurance

**Muscular strength** is very important to your overall health and fitness. Adequate levels of strength are necessary to perform your daily routines at home and work, without excessive fatigue or stress. Higher levels of muscular fitness also reduce the incidence of lower back pain and injury to the musculoskeletal system. Strong muscles also assist your cardiovascular system in sustaining physical activity. **Muscular strength** is the maximum amount of force that a muscle can generate in a single effort. **Muscular endurance** is the ability to efficiently use muscles over a longer period of time. The ability of a muscle to repeatedly contract or sustain continuous contraction involving less than maximum force. A well-rounded strength training program includes at least one exercise for each of the major muscle groups in your body. Minimally, you should include one core exercise for the lower body and two core exercises for the upper body. To avoid muscle fatigue, you should arrange your program so that successive exercises do not involve the same muscle group. This principle may be applied by using the following order for weight training exercises:

- |                         |                       |             |
|-------------------------|-----------------------|-------------|
| 1. Thighs and hips      | 4. Legs and ankles    | 7. Forearms |
| 2. Chest and upper arms | 5. Shoulders and arms | 8. Wrists   |
| 3. Back and thighs      | 6. Abdomen            |             |

### **Benefits of Muscular Strength and Endurance**

- ✓ Increase the BMR/body's need for energy at rest
- ✓ Change body composition
- ✓ Decrease the chances of osteoporosis
- ✓ Improve balance (especially is elderly), reduce the risk of falls
- ✓ Increases the chances of coping well with intense physical challenges
- ✓ Can build a sense of accomplishment and pride
- ✓ Improved appearance
- ✓ Ability to do more strenuous work and to do more work over a longer period of time

### Strength Training Principles

1. **Progression** – to steadily improve fitness level you must continually increase the physical demands to overload their systems.
2. **Overload** - the practice of continually increasing the stress placed on the muscle as it becomes capable of producing greater force or has more endurance. To improve strength level one must do more than what their bodies are used to doing. An individual can overload in duration, intensity or both. If a person's body gets stronger and can perform the same weight, sets, and reps easier, no further gains in strength will occur if the training stimulus does not increase. A reasonable guide is 2.5% to 5% increases at any one time.
3. **Training to fatigue** - in order to make significant gains in strength the muscles have to go into temporary fatigue at some points during the set. This may occur in the 1RM or in the last couple of repetitions in a set of 10.
4. **Specificity** – training your muscles for a particular sport, using muscle actions that are encountered in that sport. (resistance training should also be performed at the speed required during the actual sporting event)

5. **Periodization** – variation in the training volume and intensity, usually a lifting program that covers 8-12 weeks. During this time vary the weights, sets and reps to achieve a certain level of performance at the end of the program.

### **Methods of Strength Training**

**Isometric or Static Training** - the straining of muscles against an immovable force. In this type of training, there is a very slight shortening of the muscle and there is no movement of the joint, even though the muscle is still tense.

**Isotonic or Dynamic Training** - this occurs when, throughout the shortening of muscles, the tension remains constant and there is movement of the joint involved.

**Isokinetics** - muscle contraction with variable resistance throughout the entire range of motion

**Plyometrics** - quick explosive jumps that are done to improve leg power. The muscle is stretched initially followed by immediate maximum contraction. Plyometric exercises for the lower body include bounding, hopping, and jumping. Plyometric exercises for the upper body include catching and throwing medicine balls.

### **Muscle Contractions**

**Concentric** - Muscles actively shorten (ex. raising weight during a bicep curl, flexion)

**Eccentric** – Muscles actively lengthen (ex. lowering the weight after a bicep curl, extension)

**Isometric** – Muscles are active and held at a constant length, they do not shorten or lengthen, when tension develops in the muscle but no movement occurs (ex. carrying a heavy object in front of you, your arms are not moving so neither are your muscles; pushing your hands together)

### **Muscle Fiber Types**

**Slow twitch** muscle fibers – red muscle fibers that are slow to contract and resistant to fatigue

**Fast twitch** muscle fibers – white muscle fibers that are quick to contract and fatigue easily

### **Setting up a weight training program... How much? How many?**

1. You must first decide if you want to “tone-up” or “bulk-up” and ultimately whether or not you want to focus on developing strength or endurance. Toning-up tends to dramatically increase muscle endurance and bulking-up tends to dramatically increase muscle strength.
  - a. “**Toning-up**” consists of doing a high number of repetitions (15 or more) using “light” weights for multiple sets (2-4); decrease the weight if you can’t lift the desired weight 12 times (it’s too heavy).
  - b. “**Bulking-up**” consists of doing a low number of repetitions (8 or less) using “heavy” weights for multiple sets (3-5); increase the weight if you can lift the desired weight more than 10 times (it’s too light). It is essential to warm-up by using lighter weights before attempting to lift a heavy weight.

2. Isolate the muscle or muscle groups that you wish to develop. Put the muscle or muscle group under stress by lifting the amount of weight that is challenging for you. The basic “overload” principle of weight training is that a muscle will become stronger if it is put into a stressful situation. For that reason, one will dramatically increase their results if he or she goes to failure during the final set of repetitions. It is a myth that girls will look like boys or get “huge” if they lift heavy weights.
3. It is important to workout specific muscle groups on specific days; doing so will allow one to exercise more efficiently and effectively during class. Work out every primary muscle group at least once a week.
4. Load Adjustments: If you can do 2 or more reps over the target number of reps in the last set in two consecutive workouts, increase the load. Smaller/weaker/less trained athletes should increase 2.5% for upper body exercises and 5% for lower body exercises. Larger, stronger, more trained athletes should increase weight by 5% for upper body exercises and 10% for lower body exercises.

**Strength Training Definitions** (see Strength Training section for more detail)

**Repetition (rep):** The act of repeating; doing an exercise multiple times. The number of times you lift and lower a weight in one set of an exercise. For example, if you lift and lower a weight five times before putting the weight down, you have completed five reps.

**Set:** A group of repetitions (lifting and lowering a weight) of an exercise after which you take a brief rest. For example, if you complete 10 reps, then put the weight down to rest, complete 10 more reps, put the weight down to rest again, and then do 10 more reps, you have completed three sets of the exercise.

### **Strength Training Tips**

- Keep joint slightly flexed when lifting weights, fully extending your arms and legs. Locking a joint could lead to serious injury.
- Rest for approximately 45-75 seconds between sets when using “light” weights and 2-3 minutes when using “heavy” weights; get a drink of water and/or stretch between sets.
- Breathe through your mouth when strength training; exhale when pushing/lifting weights away from your body and inhale when pulling/ lifting weights toward your body.
- After strength training, give fatigued muscles a minimum of 48-72 hours to rest before strength training those particular muscles again.
- Every 4-6 weeks, follow the “opposite” guidelines for at least a week in order to deceive your muscles. For example, if you are trying to “tone-up” by using lighter weights, use heavier weights for a week and vice versa.
- Do not work out the same muscle groups on consecutive days. Too much strength training without a significant amount of recovery time can tear the muscles down rather than build them up.

## Related Vocabulary

**Osteoporosis** – a condition in which bones lose their mineral density and become increasingly soft and susceptible to injury. You can lower your risk for osteoporosis by taking preventative steps early in life. Get adequate amounts of calcium, *exercise regularly*, monitor caffeine intake, drink alcohol in moderation, don't smoke, and get plenty of Vitamin D.

## FLEXIBILITY

**Flexibility** is the ability to move a joint through a full range of motion. It is important to general health and physical fitness. Flexibility is reduced when muscles become short and tightened with disuse causing an increase in injury and strains.

### Benefits of Flexibility Exercises

- ✓ Decrease the chance of injury in activities of daily living/sports
- ✓ Change body composition
- ✓ Decrease the chances of osteoporosis
- ✓ Improve balance (especially in the elderly), reduce the risk of falls
- ✓ Increases the chances of coping with intense physical challenges
- ✓ Can build a sense of accomplishment and pride

### Guidelines for Stretching

Follow the **F.I.T.T.** principles in relation to flexibility:

<b>F</b>	=	Frequency	2 – 3 days per week
<b>I</b>	=	Intensity	Stretch to the point of mild uncomfortableness, to the point where you feel the tension but not pain
<b>T</b>	=	Time	15 – 30 minutes per day, hold stretch for 20 – 60 seconds
<b>T</b>	=	Type	Dynamic stretch (prepares body for exercise) Static stretch (done after warmed up) PNF (Proprioceptive Neuromuscular Facilitation)

- Dynamic stretching should be performed at the start of the workout. Dynamic stretching prepares the body for exercise.
- Static stretching should be performed within 10 minutes after every workout. Static stretching is done after the body has an opportunity to be properly warmed up. You should NOT perform static stretches when your muscles are cold.
- Move into a stretch slowly, holding it for 20 - 60 seconds and then slowly returning to the starting position.
- Perform 2 – 6 repetitions for each exercise.
- Stretch both sides of the body and opposing muscle groups.
- Use a variety of stretching modes such as dynamic, static or PNF stretching.
- Do not bounce (ballistic stretching) to increase range of motion. It could lead to injury.
- Breathe normally as you stretch. With every inhale you should lengthen and with every exhale you should stretch a little deeper.

### **Components of the human body involved in overall Flexibility:**

- **Muscles** – body tissue that contracts when stimulated causing movement (strain = injury to a muscle) 640 in the human body
- **Ligaments** – attach bone to bone (sprain = injury to ligament)
- **Tendons** – attach muscle to bone (tendonitis = inflammation of a tendon)
- **Joints** – 100 in the human body, they connect our bones with muscle
- **Bones** – 206 in the human body

### **Types of Stretching**

1. **Static – stretching** a muscle or group of muscles to its farthest point and then holding that position, you are stationary.
2. **Active** – assume a position and then hold it there with no assistance other than using the strength of your agonist muscles (ex. Holding you leg up in the air without your hands)
3. **PNF (Proprioceptive Neuromuscular Facilitation)** – it is a combination of isometric and passive stretching.
4. **Passive** - assume a position and hold it with some other part of your body or with the assistance of a partner or some other apparatus. You are relaxed and make no contribution to the range of motion. An external force is applied by something/someone else.
5. **Isometric** - a type of static stretching (meaning it does not use motion) which involves the resistance of muscle groups through isometric contractions (tensing) of the stretched muscles.
6. **Dynamic** – moving parts of your body and gradually increasing reach and speed, controlled body movements that take you to the limits of your range of motion. Do not confuse dynamic stretching with ballistic stretching.
7. **Ballistic** – jerky (bouncing) movements that force the body beyond its range of motion, you do not want to use this type of stretching!

## **BODY COMPOSITION**

**Body composition** refers to the chemical make-up of the body. It can be divided into two groups: lean body mass and fat mass. **Lean body mass** represents the weight of muscle, bone, internal organs and connective tissue. **Fat mass** is the amount of fat tissue stored in the body. It is essential to maintain some body fat, but an excess level poses a serious health risk. High levels of body fat are associated with high blood pressure, increased levels of blood fats and cholesterol, heart disease, stroke, diabetes and certain cancers. In contrast, very low body fat can cause the development of such medical conditions as heart damage, gastrointestinal problems, shrinkage of internal organs, immune system abnormalities, disorders of the reproductive system, loss of muscle tissue, damage to the nervous system, abnormal growth and even death. Body fat is expressed as a percentage of total body weight.

## **Related Vocabulary**

**Overweight** – is a body weight greater than that allowed by a norm table, usually based on age and height, or height and weight

**Underweight** – is the body weight less than that allowed by a norm table

**Cellulite** – is lumpy fat deposits; actually enlarged fat cells resulting from accumulation of body fat.

**Essential Fat** – the minimal amount of body fat needed for normal physiological functions; about 3% of total fat in men and 10-12% in women.

**Spot reducing** – a myth that claims that exercising a specific body part will result in significant fat reduction in that area.

### **Purpose and functions of fat**

1. Insulates to conserve heat
2. Metabolic fuel for the production of energy
3. Padding to cushion and protect internal organs
4. Normal physiological functioning

It is essential to maintain some body fat, but an excess level poses a serious health risk.

### **Health Risks pertaining to body fat**

**Obesity** is an excessive accumulation of fat weight. The recently completed National Children and Youth Fitness Studies report that young people are more obese than ever before. Obesity is associated with many risk factors of CHD (Coronary Heart Disease), high blood pressure, increased levels of blood fat and cholesterol, stroke and diabetes. Reversal of these risk factors can be achieved by reducing an individual's total body fat. Observing good nutritional principles relating to lowering personal consumption of saturated fats, sweets and excessive calories are important lifestyle changes that an individual must make.

Exercise and physical activity can also contribute to achieving optimal body composition. The adult onset of obesity appears to be strongly related to poor physical activity patterns. Obese young people tend to be less active than their non-obese peers.

In contrast, it is important to note, very low levels of body fat can cause the development of such medical conditions as heart damage, gastrointestinal problems, shrinkage of internal organs, immune system abnormalities, disorders of the reproductive system, loss of muscle tissue, damage to the nervous system, abnormal growth and even death. A small but significant number of children also develop eating disorders that lead to extremely low levels of body fat. It is important for students to adopt healthy behaviors that promote acceptable body composition early in life.

### **Recommended % of Body fat**

It is recommended that a girl's body fat fall between 15-25% and a boy's body fat fall between 10-20%. Boys and girls increase their risk of disease if their body fat is greater than 30% (females) and 25% (males).

**FACT:** People who are overweight and go on a crash diet lose nearly ½ the weight in muscle and water.

**FACT:** If a person eats just 10 calories above what they need per day, they will gain 1 pound of fat per year. (1 pound of fat = 3500 calories)

### **4 Methods of Measuring Body Composition**

1. **skinfold** – calipers measure the thickness of skin folded or pinched at specific landmarks on the body. The numbers are used in calculations to determine an estimate of percentage of body fat.
2. **bioelectrical impedance machines** – measure the percent of body fat by running a low-level electrical current through the body. The more resistance encountered the more fat there is. This method of measuring body fat is less time consuming, safe, and inexpensive but it is also not as accurate as other methods.
3. **hydrostatic weighing** – weight in water relative to body volume (most accurate form of testing)
4. **body mass index** – a chart used to indicate the appropriateness of a student's weight relative to their height. BMI recommendations:

18-25	Normal
26-30	Overweight
31 and up	Obese

$$\text{BMI} = [\text{weight in pounds}/\text{height in inches}^2] \times 703$$

\*When using BMI as an indicator for obesity it is important to remember muscle mass is NOT considered in the formula.

### **Weight Loss**

The only way to lose weight is to burn more calories than you consume. Unfortunately, uninformed individuals often go about losing weight the wrong way when they intentionally starve themselves in an effort to lose weight. The best way adequately lose weight (and keep it off) is to adjust your lifestyle by exercising regularly and eating as healthy as possible. In order to eat as healthy as possible, one must eat the daily recommended serving of each of the major food groups.

### **Weight Control**

Constant weight control or maintenance is more desirable for adequate health than the sporadic dieting periods in which considerable weight is swiftly lost, but later regained. It is important to be able to assess your own activity/weight patterns to allow you to place these in balance.

# NUTRITION

## 6 Essential Nutrients

**1. Carbohydrates** – provide energy for the muscles from starches and sugars in the form of glycogen. The best source of carbohydrates that are digested quickly come from fruits, milk and milk products, and vegetables. Stay away from candy, soda beverages, syrups, and table sugar which provide calories but no vitamins, minerals, and fiber. There are 4 calories per gram of carbohydrates.

**2. Complex Carbohydrates** – contain three or more sugars. Good sources of complex carbohydrates include legumes, starchy vegetables, and whole grain breads and cereals.

**3. Fat** – Primary source of stored energy that is used in long-term aerobic activity. It also helps the body to absorb vitamins. There are 9 calories per gram of fat.

**Saturated** – A fat, most often of animal origin, that is solid at room temperature. An excess of these fats in the diet is thought to raise the cholesterol level in the bloodstream.

**Unsaturated** – A fat derived from plant and some animal sources, especially fish that is liquid at room temperature. Plant sources include avocados, olives, walnuts, and some vegetable oils. Intake of foods containing more unsaturated fats than saturated fats may contribute to reduced blood cholesterol levels.

**Trans Fats** – These are formed during a process called hydrogenation. Trans fats raise blood cholesterol and can raise the risk of heart disease. May trans fats are found in processed foods such as margarine and donuts, crackers and fast foods.

### **Recommendations for fat intake:**

- Keep total fat intake between 25-30% of total calories with most fats coming from fish, nuts, seeds, and oils.
- Read labels and stay away from foods containing the words “hydrogenated” or “partially hydrogenated” in the ingredient list.
- Limit saturated fat consumption.
- Limit fast food, especially anything that is deep fried.

*Recommendations from the American Heart Association.*

**4. Fiber** – the indigestible part of plant foods the body can’t digest. Fiber helps you feel full, aids in digestion, and helps control your weight. The best sources of fiber are whole grains, beans, nuts, fruit and vegetables.

**5. Proteins** – essential for developing new muscle tissue and maintaining existing muscle tissue, helps control the water level inside and outside the cells. These break down into amino acids. There are 4 calories per gram of protein. Sources of protein include meat, dairy products, nuts, certain grains, and beans.

**Complete Proteins** – proteins that supply the body with all the amino acids it cannot make on its own. Animal products are complete proteins.

**Incomplete Protein** – proteins that do not supply the body with all the amino acids it cannot make on its own. Plant proteins are incomplete and must be combined to make complete proteins.



**6. Minerals** – help form structures in the body and regulate body processes. Some examples of minerals are calcium, sodium, potassium, and iron.

**7. Vitamins** – help to regulate metabolic reactions in the body. The body needs 13 vitamins. These are: A, D, E, K, C, thiamine, riboflavin, niacin, pantothenic acid, B-6, B-12, and folate.

**8. Water** – essential for temperature control, carries nutrients to cells and removes waste from cells, water makes up 60-70% of the body's weight. All cells need water to function. Water is lost through perspiration, urine, breath, and digestion. It is important to replace lost fluids to avoid dehydration.

### **Replacing Water Loss – How much?**

You may not feel thirsty but you may need more fluids. By the time you feel thirsty, your body may already be dehydrated. Frequent trips to the bathroom are a sign that you are probably drinking enough.

The water requirement is the amount necessary to balance losses that can vary markedly. The National Research Council recommends approximately 1.5 ml of water per calorie of energy expended. Thus, the average female requires between 10-12 cups. A good rule of thumb is to drink 8 cups of plain water daily with an additional 3-4 cups consumed in foods and other beverages such as milk. In addition, the more active you are and the hotter or more humid the weather, the more water your body requires.

### **Serving Suggestions**

- Water is more palatable at refrigerator temperature and is rapidly assimilated from the intestinal tract when ingested at this temperature.
- Use a frosty mug and add a slice of lemon or lime.
- Sip with a straw.
- Carry a 32 ounce water bottle in the car...it just takes two!
- Drink one cup in the morning when you brush your teeth, one cup with each meal and snack and one cup at bedtime.

### **8 Reasons for Drinking 8 Glasses**

1. Water is an essential nutrient.
2. Carries nutrients to cells and transports wastes to kidneys and lungs for excretion.
3. Carries hormones and disease fighting cells through the bloodstream.
4. Necessary for many chemical reactions of digestion and metabolism.
5. Assists in temperature regulation; cools through sweat.
6. Protects and cushions tissues; lubricates joints.
7. Provides satiety, gives a full feeling.
8. Assists with constipation relief.

**Fluid Replacement Guidelines:**

- ✓ Drink 16-20 oz. of water 1 to 1 1/2 hours before outdoor activity.
- ✓ Consume 6 to 12 ounces of fluid every 10-15 minutes while exercising outside.
- ✓ After activity drink 16 to 24 ounces more.
- ✓ Water is all you need if you are participating in a low or moderate intensity activity such as walking for 60 minutes or less. If you are participating in a high intensity exercise outside for 1+ hours, it is sage to add a sports drink containing sodium and potassium to replace those lost through sweat.
- ✓ Urine from a hydrated person should be pale or straw colored.

## **Related Vocabulary**

**Metabolism** – process that converts the food we eat to glucose which is the primary fuel for energy. Regular exercise helps maintain a higher level of metabolism resulting in a greater number of calories burned throughout the day.

**Calorie** – the amount of energy required to raise the temperature of one gram of water by one 1° Celsius at 15° Celsius. All calories that the body cannot absorb and utilize are stored as excess calories. Excess calories, regardless of quality, will be converted to body fat or waste products.

**Diabetes Mellitus** – the pancreas fails to make enough insulin to regulate the amount of glucose in the blood or when body cells become resistant to insulin. Insulin takes glucose from the blood and delivers it to the cells. Diabetes is becoming much more common in young adults, especially those that are overweight. To help prevent diabetes you should: *eat a diet rich in complex carbohydrates, eat fruits and vegetables*, avoid alcohol, keep your weight down, and *exercise regularly*.

**Dehydration** – physical condition that results from not having enough water in your body. The symptoms of dehydration are: thirst, chills, clammy skin, throbbing heart beat, nausea, headache, cramps, shortness of breath, dizziness, dryness in the mouth.

**Hyponatremia** – a lower than normal level of sodium in the blood. Too little sodium is related to problems with fluid balance, blood pressure regulation, and normal nervous system function. Sometimes called “water intoxication” when related to consumption of excess water during strenuous exercise without replacement of sodium.

## **TriFit 600**

The TriFit 600 system is the method used to assess, manage data and analyze student’s physical fitness levels. The following tests are completed on or entered into the TriFit computer:

1. Height
2. Weight
3. Blood pressure
4. Body composition (bioelectrical impedance)
5. Muscular endurance (sit-ups and push-ups)
6. Cardiovascular (mile run, 1.5 mile run, PACER, 12 min. swim)
7. Flexibility (modified sit and reach)

## **Heart Rate Monitors**

Heart rate monitors will be utilized in activity and fitness, students will wear a chest strap transmitter which will send heart rate information to a wrist watch receiver. Students are required to have their own elastic strap. These watches can monitor the amount of time a student spends in a generalized training zone of 140-190 beats per minute (appropriate to high school age students).

## **Body Awareness**

**The value of learning body awareness:** To better understand how the body functions so one can perform physical activities efficiently and in a safe manner.

### **Balance**

The three (3) principles of balance state that the body is more stable when:

1. the body's center of gravity is directly over the base of support.
2. the body's center of gravity is lower to the ground.
3. the base of support is wider.

### **Controlling the body in the air:**

1. Swing the hands up to the ears – swinging the arms behind the ears will cause the body to arch and the individual will lose control and most likely fall.
2. Pull the toes slightly forward.
3. Squeeze abdominals, gluteus maximus, and thighs so they are all tight

**Landing** – When landing, the following body position is most efficient:

1. The feet should be shoulder width apart.
2. The knees should be bent so they are directly over the toes.
3. The shoulders should be directly over the knees.
4. The arms are at shoulder height and pointing outward away from the midline of the body.

### **Falling**

When falling forward onto the hands – the hands should be turned inward so thumbs are pointing towards each other. This will allow the arms to bend upon impact

### **The importance of the head position:**

The body will respond to changes in the head position in the following ways:

1. When the chin is in the chest – the body tends to curl into a ball.
2. When the head is back – the body tends to arch.
3. When the head is turned to the right or left – the body will twist in that direction.

### **Strongest Body Position**

The strongest body position is when the joints (ankles, knees, hips, and shoulders) are aligned. The abdominals, gluteus maximus, and thighs should be squeezed tightly.