# BASIC COURSE INSTRUCTOR UNIT GUIDE

## 32

## PHYSICAL FITNESS/OFFICER STRESS

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THE COMMISSION
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The curricula contained in this document is designed as a *guideline* for the delivery of performance-based law enforcement training. It is part of the POST Basic Course guidelines system developed by California law enforcement trainers and criminal justice educators in cooperation with the California Commission on Peace Officer Standards and Training.

# UNIT GUIDE 32

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# CURRICULUM

## I. INTRODUCTION TO LIFETIME FITNESS

A. What is "Lifetime Fitness"?

1. For the purpose of this curricula, "lifetime fitness" relates to a commitment by the individual officer to a lifestyle which supports the development and maintenance of physical and mental health.

2. Lifetime fitness also includes the application of risk management concepts to avoid physical ailments and disablers common to peace officers.

3. Lifetime fitness extends beyond the job environment into the officer's personal life where a commitment is made to maintaining a healthy lifestyle.

B. Elements of "Lifetime Fitness"

1. The knowledge and skills necessary to self-evaluate current fitness to include:

   a. Assessment of current physical fitness levels

   b. Estimation of current body composition

   c. Evaluation of current lifestyle practices

2. Applying risk management techniques to avoid or mitigate physical and psychological disablers common to law enforcement officers to include:

   a. Understanding substances which are commonly abused by law enforcement officers (e.g., alcohol, tobacco, prescription and nonprescription medications, etc.)

   b. Understanding the nature of physical disablers and illnesses common to law enforcement officers (e.g., cardiovascular disease, low back injury, etc.)

   c. Understanding basic techniques for maintaining psychological health (e.g., managing stress, adequate rest, exercise, recreation, etc.)

   d. Understanding behaviors which unnecessarily increase the risk of disease or injury (e.g., activity, poor lifting techniques, etc.)

3. Commitment to an individualized program of regular exercise which incorporates:

   a. Cardiovascular activity

   b. A stretching/flexibility component

   c. Muscular strength development

   d. Muscular endurance development

4. Management of body composition through:

   a. A program of physical conditioning

   b. Maintenance of good eating habits

5. Application of sound nutritional principles including:

   a. Understanding individual caloric needs

   b. Understanding the need to appropriately balance basic food constituents

   c. The ability to make appropriate food choices and analyze food labels

## II. PHYSICAL DISABLERS

A. Primary physical disablers of law enforcement officers

1. Cardiovascular disease

2. Lower back injuries

3. Gastrointestinal disorders

   a. Stomach ulcers

   b. Cancers (e.g. colo-rectal, stomach)

4. Substance abuse

   a. Alcohol

   b. Tobacco

   c. Prescription and nonprescription drugs

   d. Illegal substances

B. Cardiovascular disorders

1. Coronary heart disease victimizes over 600,000 Americans annually in the form of a heart attack or myocardial infarction.

2. Most heart attacks are caused by arteriosclerosis and atherosclerosis.

3. The most common form of heart attack occurs when a blood clot (thrombus) clogs a coronary artery already narrowed by plaque.

   a. Atherosclerosis is a condition in which fatty substances collect inside the walls (lumens) of the arteries.

   b. Arteriosclerosis is a common peripheral vascular disease normally found in the elderly.

   c. This deposit leads to a narrowing of the artery and a reduction of blood flow (ischemia).

   d. As the narrowing develops, the oxygen supply to the heart is reduced. The reduction in oxygen supply may affect work capacity without obvious symptoms. As this process continues, the risk of experiencing a heart attack increases.

4. Stress can contribute to the progression of cardiovascular disorders.

   a. Peace officers are under a great deal of emotional and physical stress.

b. Although the job may be considered sedentary, many times the officer is required to go suddenly from minimum to maximum effort.

5. The relationship of warmup activity to the cardiovascular function

   a. Tests have shown that failure to warm up before vigorous activity may result in electrocardiogram abnormalities.

   b. Failure to warm up properly may cause a lack of oxygen to the heart muscle. In some individuals this lack of oxygen could account for the occurrence of heart attacks.

   c. If a person who is considered fit takes a risk when engaging in physical activity without a warmup, the problem is compounded in emergency situations for an officer who has risk factors.

6. Evidence of cardiovascular problems is becoming prevalent in younger people, possibly due to dietary trends.

   a. We now have documented cases of coronary heart disease in individuals in their twenties.

   b. Cardiac-related disability claims by safety personnel in their late thirties and early forties are common occurrences.

   c. Since peace officers are in a high risk group, they have an obligation to themselves, their family, and their agency to reduce their risk factors as much as possible.

7. Increased blood fats (hyperlipidemia) is caused by the presence of:

   a. Cholesterol

      (1) Cholesterol is derived from animal fats.

      (2) The two major types of cholesterol are high-density (HDL) and low-density lipoproteins (LDL)

      (3) HDL are the "good guys" with the purpose of removing fats from the arteries.

      (4) LDL are the "bad guys" and are partially responsible for depositing fats in the arteries.

   b. Triglycerides

      (1) Triglycerides constitute the most common storage form of fat in the body.

      (2) When needed, they can be broken down and used as energy.

8. Elevated blood pressure (hypertension) is also a serious problem.

a. The average blood pressure is 120/80, but it varies with individuals. Each person should know their normal blood pressure.

b. Borderline hypertension is usually 140/90.

9. Factors contributing to heart disease and hypertension include:

a. Tobacco use

b. High body fat

c. Physical inactivity

d. Stress

e. Use of stimulants (e.g. caffeine, ephedrine "PEP")

10. The more risk factors, the greater the chance of developing cardiovascular disorders.

C. Lower back disorders

1. Back disorders are the result of:

a. Poor physical conditioning

b. Poor posture and biomechanics

c. Major and minor trauma

d. Degenerative changes

e. Improper weight control

f. Stress (emotional and environmental)

g. Sudden or heavy exertion (e.g. violent physical confrontation, picking up duty bag, brief case)

2. Many lower back ailments are caused by weakening of the abdominal wall muscles, causing shifting of body alignment.

3. The condition may develop slowly, but the pain may manifest itself acutely.

4. Adequate job training, proper conditioning and good exercise programs minimize the risk of low back injury.

5. Officers must be physically prepared to perform intermittent or sudden heavy work involving:

a. Frequent and strenuous bending

b. Lifting and carrying

c. Pushing and pulling

6. Officers may be required to perform their duties in an awkward and unbalanced position. Therefore, they must be thoroughly familiar with proper biomechanical techniques.

D. Gastrointestinal disorders

1. Stomach ulcers

a. Stomach ulcers may be indicative of emotional and environmental stresses and strains.

b. An ulcer is an open sore in the skin or mucous membrane that heals slowly. A wound is not an ulcer.

c. Many people have peptic ulcers (ulcers in the lining structure) in the stomach. Ulcers also occur in the duodenum, which is the part of the intestine that is located immediately below the stomach.

d. Ulcers are typically caused by a bacterial infection.

e. Ulcers are also frequently caused by failure to effectively manage stress.

f. Too much gastric juice can also contribute to stomach ulcers.

g. The ulcer symptoms may be aggravated by the presence of ethyl alcohol in the stomach which further damages already ulcerated tissue.

h. The release of adrenalin-like substances prompted by stress (e.g. flight or fight reaction) can be contributing factors in gastrointestinal disorders, stomach ulcers, duodenal ulcers, nervous stomach and colitis (inflammation of the colon). These ailments are commonly experienced by emergency services personnel.

i. Excess acid in the stomach keeps the ulcer from healing (helps keep it chronic). Ulcers of this kind usually cause pain or distress in the pit of the stomach.

j. Ulcers may sometimes bleed and are most dangerous when they perforate (eat through) the stomach. This condition may lead to peritonitis.

k. Stomach ulcers are treated with drugs, diet and stress management. Some ulcers require surgical treatment.

2. Gastrointestinal cancers

There is some evidence that indicates peace officers suffer from higher incidents of gasto-intestinal cancers. (e.g. colo-rectal, stomach)

E. Alcohol use and abuse

1. Medically, alcohol is a depressive or sedative drug that slows the activity of the central nervous system.

2. Ethyl alcohol is the ingredient in alcoholic beverages that causes intoxication.

3. Alcohol enters the blood stream rapidly and can be circulated to all parts of the body within minutes.

    a. Absorption is generally slowed by food in the stomach.

    b. Alcohol primarily affects the central nervous system. Alcohol actually deadens control centers in the brain, which results in intoxication.

4. Short-term effects of alcohol

    a. Intoxication occurs in six basic stages:

        (1) The "happy" stage, when the subject is happy, talkative, sociable, and relaxed.

        (2) The "excited" stage, marked by emotional and erratic behavior.

        (3) The "confused" state, when staggering, disorientation, and moodiness are prevalent. Frequently, exaggerated fear is experienced.

        (4) The "stupor" stage, when walking and standing are almost impossible and paralysis is fast approaching.

        (5) The "coma" stage, with complete unconsciousness and no reflexes. Respiratory paralysis is highly possible, followed by death.

        (6) The "next day" stage, when the imbiber experiences a hangover and all the attendant symptoms.

5. Alcohol and exercise do not mix.

    a. Alcohol affects the distribution of blood circulation throughout the body.

    b. When a person exercises, certain muscles work and the body will rush as much blood to the working muscles as needed. The body will not deprive the brain or the heart of blood. Since alcohol affects all the arteries, the body needs to take the blood from other organs (e.g. kidney).

    c. It takes approximately one hour for the average sized person (based upon a 150 pound male) to metabolize 1/2 oz. of alcohol. Several hours should elapse between alcohol intake and an exercise session.

6. Long-term effects of alcohol

a. Addiction

(1) Addiction is defined as a state of being devoted, habitually or compulsively, to some habit, practice, or pursuit, especially drugs.

(2) Early recognition of psychological dependence on alcohol is accomplished by obtaining a history of a drinking pattern. Following is a list of eight symptoms of alcohol drinking that should be looked for in the suspected alcoholic. It should be emphasized that this pattern of drinking is a characteristic that alcoholics have in common, regardless of age.

(a) Preoccupation: The alcohol-dependent person is occasionally preoccupied with the next time she/he will be able to drink.

(b) Increased tolerance: The alcoholic is able to consume greater amounts of alcohol than nonalcoholics.

(c) Gulping of drinks: As with any kind of dependency, the person drinks in a manner that allows the alcohol to act quickly on him/her.

(d) Drinking alone: Sociability is not the important factor.

(e) Use as a medicine: Once the alcoholic receives the rewarding effects of alcohol, he/she often thinks of alcohol as a kind of panacea.

(f) Blackout: The alcoholic has difficulty recalling some of the events of the previous day.

(8) Protection of the supply: Sometimes the alcoholic feels more comfortable if they know that alcohol is available. Alcoholics feel reassured if they know that there is sufficient alcohol at home, in the trunk of the car, or in the office desk.

(9) Nonpremeditated use: Alcoholics often drink more than they plan to or know they should, or they simply start drinking without even thinking about it.

NOTE: If a person has four or more of the above eight symptoms, it is likely that he/she is an alcoholic.

7. Alcohol can have an adverse effect on health.

a. Although it is possible that drinking less than 2 oz. of alcohol per day may cause no direct harm, continued drinking over a period of years can.

b. Overindulgence and the malnutrition which are symptomatic of chronic alcoholism can lead to cirrhosis of the liver, damage to the nervous system and other degenerative conditions.

F. Tobacco use (both smoking and smokeless)

1. Short-term effects of tobacco use: Tobacco use severely inhibits the body's ability to absorb and distribute oxygen to sustain normal body functions.

   a. Constriction of the arteries, especially the coronary and cerebral arteries

   b. Increased carbon monoxide and reduction of oxygen in the blood, resulting in:

      (1) Muscle weakness

      (2) Increased heart rate

      (3) Elevated blood pressure

2. Long-term effects of tobacco

   a. Addiction

      (1) Tobacco use is probably the most addictive and dependence-producing form of object specific, self-administered gratification known to humans.

      (2) Patterns of tobacco use parallel patterns of use of other addictive drugs.

   b. Effects of tobacco use on the cardiovascular and respiratory systems:

      (1) The presently accepted theory is that toxic chemicals in smoke pass through the lungs into the bloodstream. The combination of the action of the toxic chemicals and the constriction of the arteries makes the arteries more vulnerable to plaque (arteriosclerosis), especially in the coronary arteries.

      (2) All smokers develop emphysema if they continue to smoke and live long enough.

   c. Tobacco users stand a much greater chance of developing cancer of the lungs, mouth and other organs.

   d. Smoke directly from the lit end of a cigarette or cigar or the bowl of a pipe has twice the tar and twice the nicotine, and five times the carbon monoxide as directly inhaled smoke.

   e. Secondhand smoke (expelled smoke and smoke stream smoke) has been proven harmful to those people breathing it, whether or not they are smokers.

   f. If a smoker can stop smoking and there has been no irreparable damage, by the end of four to five years the lungs of that person will be pretty much back to normal.

3. Although some of the following substances may have legitimate uses (when used properly and in appropriate doses), there is a danger of overuse/abuse which could lead to health hazards and addiction.

   a. Caffeine (soft drinks, tea, coffee, chocolate)

   b. Prescription drugs

   c. Nonprescription drugs

   d. Illegal drugs

## III. RISK MANAGEMENT STRATEGIES

A. Risk management pertains to the assessment of current risks and determination of current fitness levels to include:

1. Application of appropriate education and training

2. Estimation of current body composition

3. Evaluation of current practices as they relate to illness and injury risk

B. Risk management involves the development and implementation of an individualized action plan which incorporates the following elements:

1. Regular exercise

2. Body composition management

3. Proper nutrition

4. No substance abuse (e.g. tobacco, alcohol)

5. Management of stress

6. Flexibility program with emphasis placed on stretching the lower back

C. Risk management programs should be complemented and augmented with continuing education and training

D. Officers who follow a risk management program reduce the chance of developing or exacerbating disabler(s) common to law enforcement officers.

## IV. CONCEPTS OF STRESS MANAGEMENT

A. What is stress?

1. Stress is a nonspecific response of the body to any demand made on it.

2. Not all stress is "bad" stress.

3. It is the failure to manage stress effectively which leads to disabling effects.

B. Causes of stress may include:

1. Conflicts with supervisors and co-workers

2. Role conflicts (e.g. the requirement to suppress emotion)

3. Anger/frustration

4. Fear

5. Rotating shifts

6. Family expectations

7. Time constraints and workload pressures

8. Disillusionment/disagreement with other components of the criminal justice system

9. Confronting extremes of human emotion (e.g. anger, hostility, frustration, despair, etc.)

10. Emotionally draining experiences

C. The following are potential physical indicators of stress, but are not all-inclusive.

1. High blood pressure

2. Shortness of breath

3. A marked increase in use of:

(a) Coffee

(b) Alcohol

(c) Tobacco

(d) Prescription or nonprescription drugs

(e) Other substances capable of being abused

4. Eating disorders

5. Trembling hands, sweating, dizziness or nausea

6. Sexual dysfunctions

7. Sleeping disorders (e.g. insomnia, excessive sleeping)

D. Physiological responses to stress include:

1. An individual under continual stress has an increase in blood adrenalin and adrenalin-like products.

2. These substances are produced by the body in preparation for "flight or fight."

3. The adrenaline-like release causes increases in:

(a) Heart rate

(b) Contractibility of the heart

(c) Consumption of oxygen (dramatic increase)

E. Techniques for managing stress will vary by individual but may include any of the following:

1. Regular exercise

NOTE: Additional information on exercise benefits can be found in this Unit Guide under Section VII: Principles of Physical Conditioning

2. Proper nutrition

3. Removal from the stressful activity/environment if possible.

4. Recognition of personal stress thresholds

5. Prioritization of work hours if possible

6. Participation in religious activity

7. Professional and peer counseling

8. Relaxation (e.g. vacations, hobbies, reading a book)

9. Sufficient sleep

10. Biofeedback

11. Meditation

12. Massage/acupuncture therapy

13. Laughter/appropriate humor

14. Recreation/play

## V. CONCEPTS OF EFFECTIVE NUTRITION

A. The purposes of this section are to:

1. Provide guidelines for identifying a safe and sound lifelong eating plan; and

2. Describe the basic elements of nutrition

B. What is nutrition?

1. Nutrition may be defined as the science of nourishing the body properly (e.g., adequately providing for its growth, maintenance, and repair).

2. To nourish the body, foods must contain substances that do one or more of the following:

   a. Furnish body fuel

   b. Provide materials for the building or maintenance of body tissues

   c. Supply substances that act to regulate body processes

3. Solid foods and liquids provide the fuels necessary for energy and enable our bodies to perform optimally, both mentally and physically, each day.

C. General overview of a nutritional plan

1. A nutritional plan identifies the overall daily percentage intake of fats, complex carbohydrates and proteins.

2. Generally speaking, of the daily calories consumed by an individual:

   a. 25% or less should consist of fat

   b. 12%-18% should consist of proteins

   c. The remaining calories should consist of complex carbohydrates.

EXAMPLE: A daily caloric intake of 1,500 calories would ideally consist of 20% fat (300 calories), 15% protein (225 calories); and 65% complex carbohydrates (975 calories).

3. Most Americans have poor eating habits. The application of a sound nutritional plan generally results in the following changes:

   a. A significant reduction of fat intake

   b. A moderate reduction in protein intake

   c. An increase in complex carbohydrate intake (whole grains, fruits, and vegetables)

d. An increase in fiber intake

e. A reduction in refined sugar intake

f. A reduction in caffeine and alcohol intake

g. An increase in water intake

D. Overweight versus overfat

1. Although people are often concerned with "weight loss" and "weight gain", the correct issue is one of "fat loss" or "fat gain".

2. It is important to understand that a person can be overweight according to accepted height and weight tables and not be overfat. Conversely, it is also possible to be at ideal weight on these tables and yet actually be overfat.

3. The average scale can only determine the aggregate weight of the object weighed.

   a. A scale will not reveal anything about the composition of what is being weighed.

   b. The scale does not tell anything about the ratio of fat to "lean body mass" (i.e. everything else... muscle, bone, water, etc.).

4. There is no safe, quick way to lose fat weight nor is there a magic diet or miracle food.

5. In order for a weight loss or a weight maintenance program to be successful, the nutritional plan must be well balanced and combined with a regular aerobic exercise program. The object is to decrease overall body fat, not lean body mass.

6. For weight loss to occur, the number of calories used by the body for fuel must exceed the overall number of calories the person consumes.

E. Types of food constituents/nutrients

1. Carbohydrates

   a. Generally, carbohydrates should account for 65% or more of daily caloric intake

   b. When calculating calories, one gram of carbohydrates equals approximately four (4) calories.

   c. The primary function of carbohydrates is to supply a fuel source for energy, especially for high intensity exercise.

   d. Carbohydrates are the most abundant nutrients in foods.

e. One of the principal roles of carbohydrates in the diet is to supply energy in the form of blood glucose.

f. Carbohydrates are divided into two classes:

(1) Complex carbohydrates

(a) Complex carbohydrates consist of starches, glycogen, and cellulose (fiber).

(b) Some examples of complex carbohydrates are:

1) Grain products (e.g., breads, cereals, bran, pasta)

2) Legumes (e.g., beans, peas, and lentils)

3) Tubers (e.g.,potatoes and yams)

4) Fruits

5) Vegetables

(c) Complex carbohydrates are broken down into glucose units in approximately one to four hours after a meal and, consequently, provide more sustained energy to the body.

(2) Simple carbohydrates

(a) Ordinary table sugar and honey are good examples of simple carbohydrates.

(b) Many types of sugars are found in simple carbohydrates (e.g. sucrose, fructose, glucose, etc.)

(c) This becomes important because many food labels will list these "....ose" ingredients, rather than calling them "sugar". Popular breakfast cereals are notorious in this regard.

(d) Simple carbohydrates are broken down into glucose units very quickly, but typically do not provide a sustained source of energy to the body.

g. If the overall intake of carbohydrate calories exceeds the number of calories that are consumed by bodily activity, they will be stored in the body as body fat.

2. Fats

a. Fats should comprise approximately 25% or less of daily caloric intake.

b. Fats have a very high fuel value. When calculating calories, one gram of fat equals approximately nine (9) calories.

c. If the intake of fat calories exceeds the number of calories that are consumed by bodily activity, it will be stored in the body as body fat.

d. In the most simplistic sense, body fat is simply unburned stored fuel.

e. Types of fats

(1) Fats are divided into three basic categories: saturated, polyunsaturated and monounsaturated.

(a) Generally a saturated fat is a solid at room temperature (e.g., bacon grease, butter, margarine, lard, etc)

(b) Unsaturated fats (polyunsaturated and monounsaturated) are liquid at room temperature

(2) Fats come from either animal or plant sources.

(a) Fats that come from animal sources contain cholesterol.

(b) Fats of animal origin are relatively high in saturated fatty acids.

(c) Fats that come from plant sources do not contain cholesterol.

(3) Consuming less saturated and more polyunsaturated and monounsaturated fats is thought to be effective in reducing the risk of heart disease.

(4) Generally speaking, poultry and fish are lower in saturated fat than red meat. Some cuts of properly cooked lean red meat, however, may be lower in saturated fat than dark meat poultry cooked with its skin on.

(5) Usually, plant source fats have a much lower content of saturated fatty acids and a higher content of unsaturated fatty acids.

(a) Corn, cottonseed, soybean, safflower, sunflower and wheat germ oils are especially high in polyunsaturates and are thus more desirable than saturated fats.

(b) Olive, peanut, canola and avocado oils are classified as monounsaturated fats. A mix of the polyunsaturates and mononsaturated fats is generally the best choice.

(c) Palm, palm kernel and coconut oils, in contrast, are extremely high in saturated fat and are thus undesirable.

(6) Eating an excess of saturated fat foods, such as beef and pork, or butter and cheese, may lead to elevated blood cholesterol levels.

3. Proteins

a. Proteins should comprise approximately 12%-18% of daily caloric intake.

b. When calculating calories, one gram of protein equals approximately four (4) calories.

c. Proteins are present in all living tissues (plant or animal) and are essential to life because they are a vital part of every cell.

d. Proteins are made up of great numbers of relatively simple nitrogen-containing compounds called amino acids.

e. In a protein, 21 to 23 different amino acids are present and are linked together in a great variety of ways.

f. The role of protein in food is not to provide body proteins directly but to supply the amino acids from which the body can build and repair its own cells.

g. There are eight essential amino acids that the body cannot make at all. To make body protein, a cell must have all 21 to 23 amino acids available simultaneously.

h. A complete protein is a protein that contains all of the essential amino acids. Fish and milk, for example, contain complete proteins.

i. Animal sources contain complete protein and plant sources contain incomplete proteins.

j. Foods which do not contain complete proteins may be supplemented with other grains and vegetables to make complete proteins.

k. Any meal plan that contains complete proteins, whether derived from animal sources or by combining vegetables and grains, is adequate with respect to protein.

4. Water intake

a. Water serves as an important regulating substance in the body.

b. An individual can live only for a few days without water.

c. Water holds substances in solution in the blood, digestive tract and tissues.

d. Water assists in the regulation of excretion, circulation, body temperature and many other body processes.

e. Usually more water is excreted by the kidneys in the urine than by other channels (e.g., lungs, skin, and stools), but in hot weather, a larger amount is thrown off in perspiration in order to assist in regulating body temperature.

f. Water can be replaced from a variety of sources.

(1) Liquids such as milk, soups and other beverages

(2) Solid foods which contain water such as:

(a) Fresh or cooked vegetables

(b) Fresh or cooked fruits

(c) Cooked cereals (e.g., oatmeal)

g. The best source of water replacement is pure water, as opposed to alcoholic beverages or coffee, tea or other caffeinated beverages which act as diuretics (i. e., increase the secretion and flow of urine) .

h. About 64 ounces of water per day are recommended.

(1) An individual involved in an exercise program requires additional water replacement.

(2) It is recommended that water be taken according to a schedule rather than by perceived thirst.

(3) Perceived thirst indicates that some dehydration has already taken place.

5. Vitamins and minerals

a. Vitamins and minerals are necessary in the digestion of food and for the body's normal growth and good health. However, they are just one part of good nutrition plan.

b. Vitamins and minerals have long been associated with mystique and fallacy.

c. Many people believe that large doses of certain vitamins and minerals can cure anything from depression to cancer.

d. The fact is, however, that there is little, if any, scientific evidence that supports miracle cures with the use of vitamins and minerals.

e. Even though vitamin companies would like the public to believe in vitamin miracles, the people taking large doses may actually be harming themselves.

f. General information about vitamins and minerals:

(1) Vitamins are divided into two classes:

(a) Fat soluble vitamins (e.g., A, D, E, K)

(b) Water soluble vitamins, (e.g., C, B, complex)

(2) The main differences between fat soluble and water soluble vitamins are:

(a) Fat soluble vitamins are absorbed from the intestine along with fats and lipids in foods.

(b) Water soluble vitamins dissolve in water and are assimilated by the body as needed.

(c) Excesses of fat soluble vitamins are stored in the body, whereas excess water soluble vitamins are excreted in the urine.

(d) Fat soluble vitamins are more stable under heat than the water soluble vitamins and are less likely to be lost in the cooking and processing of foods.

(e) Fat soluble vitamins and trace minerals are stored in the body and can reach toxic levels quite easily. Therefore, extra caution must be taken with respect to dosage.

g. A supplement can help correct imbalances resulting from poor eating habits., but they can never take the place of a healthy diet of fresh and unrefined foods.

## VI. PRINCIPLES FOR MANAGING BODY COMPOSITION

A. The purpose of managing body composition

1. "Overweight", overfat and obesity are significant health issues in law enforcement.

2. An understanding of body composition management principles is fundamental to long-term weight control and optimal health.

3. The overall objective is to provide information on how to reduce body fat and increase lean body mass.

B. Body composition components

1. Body tissue is divided into two basic categories:

   (a) Nonfat tissue

   (b) Fat tissue

2. Nonfat tissue (also referred to as "lean body mass") includes:

   (a) Blood

   (b) Bone

   (c) Muscle

   (d) Organ tissue

3. Fat tissue includes:

   (a) "Essential fat" which is necessary for physiological health (needed to protect body organs, etc.)

   (b) "Storage fat" which becomes an energy reserve.

C. Body composition assessment

1. Body fat, rather than body weight, is a more accurate indicator of the general health of an individual.

2. The amount of fat in the body is commonly expressed as a percentage.

3. The oldest and easiest method of assessing one's body fat is looking in the mirror.

   a. Usually, 50%-70% of the body fat is stored near the surface of your skin (subcutaneous fat).

   b. It is generally obvious when one has too much body fat.

c. In addition to the mirror test, an individual can do a pinch test.

(1) The skin can be pinched gently between the thumb and forefinger on various (designated) parts of the body.

(2) In general, if the fold of skin and fat on any part of the body is thicker than 3/4", then the individual has too much body fat.

(3) Tables are available for use in converting skinfold thickness into percent of body fat for men and women.

4. Other methods of body fat assessment

a. A number of more scientific methods can be used to estimate body fat rather than by just looking at oneself in the mirror or by giving oneself the pinch test.

b. Other methods of measuring an individual's percent of body fat include:

(1) Skinfold calipers

(2) Bioelectrical impedance testing

(3) Underwater (hydrostatic) weighing

D. The importance of weight control

1. Obesity has become a national health problem in the United States.

NOTE: Defining the term "obesity" is difficult because there is no recognized standard at this time. The spirit behind this, however, is to manage body fat which may adversely impact health and physical performance.

2. Obesity with reference to the amount of fat on a body (percent body fat) may increase the risk of developing other physical complications and diseases.

3. Some diseases of the heart and the circulatory system are associated with obesity.

4. Obesity may also contribute to:

a. High blood pressure

b. High heart rate

c. Atherosclerosis

d. Diabetes

e. Kidney problems

f. Liver problems

g. Osteoarthritis

h. Gall bladder disease

i Cancer

5. Overfat pregnant women tend to experience more complications during delivery and are more likely to deliver a stillborn baby.

6. The optimal, or ideal, percent of body fat for an individual is that which is conducive to optimal health.

   a. Presently, researchers cannot agree on exactly what those optimal values are for a given individual.

   b. Most health authorities estimate that the optimal range of percent body fat in the United Statesis 10%-18% for a male and 15%-25% for a female.

E. Control of body composition

1. The most effective means of controlling body fat are the combined practices of good nutrition and regular exercise.

2. Neither one alone can be as effective as the combination of the two.

3. How much fat the body stores depends on one's caloric intake and expenditure.

   a. Intake is determined by the types and quantities of food consumed.

   b. Expenditures are determined by the amount of caloric burning activity of the body.

   c. If caloric intake is higher than expenditure, the excess is stored as fat.

   d. If expenditure is higher than intake, the body will need to break down and burn stored fats, resulting in a loss of body fat.

4. Other factors relating to caloric intake

   a. Generally speaking, a moderately active male needs approximately 2,800 calories a day to maintain weight.

   b. A moderately active female needs approximately 2,100 calories to maintain weight.

   c. Assuming a person wanted to lose 2 pounds a week, (just by limiting calories), they would have to reduce daily intake by 1,000 calories (3,500 calories equal 1 lb).

   NOTE: A far more effective strategy however, would be a individualized program of exercise combined with a more conservative reduction in caloric intake.

5. The effect of physical activity on calorie expenditure and body composition:

   a. Any type of physical activity burns calories. The nature, intensity, and duration of the activity determine the number of calories that are burned.

   b. In this sense, any type of physical activity could potentially affect body composition.

   c. Different types of physical activity produce changes in the body that also affect body composition in addition to the caloric deficit they create.

      (1) Walking (3.5 mph) burns approximately 5 calories per minute.

      (2) Bike riding burns approximately 8 calories per minute.

      (3) Swimming burns approximately 11 calories per minute.

      (4) Running burns approximately 15 calories per minute.

      (5) If a person runs 30 minutes three times a week, he/she can burn off approximately 1,350 calories, or about one-half of a pound of body fat.

   d. Generally, increasing the level of physical activity in one's everyday life will have a beneficial effect on body composition.

   e. Strength training activities such as weight lifting and muscle conditioning tend to increase muscle mass and will also increase energy expenditure.

   f. Aerobic activities (e.g., walking, bicycling, running and jumping rope, etc.) are an effective way to reduce overall body fat percentage. This is true for several reasons:

      (1) This type of activity relies primarily on a combination of oxygen and fat for fuel, rather than other types of fuel that are stored in muscle tissues.

      (2) Aerobic activities, when performed regularly over a period of time, produce metabolic changes.

         (a) This results in an increased burning of fat, not only while exercising but also while at rest.

         (b) Aerobic activities can be enhanced by lengthening the duration and frequency of the workouts and keeping the intensity of the workouts moderate.

         EXAMPLE: For example, running 3 times a week at a 7-minute pace for 20 minutes will not have as great an effect on the body composition as running 5 times a week at a 9-minute pace for 40 minutes. The key is to increase the frequency and duration of aerobic activities, not the intensity, to control body composition.

## VII. PRINCIPLES OF PHYSICAL CONDITIONING

NOTE: Additional detail regarding physical conditioning is contained in the *POST Basic Academy Conditioning Manual.*

A. Basic principles of conditioning

1. Progressive overload

a. The intent of progressive overload is to add incremental physical stress to a targeted body system (e.g. cardiovascular or muscular) in order to increase physical work capacity.

b. The stress/increased work capacity interaction is the foundation of the physical conditioning process.

(1) Essentially, the body is forced to do more than it is used to.

(2) The body will adapt by preparing itself to do more work the next time.

(3) Over time, workload is increased in small increments.

c. Excessive overload can lead to injury.

2. Specificity

a. Specificity involves the selection of an activity that matches the performance goal.

b. The body will respond specifically to the type of work it is forced to do. (e.g. Riding a stationary bike will increase cardiovascular endurance, but will not totally prepare the person to run a foot race.)

3. Frequency

a. Frequency relates to how often the work sessions occur in a given week.

b. More sessions equate to more overload

c. Generally, the recommended minimum is three sessions per week.

d. The intervening period of rest is important for body recovery.

e. Too little rest can result in overtraining and injury.

NOTE: Current recommendation is three to five sessions per week of cardiovascular activity and 48 hours of rest between strength training sessions for the same muscle group.

4. Intensity

a. Intensity relates to the percentage of a person's maximum effort which is performed in a given exercise session

NOTE: The *POST Basic Academy Physical Conditioning Manual* contains specific percentages of aerobic capacity, repetitions and sets for strength training.

b. Generally, as the person's physical condition improves, the intensity level increases.

5. Duration/time

a. Duration is the amount of time devoted to the conditioning period and does not include warmup and cooldown time.

b. Every exercise session should include a warmup/stretch and a cooldown/stretch component.

c. For cardiovascular training, the general recommendation is 20-60 minutes per session.

d. For strength training, rest between sets should normally be 45-60 seconds.

B. Components of an exercise session

1. Warmup phase

a. Every exercise session should begin with a warmup. The purpose is to:

(1) Increase the muscle and body core temperatures

(2) Increase blood flow to the working muscles and joints

b. The warmup will properly prepare the body for stretching.

NOTE: Generally the best warmup is the conditioning activity at a lower intensity. (e.g. jogging before running)

2. Stretching phase

a. Stretching should only be done after the muscles are adequately warmed up. The purpose of stretching prior to exercise is to:

(1) Increase range of motion

(2) Reduce risk of injury

b. Stretching prior to the conditioning phase is only mandatory when the activity will be ballistic (explosive) in nature and/or involve full range of motion (e.g. obstacle course, sprinting).

c. Stretching is not **always** necessary before starting an exercise session (e.g. prior to a moderate jog).

NOTE: Stretching should be static with each position held for a 20-40 seconds.

3. Conditioning phase

   a. This is the activity that addresses the primary conditioning goal. (e.g. cardiovascular endurance, muscular strength/endurance and body composition change)

   b. In some cases, more than one activity can occur in the same session. (e.g. calisthenics followed by distance running)

4. Cooldown phase

   a. Every exercise session should end with a cooldown. The purpose is to:

      (1) Gradually decrease exercise heart rate

      (2) Pump waste products out of the muscle tissue

      (3) Lower body temperature

      (4) Reduce risk of blood pooling and the related risk of cardiac arrest

   b. Generally, intensity should taper off as the session concludes. (e.g. Sprinting at the end of a distance run is inadvisable.)

   NOTE: Generally the best cooldown is the conditioning activity at a lower intensity.

5. Stretching phase

   a. Stretching may also be done after the cooldown. The purpose of stretching following exercise is to:

      (1) Reduce the likelihood of soreness

      (2) Attain optimal range of motion

   b. Stretching after cooldown is not **always** necessary.

C. Elements of a personal physical fitness program

1. Cardiovascular element: Any aerobic activity which elevates the heartrate to 60-85 percent of the estimated maximum heartrate for a minimum of 20 minutes

   a. Body composition

(1) Slow pace, long duration and more frequent aerobic activities are the most effective for reducing body fat and will also increase the body's ability to burn fat.

(2) Over time, the muscle tissue becomes more efficient at oxidizing fat.

b. Work capacity

(1) Baseline cardiovascular endurance is improved with moderate intensity levels of aerobic exercise.

(2) Anaerobic threshold is increased through high-intensity, short duration aerobic activity.

c. Cardiovascular exercise may reduce the risk of a variety of serious illnesses including:

(1) Cardiovascular disease

(2) Cancer

(3) Stress-related illnesses

2. Flexibility element: Developing/maintaining the optimal ability to move a joint through a full range of motion

a. Stretching

(1) A static stretch is the gradual application of increased tension, prior to the point of pain, across a major movable joint of the body typically sustained for 20-40 seconds.

(2) A ballistic stretch is a repeated bouncing stretching technique that causes the muscles to tighten rather than increase range of motion. (generally not recommended)

b. Application of stretching to injury reduction strategies in the following areas:

(1) Occupation

(2) Sports

(3) Recreation

(4) Exercise

3. Muscular strength element: The maximum force a muscle can exert one time

a. Strength training uses progressive resistance over several sessions of exercise to increase the amount of force a specific muscle group can exert.

b. Generally, all major muscle groups of the body should be worked in balance beginning with the largest muscle group and working to the smallest.

c. Generally, one exercise per major muscle group is performed in three sets of 8-12 repetitions maximum to the point of temporary muscle failure.

(1) "Temporary muscle failure" is defined as the point at which another repetition cannot be performed with proper technique.

(2) When the individual can exceed the 12-repetition maximum, increase the resistance by 5%. (overload principle)

4. Muscular endurance element: Increasing or maintaining the number of times a muscle can contract before it fatigues

a. Generally, when body weight is the resistance, after several exercise sessions the muscle's endurance will be improved versus its strength. (e.g. calisthenics including pushups, pullups, situps)

b. While calisthenics will not generally enhance strength, strength training will enhance muscular endurance.

c. Cardiovascular activities enhance muscular endurance but not necessarily muscular strength. (e.g. Running does not significantly increase the strength of the leg muscles.)

## VIII. DEVELOPMENT OF A PERSONAL FITNESS PROGRAM

A. The elements of lifetime fitness generally consist of the following components:

1. Cardiovascular endurance

2. Muscular strength

3. Muscular endurance

4. Flexibility

5. Body composition management

B. The first step in developing a personal fitness program is to assess each person's base fitness level with regard to each of these components.

1. Following the determination of ones fitness level, specific exercises at the appropriate intensity and duration can be identified.

2. This instructor unit guide includes nationally recognized procedures designed to measure an individual status on these factors. These tests are listed below.

3. According to a consensus of law enforcement fitness professionals, officers who fall below the 60th percentile for their age and gender group may be considered unfit.

NOTE: When developing individualized programs based on the test results, students should be aware of and apply the principles of conditioning as described in Section VII of this instructor unit guide.

4. Additional information regarding the development and maintenance of fitness programs can be found in the:

a. *POST Basic Academy Physical Conditioning Manual*

b. *POST Inservice Physical Fitness Program Officer's Manual*

c. Reference section of this instructor unit guide

C. The five components of fitness and methods of self-evaluation are:

1. Cardiovascular fitness

a. 1.5 mile run test

b. Step test

c. 3 mile walk test

2. Flexibility: Sit and reach test

3. Muscular strength

   a. Bench press test

4. Muscular endurance

   a. Push ups test

   b. Bent knee sit ups test

5. Body composition

   a. Percent

   b. Waist-hip ration

   c. Mirror test

   d. Pinch test

NOTE: Test protocols and scoring charts for each of these above procedures are provided in this instructor unit guide under the supporting material/reference section where the scoring charts are presented in terms of how a person of a particular age and gender should score in order to be considered physically fit.

D. Evaluation and treatment of training injuries

1. There are two types of training injuries.

   a. Acute injuries

      (1) Acute injuries are the consequence of a specific event, mishap or accident.

      (2) Examples include sprains, strains, fractures, dislocations, etc.

      (3) Instructors and students should be aware that as fatigue increases, environmental awareness decreases and acute injuries are more likely to happen.

      (4) Medical attention should be sought if warranted.

   b. Chronic injuries

      (1) Chronic injuries (overtraining/overuse) are not the consequence of one incident, but are the result of several exercise sessions when:

         (a) The individual does too much too soon

         (b) The body mechanics of the individual are abnormal

      (2) Examples include soft tissue inflammation, shin splints, tendinitis.

(3) Prevention would include appropriate progression of duration, frequency and intensity.

c. Treatment of training injuries

(1) Self-treatment

(a) Rest, Ice, Compress, Elevate (RICE)

(b) Nonprescription anti-inflammatory drugs (e.g. aspirin, ibuprofen, naprosyn)

(c) Generally pain that is vague, gradual in its onset and not associated with limiting normal range of movement can be self-treated.

1) Pain that fits the above description, comes on during activity and disappears when the activity ceases can often be self-treated.

2) Pain that fits the above description, comes on during activity, but that goes away after two or three days of rest (over the weekend) can also often be self-treated.

3) Pain that persists more than three days of rest, is focused and limits movement should **not** be self-treated.

(2) Professional medical treatment (e.g. formal medical evaluation, physical therapy, etc.)

# SUPPORTING MATERIAL

# AND

# REFERENCES

This section is set up as reference information for use by training institutions. These materials can be used for instruction, remediation, additional reading, viewing, or for planning local blocks of instruction. This list is not an endorsement of any author, publisher, producer, or presentation. Each training institution should establish its own list of reference materials.

## TOPICAL LIST OF SUPPORTING MATERIALS AND REFERENCES INCLUDED IN THIS SECTION

Dispelling Myths about Nutrition, Diet and Exercise
Physical Fitness Test Battery Protocols
Computing the Target Zone Pulse Rate

## MYTHS ABOUT NUTRITION, DIET AND EXERCISE

1. **FAD DIETS**

FALLACY. Fad diets work. Weight can be lost fast and kept off.

FACT:

a. Any significantly calorically restricted diet will produce a loss of body weight.

b. There is NO value to certain foods (or combinations) over any other in terms of promoting fat loss. There are no miracle fat-burning foods.

c. The more rapidly a person loses body weight by dieting, the more likely he or she will regain the weight after going off the diet.

d. Dieting actually causes the body to lower its metabolic rate, resulting in an increased tendency to regain and store fat.

e. The weight lost through fad dieting is composed of water, lean mass (muscle tissue) and fat. The weight gained after going off the diet is mostly fat.

f. Over 90% of the people who lose weight through fad diets regain the weight within a year.

2. **SWEATING**

FALLACY: Fat is burned when one sweats; therefore, increasing perspiration will increase fat loss.

FACT:

Fat boils at 360°F. Sweating is the body's primary mechanism for maintaining its core temperature at 98.6°F. The sweat needs to evaporate in order for this mechanism to function properly. Plastic suits or heavy clothing forces the body to sweat profusely as it struggles to stay cool. The resulting rise in body temperature can cause heat prostration, heat stroke, brain damage, and death. All water lost through sweating must be replaced by ingesting fluids and food. Sweating does not increase fat loss. During exercise one should always wear appropriate clothing for the temperature and humidity conditions.

3. **MUSCLE TO FAT**

FALLACY: One should not develop muscles because they will turn to fat when exercise is discontinued.

FACT:

Muscle and fat are two entirely separate tissues, neither of which can turn into the other. Muscle tissue can be gained and fat tissue lost primarily through proper nutrition and regular exercise.

Muscle tissue can be lost and fat tissue gained primarily through improper nutrition and lack of exercise.

4. **SPOT REDUCING**

FALLACY: It is possible to spot-reduce fat at specific locations on the body either by exercising the area (e.g., sit-ups for abdominal fat) or by the use of devices such as body wraps.

FACT:

There is NO way to spot-reduce fat except for surgical removal. When a particular muscle group performs work that requires fat for energy, the fat may be taken from ANY storage site. In other words, while one is doing 300 sit-ups, the body may be using fat from the legs or arms.

The best way to reduce total body fat is by large muscle aerobic exercise that lasts more than 40 minutes and is performed on a frequent basis (5-7 days a week).

Wearing elastic wraps around certain parts of the body will cause water to be flushed from that area through profuse sweating. The water loss is quickly replaced shortly after removal of the device, and no fat is burned through the use of these wraps.

5. **DIET PILLS**

FALLACY: Taking "diet" pills will result in safe long-term fat loss.

FACT:

Diet pills are not considered safe by most experts and do not result in permanent weight loss. For any diet pill regimen to be effective for a lifetime, it would be necessary to take the pills for life. Considering the potentially harmful side effects and lack of proven effectiveness, it is impossible to recommend ANY form of diet pill as a healthful method of weight control.

**SUMMARY**

Scale weight is not the best measure of fitness. Body composition, or the amount of your body weight that is fat, is a better measure of fitness. This is often expressed as body fat percentage. Obesity (being over fat) has become a national health problem in the U.S. It increases the risk of developing heart disease and high blood pressure and is associated with many other diseases.

The best way to control body fat percentage is through proper nutrition and exercise. A prudent diet, well balanced and low in fat, combined with a regular aerobic exercise program will have the biggest effect on body composition.

Adopting healthy eating and exercise habits for a lifetime is the key to achieving and maintaining body composition changes.

# PHYSICAL FITNESS TEST BATTERY PROTOCOLS

## Body Composition Measures

### A. Percent Body Fat (Skinfold Measurement)

Materials: Harpenden or Lange skinfold calipers

Procedures:

1. Instructions to Participants: "This test estimates your percentage of body fat by measuring the thickness of the layer of fat beneath the skin at three different places."

2. Note: This procedure requires a relatively high level of technical proficiency or inaccuracies are likely to result. It is recommended that the person who takes the skinfolds be formally trained in skinfold measurement technique. If no one is so trained, this test may be omitted.

   All measurements should be taken on the non-dominant side. Perform all three measurements once, then repeat all three again. Do not take the same measurement twice in a row. If the two measurements for any site differ by more than one millimeter, repeat the measurement. If necessary, continue to repeat the measurement until two measurements at the same site are within one millimeter. Record each measurement in the space provided on the POST Fitness Battery Score Sheet.

   When taking measurements, grasp skinfold between thumb and index finger so as to include two thicknesses of skin and subcutaneous fat but no muscle tissue. (Make sure that all skin and fat are pulled away from underlying muscle.) If in doubt regarding the presence of muscle tissue, ask person to contract muscle. Apply calipers approximately one centimeter above fingers. Hold calipers with slight inward pressure at a depth approximately equal to the thickness of the fold.

3. For males, take the skinfold measurements at the chest, abdomen, and thigh.

4. For females, take the skinfold measurements at the tricep, suprailiac (hip) and thigh.

5. The correct procedure for taking these skinfolds is illustrated in Figures 1-5.

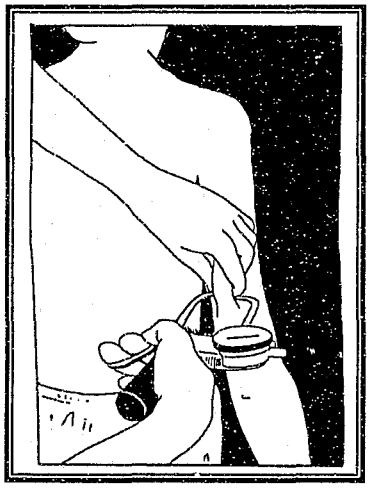


Figure 1 Tricep site

Figure 2 Chest Site
(Male only)

ale only)

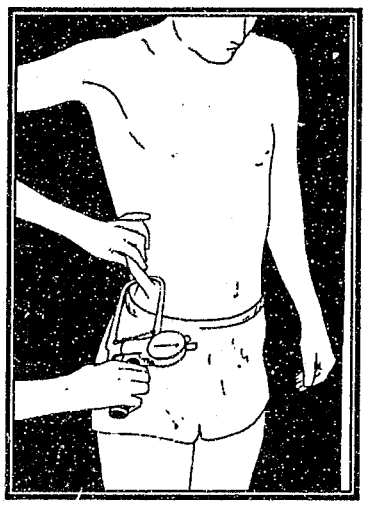


**Figure 3 Suprailiac Site**
(Female only)

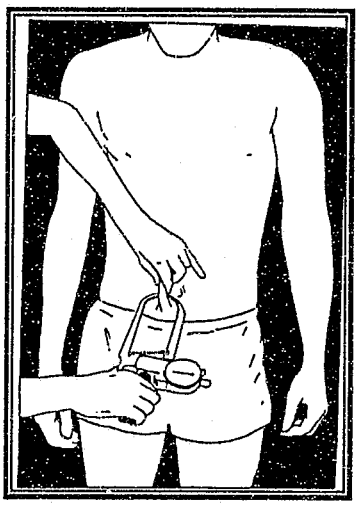


**Figure 4 Abdomen site**
(Male only)

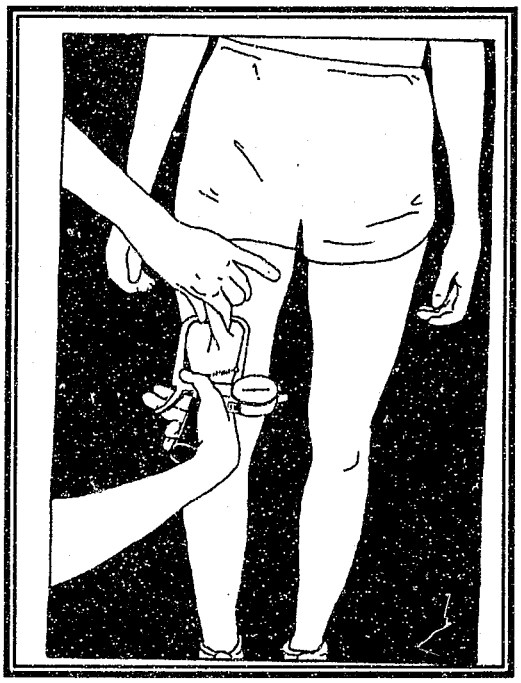


**Figure 5 Thigh Site**
(Male and Female)

6. Calculate percent body fat using the attached tables for males and females:

   First, calculate the sum the three skinfold measurements (i.e., add up the **chest, abdomen** and **thigh** or males and **triceps, suprailiac,** and **thigh** for females) in millimeters.

   Then, go to Table A (for Males) or Table B (for Females) and find the sum (mm) in the left-hand column. Look in the row across from the sum (mm) under the person's age.

   Percent Body Fat equals the number that appears in the cell under the person's age and across from his/his sum of skinfolds (mm).

# TABLE A: PERCENT BODY FAT CONVERSION TABLE FOR MALES

Estimation of relative body fat, by percent*, in men from the sum of chest, abdominal, and thigh skinfolds (from Pollock, et al. 1980).

| Age to Last Year<br>Sum of Skinfolds<br>(mm) | Under 22 | 23 to 27 | 28 to 32 | 33 to 37 | 38 to 42 | 43 to 47 | 48 to 52 | 53 to 57 | Over 58 |
|---|---|---|---|---|---|---|---|---|---|
| 8-1 | 1.3 | 1.8 | 2.3 | 2.9 | 3.4 | 3.9 | 4.5 | 5.0 | 5.5 |
| 11-13 | 2.2 | 2.8 | 3.3 | 3.9 | 4.4 | 4.9 | 5.5 | 6.0 | 6.5 |
| 14-16 | 3.2 | 3.8 | 4.3 | 4.8 | 5.4 | 5.9 | 6.4 | 7.0 | 7.5 |
| 17-19 | 4.2 | 4.7 | 5.3 | 5.8 | 6.3 | 6.9 | 7.4 | 8.0 | 8.5 |
| 20-22 | 05.1 | 5.7 | 6.2 | 6.8 | 7.3 | 7.9 | 8.4 | 8.9 | 9.5 |
| 23-25 | 6.1 | 6.6 | 7.2 | 7.7 | 8.3 | 8.8 | 9.4 | 9.9 | 10.5 |
| 26-28 | 7.0 | 7.6 | 8.1 | 8.7 | 9.2 | 9.8 | 10.3 | 10.9 | 11.4 |
| 29-31 | 8.0 | 8.5 | 9.1 | 9.6 | 10.2 | 10.7 | 11.3 | 11.8 | 12.4 |
| 32-34 | 8.9 | 9.4 | 10.0 | 10.5 | 11.1 | 11.6 | 12.2 | 12.8 | 13.3 |
| 35-37 | 9.8 | 10.4 | 10.9 | 11.5 | 12.0 | 12.6 | 13.1 | 13.7 | 14.3 |
| 38-40 | 10.7 | 11.3 | 11.8 | 12.4 | 12.9 | 13.5 | 14.1 | 14.6 | 15.2 |
| 41-43 | 11.6 | 12.2 | 12.7 | 13.3 | 13.8 | 14.4 | 15.0 | 15.5 | 16.1 |
| 44-46 | 12.5 | 13.1 | 13.6 | 14.2 | 14.7 | 15.3 | 15.9 | 16.4 | 17.0 |
| 47-49 | 13.4 | 13.9 | 14.5 | 15.1 | 15.6 | 16.2 | 16.8 | 17.3 | 17.9 |
| 50-52 | 14.3 | 14.8 | 15.4 | 15.9 | 16.5 | 17.1 | 17.6 | 18.2 | 18.8 |
| 53-55 | 15.1 | 15.7 | 16.2 | 16.8 | 17.4 | 17.9 | 18.5 | 18.1 | 19.7 |
| 56-58 | 16.0 | 16.5 | 17.1 | 17.7 | 18.2 | 18.8 | 19.4 | 20.0 | 20.5 |
| 59-61 | 16.9 | 17.4 | 17.9 | 18.5 | 19.1 | 19.7 | 20.2 | 20.8 | 21.4 |
| 62-64 | 17.6 | 18.2 | 18.8 | 19.4 | 19.9 | 20.5 | 21.1 | 21.7 | 22.2 |
| 65-67 | 18.5 | 19.0 | 19.6 | 20.2 | 20.8 | 21.3 | 21.9 | 22.5 | 23.1 |
| 68-70 | 19.3 | 19.9 | 20.4 | 21.0 | 21.6 | 22.2 | 22.7 | 23.3 | 23.9 |
| 71-73 | 20.1 | 20.7 | 21.2 | 21.8 | 22.4 | 23.0 | 23.6 | 24.1 | 24.7 |
| 74-76 | 20.9 | 21.5 | 22.0 | 22.6 | 23.2 | 23.8 | 24.4 | 25.0 | 25.5 |
| 77-79 | 21.7 | 22.2 | 22.8 | 23.4 | 24.0 | 24.6 | 25.2 | 25.8 | 26.3 |
| 80-82 | 22.4 | 23.0 | 23.6 | 24.2 | 24.8 | 25.4 | 25.9 | 26.5 | 27.1 |
| 83-85 | 23.2 | 23.8 | 24.4 | 25.0 | 25.5 | 26.1 | 26.7 | 27.3 | 27.9 |
| 86-88 | 24.0 | 24.5 | 24.1 | 25.7 | 26.3 | 26.9 | 27.5 | 28.1 | 28.7 |
| 89-91 | 24.7 | 25.3 | 25.9 | 25.5 | 27.1 | 27.6 | 28.2 | 28.8 | 29.4 |
| 92-94 | 25.4 | 26.0 | 26.6 | 27.2 | 27.8 | 28.4 | 29.0 | 29.6 | 30.2 |
| 95-97 | 26.1 | 26.7 | 27.3 | 27.9 | 28.5 | 29.1 | 29.7 | 30.3 | 30.9 |
| 98-100 | 26.9 | 27.4 | 28.0 | 28.6 | 29.2 | 29.8 | 30.4 | 31.0 | 31.6 |
| 101-103 | 27.5 | 28.1 | 28.7 | 29.3 | 29.9 | 30.5 | 31.1 | 31.7 | 32.3 |
| 104-106 | 28.2 | 28.8 | 29.4 | 30.0 | 30.6 | 31.2 | 31.8 | 32.4 | 33.0 |
| 107-109 | 28.9 | 29.5 | 30.1 | 30.7 | 31.3 | 31.9 | 32.5 | 33.1 | 33.7 |
| 110-112 | 29.6 | 30.2 | 30.8 | 31.4 | 32.0 | 32.6 | 33.2 | 33.8 | 34.4 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 113-115 | 30.2 | 30.8 | 31.4 | 32.0 | 32.6 | 33.2 | 33.8 | 34.5 | 35.1 |
| 116-118 | 30.9 | 31.5 | 32.1 | 32.7 | 33.3 | 33.9 | 34.5 | 35.1 | 35.7 |
| 119-121 | 31.5 | 32.1 | 32.7 | 33.3 | 33.9 | 34.5 | 35.1 | 35.7 | 36.4 |
| 122-124 | 32.1 | 32.7 | 33.3 | 33.9 | 34.5 | 35.1 | 35.8 | 36.4 | 37.0 |
| 125-127 | 32.7 | 33.3 | 33.9 | 34.5 | 35.1 | 35.8 | 36.4 | 37.0 | 37.6 |

*Percent fat calculated by the formula by Siri: Percent Fat = [(4.95/BD) - 4.5] * 100, where BD = Body density.

# PERCENT BODY FAT CONVERSION TABLE FOR FEMALES

Estimation of relative body fat, by percent*, in women from the sum of triceps, suprailiac, and thigh skinfolds (from Pollock, et al. 1980).

| Age to Last Year<br>Sum of Skinfolds (mm) | Under 22 | 23 to 27 | 28 to 32 | 33 to 37 | 38 to 42 | 43 to 47 | 48 to 52 | 53 to 57 | Over 58 |
|---|---|---|---|---|---|---|---|---|---|
| 23-25 | 9.7 | 9.9 | 10.2 | 10.4 | 10.7 | 10.0 | 11.2 | 11.4 | 11.7 |
| 26-28 | 11.0 | 11.2 | 11.5 | 11.7 | 12.0 | 12.3 | 12.5 | 12.7 | 13.0 |
| 29-31 | 12.3 | 12.5 | 12.8 | 13.0 | 13.3 | 13.5 | 13.8 | 14.0 | 14.3 |
| 32-34 | 13.6 | 13.8 | 14.0 | 14.3 | 14.5 | 14.8 | 15.0 | 15.3 | 15.5 |
| 35-37 | 14.8 | 15.0 | 15.3 | 15.5 | 15.8 | 16.0 | 16.3 | 16.5 | 16.8 |
| 38-40 | 16.0 | 16.3 | 16.5 | 16.7 | 17.0 | 17.2 | 17.5 | 17.7 | 18.0 |
| 41-43 | 17.2 | 17.4 | 17.7 | 17.9 | 18.2 | 18.4 | 18.7 | 18.9 | 19.2 |
| 44-46 | 18.3 | 18.6 | 18.8 | 19.1 | 19.3 | 19.6 | 19.8 | 20.1 | 20.3 |
| 47-49 | 19.5 | 19.7 | 20.0 | 20.2 | 20.5 | 20.7 | 21.0 | 21.2 | 21.5 |
| 50-52 | 20.6 | 20.8 | 21.1 | 21.3 | 21.6 | 21.8 | 22.1 | 22.3 | 22.6 |
| 53-55 | 21.7 | 21.9 | 22.1 | 22.4 | 22.6 | 22.9 | 23.1 | 23.4 | 23.6 |
| 56-58 | 22.7 | 23.0 | 23.2 | 23.4 | 23.7 | 23.9 | 24.2 | 24.4 | 24.7 |
| 59-61 | 23.7 | 24.0 | 24.2 | 24.5 | 24.7 | 25.0 | 25.2 | 25.5 | 25.7 |
| 62-64 | 24.7 | 25.0 | 25.2 | 25.5 | 25.7 | 26.0 | 26.7 | 26.4 | 26.7 |
| 65-67 | 25.7 | 25.9 | 26.2 | 26.4 | 26.7 | 26.9 | 27.2 | 27.4 | 27.7 |
| 68-70 | 26.6 | 26.9 | 27.1 | 27.4 | 27.6 | 27.9 | 28.1 | 28.4 | 28.6 |
| 71-73 | 27.5 | 27.8 | 28.0 | 28.3 | 28.5 | 28.8 | 29.0 | 29.3 | 29.5 |
| 74-76 | 28.4 | 28.7 | 28.9 | 29.2 | 29.4 | 29.7 | 29.9 | 30.2 | 30.4 |
| 77-79 | 29.3 | 29.5 | 29.8 | 30.0 | 30.3 | 30.5 | 30.8 | 31.0 | 31.3 |
| 80-82 | 30.1 | 30.4 | 30.6 | 30.9 | 31.1 | 31.4 | 31.6 | 31.9 | 32.1 |
| 83-85 | 30.9 | 31.2 | 31.4 | 31.7 | 31.9 | 32.2 | 32.4 | 32.7 | 32.9 |
| 86-88 | 31.7 | 32.0 | 32.2 | 32.5 | 32.7 | 32.9 | 33.2 | 33.4 | 33.7 |
| 89-91 | 32.5 | 32.7 | 33.0 | 33.2 | 33.5 | 33.7 | 33.9 | 34.2 | 34.4 |
| 92-94 | 33.2 | 33.4 | 33.7 | 33.9 | 34.2 | 34.4 | 34.7 | 34.9 | 35.2 |
| 95-97 | 33.9 | 34.1 | 34.4 | 34.6 | 34.9 | 35.1 | 35.4 | 35.6 | 35.9 |
| 98-100 | 34.6 | 34.8 | 35.1 | 35.3 | 35.5 | 35.8 | 36.0 | 36.3 | 37.2 |
| 101-103 | 35.3 | 35.4 | 35.7 | 35.9 | 36.2 | 36.4 | 36.7 | 36.9 | 37.2 |
| 104-106 | 35.8 | 36.1 | 36.3 | 36.6 | 36.8 | 37.1 | 37.3 | 37.5 | 37.8 |
| 107-109 | 36.4 | 36.7 | 36.9 | 37.1 | 37.4 | 37.6 | 37.9 | 38.1 | 38.4 |
| 110-112 | 37.0 | 37.2 | 37.5 | 37.7 | 38.0 | 38.2 | 38.5 | 38.7 | 38.9 |
| 113-115 | 37.5 | 37.8 | 38.0 | 38.2 | 38.5 | 38.7 | 39.0 | 39.2 | 39.5 |
| 116-118 | 38.0 | 38.3 | 38.5 | 38.8 | 39.0 | 39.3 | 39.5 | 39.7 | 40.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 119-121 | 38.5 | 38.7 | 39.0 | 39.2 | 39.5 | 39.7 | 40.0 | 40.2 | 40.5 |
| 122-124 | 39.0 | 39.2 | 39.4 | 39.7 | 39.9 | 40.2 | 40.4 | 40.7 | 41.9 |
| 125-127 | 39.4 | 39.6 | 39.9 | 40.1 | 40.4 | 40.6 | 40.9 | 41.1 | 41.4 |
| 128-130 | 39.8 | 40.0 | 40.3 | 40.5 | 40.8 | 41.0 | 41.3 | 41.5 | 41.8 |

*Percent fat calculated by the formula by Siri: Percent Fat = [(4.95/BD) - 4.5] * 100, where BD = Body density.

## B. Waist to Hip Ratio

Materials: Spring tension measuring tape

Procedures:

1. Instructions to participants: "This test measures your body composition in terms of the pattern of subcutaneous fat distribution. The measurement is made by comparing your waist circumference to your hip circumference."

2. Demonstrate technique:

   Waist (Abdominal) girth

   The participant stands erect. The assessor uses a cross-handed technique to position the tape horizontally at the level of noticeable waist narrowing. The tape is then placed in the recording position and the measurement is made at the end of a normal exhalation (breath). If there is no noticeable waist narrowing, take the measurement at the same level as the bottom of the rib cage when felt at the side. Be sure the tape is at the same horizontal level all the way around. Record the waist measurement on the POST Fitness Battery Score Sheet.

   Hip (Gluteal) girth

   The participant stands erect with feet together. The tape is positioned at the level where the hips are the largest (usually where the legs start) using the same technique as above, i.e., cross-handed technique to position the tape horizontally. Record the hip girth measurement.

   After performing each measurement once, take each measurement a second time. Do not perform the same measurement twice in a row. If the two measurements (for either hip or waist) are greater than one (1) centimeter apart, repeat the measurement until two values are within 1 centimeter. Take the average of the two measurements which are within 1 centimeter of each other and record this value in the appropriate place on the Score Sheet.

## C. Mirror Test

Usually, 50 - 70 percent of one's body fat is near the surface of your skin (subcutaneous fat). Because of this, it is usually obvious when one has too much body fat.

## D. Pinch Test

In addition to the mirror test, an individual can do a pinch test.

(1) The skin can be pinched gently b etween the thumb and orefinger on various parts of the body.

(2) In general, if the fold of skin and fat on any part of the body is thicker than 3/4 inch, then the individual has too much body fat.

# Cardiovascular Measures

## 1.5 Mile Run

Materials: stopwatch, distance measuring device, traffic cones.

Setup: Measure a 1.5 mile distance, preferably on a track. Mark start and finish lines with traffic cones.

Procedures:

1. Instructions to participant: "This test measures your cardiopulmonary or aerobic endurance. You are to run the 1.5 miles as quickly as you can. This test will be administered once."
2. Position participant at the start line.
3. Set stopwatch to zero and start test with the commands, "ready, go."
4. Clock and record time to the nearest tenth of a second.
5. Observe participant during cool-down. Encourage participant to walk around; discourage participant from laying or sitting down.

## 3 Mile Walk (alternative to 1.5 Mile run)

Materials: stopwatch, distance measuring device, traffic cones.

Setup: Measure a 3.0 mile distance, preferably on a track. Mark start and finish lines with traffic cones.

Procedures:

1. Instructions to Participant: "This test measures your cardiopulmonary or aerobic endurance. Your are to walk the 3.0 miles as quickly as you can.

   **Do not run or jog.** If you run or jog during this test, your trial will be disallowed and you will need to repeat the test at a later time."
2. Position participant at the start line.
3. Set stopwatch to zero and start the test with the commands "ready, go."
4. Clock and record time to the nearest tenth of a second.
5. Observe participants during cool-down. Encourage then to walk around; discourage participant from laying or sitting down.

## 3-Minute Step Test

Materials: 12 inch high sturdy bench; a metronome, a timer (or stopwatch); a stethoscope;

Setup: Set the metronome at 96 bpm (Four clicks of the metronome equal one step -- up, up, down, down at 24 steps per minute)

Procedures:

1. This test measures your cardiopulmonary or aerobic endurance. Your are to step up and down on the bench in time with the metronome for three minutes.

2. Face the bench and, in time the metronome, step one foot up on the bench (first beat), step up with the second foot (second beat), step down with the first foot (third beat), and step down with the other foot (fourth beat). The sequence is alternating feet. It down not matter which foot leads or if the lead foot changes during the test.

3. Do not practice as practice will affect the heart rate.

4. Set stopwatch to zero.

5. Pick up the beat of the metronome by marking time in place.

6. Start the stop watch when participant starts stepping up for the first step.

7. After exactly 3 minutes have elapsed, the participant immediately sits down on the bench or a chair.

8. When participant sits down, immediately place the stethoscope on the chest, get the rhythm and start counting the number heart beats for one full minute.

9. Begin the count on a beat, counting that beat as "zero."

10. The recovery rate count must be started within 5 seconds or the heart rate will be significantly different.

    (NOTE: Pay close attention to the hearts rhythm , which can change suddenly during recovery. It is easy to loose count.)

11. The total 1-minute post-exercise heart rate is the score for the test. That is, the score is the total number of heart beats that occur in the first minute following the 3-minute stepping.

# Flexibility Measure

## Sit and Reach Test

Materials: Sit and Reach Box (see diagram below construction).

Procedures:

1. Instructions to participant: "This test measures the flexibility of the muscles in your lower back and hamstrings. You will be given three trials."

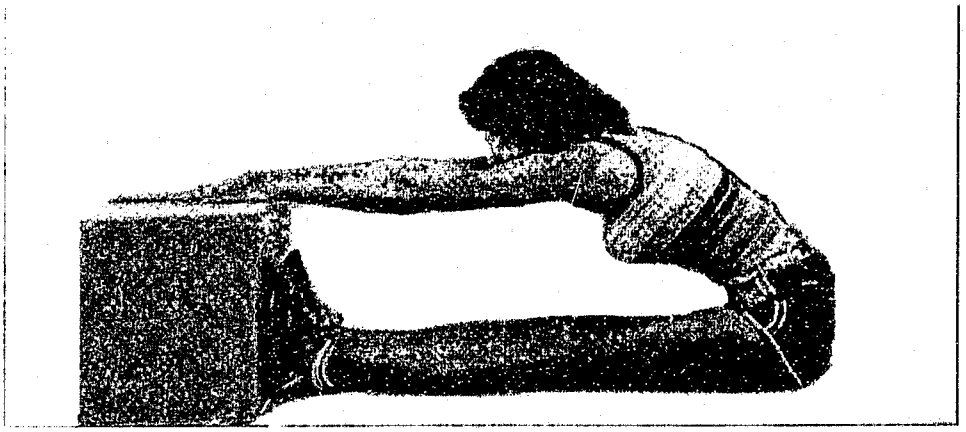
2. Instruct participants to remove shoes.

3. Demonstrate the procedure: (1) Legs are fully extended and the soles of the feet are placed flat against the Sit and Reach Box; (2) hands placed one on top of the other; (3) the arms are extended as far forward as possible in a smooth motion and held for a count of three (Do not lurch forward - move slowly); (4) the point at the tip of the fingers is recorded on the POST Fitness Battery Score Sheet.

4. Guard against the participant's knees bending by keeping a hand on the knees to detect movement.

5. Caution the participant against bouncing or jerking forward.

6. Three trials are given. The best score is recorded.



# Muscular Strength Tests

*A PERSON WHO SUFFERS FROM LOWER BACK AILMENTS SHOULD NOT PERFORM THIS TEST.*

Materials: 35-lb barbell (women); 80-lb barbell (men)
Metronome set for 70 bpm
Conventional bench used for pressing weights or a similar bench.

Procedures:

1.. Set metronome for 60 beats per seconds.

2. Have participant lie on the bench in a supine (fact up) position, with the knees bend and the feet on the floor.

3. Hand the barbell to the participant, who has elbows flexed and palms up (down position).

4. The participant should grip the bar with hands shoulder-width apart.

5. Have the participant then press the barbell upward to extend the elbows fully.

6. After each extension the participant should return the barbell to the original down position.

7. The rhythm is kept by the metronome, with each click representing a movement up or down (60 bpm).

8. Encourage the participant to breath regularly and to no strain during the test to avoid a Valsalva maneuver.

Scoring

Score the number of successful repetitions. The test is terminated when:

(a) Participant is unable to reach full extension of the elbows or

(b) Participant breaks cadence and cannot keep up with the rhythm of the metronome

Safety Consideration

For safety, at least one spotter should be present during the test. If a single spotter is physically unable to catch the weight, two spotters should be present.

# Muscular Endurance Tests

## Push-Up Test

***A PERSON WHO SUFFERS FROM LOWER BACK AILMENTS SHOULD NOT PERFORM THIS TEST.***

Materials: Gym mat

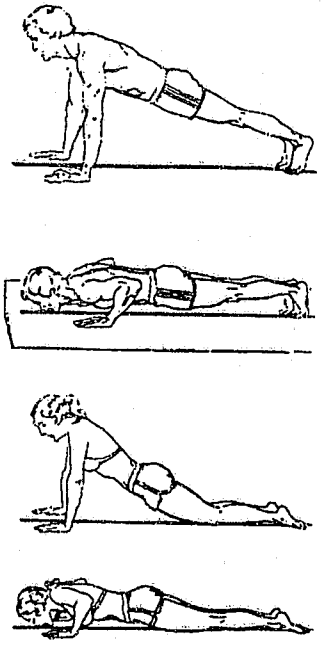
Procedures:

1. Instructions to participant: "This test measures the dynamic strength and endurance of the arm, chest, and shoulder muscles. You are to perform as many push-ups in proper form as you can. The test will be administered once."

2. Demonstrate the correct technique:

   Males: (1) Lie on stomach, legs together; (2) position hands under shoulders and pointing forward; (3) Push up from the mat by fully straightening elbows and using toes as pivotal point; (4) keep upper body in a straight line, don't bend the back; (5) lower body to within two inches of the mat; neither stomach nor thighs should touch the mat

   Females: (1) Lie on stomach, legs together; (2) position hands under the shoulders and pointing forward; (3) Push up from the mat by fully straightening elbows and using knees as pivotal point; (4) keep upper body in a straight line, don't bend the back; (5) lower body to starting position, chin touches the mat, the stomach should not touch the mat; (6) lower legs remain in contact with the mat, ankles straight (point toes).



3. Check for improper technique:

   Males: (1) bending the back; (2) not lowering to within 2 inches of the ground.

   Females: (1) bending the back; (2) not lowering chin to mat; (3) stomach touches mat.

4. Record the number of properly executed push-ups on the POST scoring form.

## BENT-KNEE SIT-UPS

*A PERSON WHO SUFFERS FROM LOWER BACK AILMENTS SHOULD NOT PERFORM THIS TEST.*

Material: Gym mat, timer or stop-watch

Procedure:

The participant lies in a supine position, knees bent at a right angle, and feet shoulder-width apart. The hands are placed at the side of the head with the fingers over the ears. The elbows are pointed toward the Knees. The hands and elbows must be maintained in these positions for the entire duration of the test. Also, the ankles of the participant must be held throughout the test by the appraiser to ensure that the heels are in constant contact with the mat.

The participant is required to sit up, touch the knees with the elbows and return to the starting position (shoulders touch floor). THE PARTICIPANT PERFORMS AS MANY SIT-UPS AS POSSIBLE WITHIN ONE MINUTE. The participant may pause to rest whenever necessary.

It is imperative that the participant is well instructed in the correct performance of the sit-up. The participant should be informed to initiate the sit-up by flattening the lower back followed by actively contracting the abdominal muscles and then continuing the movement with a well-controlled "curling up" of the trunk to the point where the elbows touch the knees. This is followed by a "curling down" of the trunk with particular emphasis on the lower back fully contacting the mat before the upper back and shoulders touch the mat.

A "rocking" or "bouncing" movement is not permitted. Also, the participant's buttocks must remain in contact with the mat and the fingers in contact with the side of the head at all times. Have the participant practice one or two repetitions to check for proper technique.

Advise the participant that incorrect repetitions, those not meeting the above criteria, will not be counted. The participant should also be advised to avoid breath-holding by breathing rhythmically and to "exhale on effort:; i.e., exhale during "curling-up" phase of the sit-up.

When the participant is fully informed of the preceding details and is ready to start the sit-up test, give the command "Begin" and start the timer.

# FITNESS TEST NORM TABLES BY GENDER AND AGE

## PERCENT BODY FAT - FEMALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **20-29** | **30-39** | **40-49** | **50-59** | **60+** |
| | 90 | 14.5 | 15.5 | 18.5 | 21.6 | 21.1 |
| | 85 | 16.0 | 16.9 | 20.3 | 23.6 | 23.5 |
| | **80** | **17.1** | **18.0** | **21.3** | **25.0** | **25.1** |
| | | | | | | |
| | 75 | 18.2 | 19.1 | 22.4 | 25.8 | 26.7 |
| | **70** | **19.0** | **20.0** | **23.5** | **26.6** | **27.5** |
| | | | | | | |
| | 65 | 19.8 | 20.8 | 24.3 | 27.4 | 28.5 |
| Minimum fitness level | **60** | **20.6** | **21.6** | **24.9** | **28.5** | **29.3** |
| | | | | | | |
| | 55 | 21.3 | 22.4 | 25.5 | 29.2 | 29.9 |
| | 50 | 22.1 | 23.1 | 26.4 | 30.1 | 30.9 |
| | 45 | 22.7 | 24.0 | 27.3 | 30.8 | 31.8 |
| | 40 | 23.7 | 24.9 | 28.1 | 31.6 | 32.5 |
| | 35 | 24.4 | 26.0 | 29.0 | 32.6 | 33.0 |
| | 30 | 25.4 | 27.0 | 30.1 | 33.5 | 34.3 |
| | 25 | 26.6 | 28.1 | 31.1 | 34.3 | 35.5 |
| | 20 | 27.7 | 29.3 | 32.1 | 35.6 | 36.6 |
| | 15 | 29.8 | 31.0 | 33.3 | 36.6 | 38.0 |
| | 10 | 32.1 | 32.8 | 35.0 | 37.9 | 39.3 |
| | 5 | 35.4 | 35.7 | 37.8 | 39.6 | 40.5 |
| | 1 | >40.5 | >40.0 | >45.5 | >50.8 | >47.0 |
| | | | | | | |

From: Cooper, K. The Aerobics Institute, Dallas, TX.

## PERCENT BODY FAT - MALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **20-29** | **30-39** | **40-49** | **50-59** | **60+** |
| | 90 | 7.1 | 11.3 | 13.6 | 15.3 | 15.3 |
| | 85 | 8.3 | 12.7 | 15.1 | 16.9 | 17.2 |
| | **80** | **9.4** | **13.9** | **16.3** | **17.9** | **18.4** |
| | | | | | | |
| | 75 | 10.6 | 14.9 | 17.3 | 19.0 | 19.3 |
| | **70** | **11.8** | **15.9** | **18.1** | **19.8** | **20.3** |
| | | | | | | |
| | 65 | 12.9 | 16.6 | 18.8 | 20.6 | 21.1 |
| **Minum fitness*** | **60** | **14.1** | **17.5** | **19.6** | **21.3** | **22.0** |
| | | | | | | |
| | 55 | 15.0 | 18.2 | 20.3 | 22.1 | 22.6 |
| | 50 | 15.9 | 19.0 | 21.1 | 22.7 | 23.5 |
| | 45 | 16.8 | 19.7 | 21.8 | 23.4 | 24.3 |
| | 40 | 17.4 | 20.5 | 22.5 | 24.1 | 25.0 |
| | 35 | 18.3 | 21.4 | 23.3 | 24.9 | 25.9 |
| | 30 | 19.5 | 22.3 | 24.1 | 25.7 | 26.7 |
| | 25 | 20.7 | 23.2 | 25.0 | 26.6 | 27.6 |
| | 20 | 22.4 | 24.2 | 26.1 | 27.5 | 28.5 |
| | 15 | 23.9 | 25.5 | 27.3 | 28.8 | 29.7 |
| | 10 | 25.9 | 27.3 | 28.9 | 30.3 | 31.2 |
| | 5 | 29.1 | 29.9 | 31.5 | 32.4 | 33.4 |
| | 1 | >36.4 | >35.6 | >37.4 | >38.1 | >41.3 |
| | | | | | | |

From: Cooper, K. The Aerobics Institute, Dallas, TX.

## WAIST-TO-HIP RATIO - FEMALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **20-29** | **30-39** | **40-49** | **50-59** | **60+** |
| | 95 | .65 | .66 | .66 | .67 | .71 |
| | 90 | .67 | .68 | .69 | .71 | .73 |
| | 85 | .68 | .69 | .71 | .72 | .74 |
| | **80** | **.69** | **.71** | **.72** | **.73** | **.75** |
| | | | | | | |
| | 75 | .71 | .72 | .73 | .74 | .76 |
| | **70** | **.72** | **.73** | **.74** | **.75** | **.77** |
| | | | | | | |
| | 65 | .73 | .74 | .75 | .76 | .78 |
| Minimum fitness level | **60** | **.73** | **.75** | **.76** | **.77** | **.79** |
| | | | | | | |
| | 55 | .74 | .75 | .76 | .77 | .80 |
| | 50 | .75 | .76 | .77 | .78 | .81 |
| | 45 | .76 | .77 | .78 | .79 | .82 |
| | 40 | .76 | .78 | .79 | .80 | .83 |
| | 35 | .77 | .78 | .79 | .81 | .84 |
| | 30 | .78 | .79 | .80 | .82 | .85 |
| | 25 | .78 | .80 | .82 | .84 | .86 |
| | 20 | .79 | .81 | .84 | .85 | .87 |
| | 15 | .80 | .83 | .86 | .86 | .88 |
| | 10 | .82 | .85 | .87 | .88 | .91 |
| | 5 | .85 | .87 | .92 | .92 | .94 |
| | | | | | | |

From: Canadian standardization Test of Fitness Operations Manual, Third Edition, 1986

## WAIST-TO-HIP RATIO - MALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **20-29** | **30-39** | **40-49** | **50-59** | **60+** |
| | 95 | .76 | .80 | .81 | .82 | .84 |
| | 90 | .80 | .81 | .83 | .85 | .88 |
| | 85 | .81 | .82 | .8.4 | .87 | .89 |
| | **80** | **.81** | **.83** | **.86** | **.89** | **.90** |
| | | | | | | |
| | 75 | .82 | .84 | .87 | .89 | .90 |
| | **70** | **.83** | **.84** | **.88** | **.90** | **.91** |
| | | | | | | |
| | 65 | .83 | .85 | .89 | .91 | .92 |
| Minimum fitness level | **60** | **.84** | **.86** | **.90** | **.92** | **.93** |
| | | | | | | |
| | 55 | .85 | .87 | .91 | .92 | .94 |
| | 50 | .85 | .88 | .92 | .93 | .94 |
| | 45 | .86 | .89 | .92 | .94 | .95 |
| | 40 | .87 | .90 | .93 | .95 | .96 |
| | 35 | .87 | .91 | .94 | .95 | .97 |
| | 30 | .88 | .92 | .95 | .96 | .98 |
| | 25 | .89 | .93 | .95 | .98 | .99 |
| | 20 | .91 | .94 | .97 | .99 | 1.00 |
| | 15 | .93 | .95 | .99 | 1.01 | 1.02 |
| | 10 | .94 | .96 | 1.01 | 1.02 | 1.03 |
| | 5 | .96 | 1.01 | 1.03 | 1.04 | 1.04 |
| | | | | | | |

From: Canadian Standardization Test of Fitness Operations Manual, third Edition, 1986

## FLEXIBILITY (in Inches) - FEMALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **18-25** | **26-35** | **36-45** | **46-55** | **56-65** |
| | 100 | 27 | 26 | 25 | 24 | 23 |
| | 95 | 25 | 24 | 23 | 22 | 21 |
| | 90 | 24 | 23 | 22 | 21 | 20 |
| | 85 | 23 | 22 | 21 | 20 | 19 |
| | **80** | **22** | **21** | **20** | **19** | **18** |
| | | | | | | |
| | 75 | 21 | 20 | 19 | 18 | 18 |
| | **70** | **21** | **20** | **19** | **18** | **17** |
| | | | | | | |
| | 65 | 20 | 19 | 18 | 17 | 17 |
| Minimum fitness level | **60** | **20** | **19** | **17** | **17** | **16** |
| | | | | | | |
| | 55 | 19 | 18 | 17 | 16 | 15 |
| | 50 | 19 | 18 | 16 | 16 | 15 |
| | 45 | 18 | 18 | 16 | 15 | 15 |
| | 40 | 18 | 17 | 15 | 15 | 14 |
| | 35 | 17 | 16 | 15 | 14 | 13 |
| | 30 | 17 | 16 | 14 | 14 | 13 |
| | 25 | 16 | 15 | 13 | 13 | 12 |
| | 20 | 15 | 14 | 12 | 12 | 11 |
| | 15 | 14 | 14 | 11 | 11 | 10 |
| | 10 | 13 | 13 | 10 | 10 | 9 |
| | 5 | 12 | 11 | 9 | 8 | 7 |
| | 0 | 8 | 8 | 6 | 4 | 3 |
| | | | | | | |

From: Golding, et. al., Y's Way to Physical Fitness, Third Edition, 1989

## FLEXIBILITY (in Inches) - MALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **18-25** | **26-35** | **36-45** | **46-55** | **56-65** |
| | 100 | 26 | 25 | 24 | 23 | 21 |
| | 95 | 22 | 22 | 21 | 20 | 19 |
| | 90 | 20 | 20 | 19 | 19 | 17 |
| | 85 | 20 | 19 | 19 | 17 | 17 |
| | **80** | **19** | **18** | **17** | **17** | **15** |
| | | | | | | |
| | 75 | 18 | 18 | 16 | 16 | 15 |
| | **70** | **18** | **17** | **16** | **15** | **13** |
| | | | | | | |
| | 65 | 17 | 17 | 15 | 15 | 13 |
| Minimum fitness level | **60** | **17** | **16** | **15** | **14** | **13** |
| | | | | | | |
| | 55 | 16 | 16 | 15 | 13 | 11 |
| | 50 | 16 | 15 | 14 | 12 | 11 |
| | 45 | 15 | 15 | 13 | 12 | 11 |
| | 40 | 14 | 14 | 13 | 11 | 9 |
| | 35 | 14 | 13 | 11 | 10 | 9 |
| | 30 | 13 | 12 | 11 | 10 | 9 |
| | 25 | 12 | 12 | 11 | 9 | 7 |
| | 20 | 12 | 11 | 9 | 8 | 7 |
| | 15 | 10 | 10 | 9 | 7 | 5 |
| | 10 | 9 | 9 | 7 | 6 | 5 |
| | 5 | 7 | 7 | 5 | 4 | 3 |
| | 0 | 2 | 2 | 1 | 1 | 1 |
| | | | | | | |

From: Golding, et. al., Y's Way to Physical Fitness, Third Edition, 1989

## 1.5 MILE RUN - FEMALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **20-29** | **30-39** | **40-49** | **50-59** | **60+** |
| | 99 | <8:33 | <10:05 | <10:47 | <12:28 | <11:36 |
| | 95 | 10:47 | 11:49 | 12:51 | 14:20 | 14:06 |
| | 90 | 11:43 | 12:51 | 13:22 | 14:55 | 14:55 |
| | 85 | 12:20 | 13:06 | 14:06 | 15:29 | 15:57 |
| | **80** | **12:51** | **13:43** | **14:31** | **15:57** | **16:20** |
| | | | | | | |
| | 75 | 13:22 | 14:08 | 14:57 | 16:05 | 16:27 |
| | **70** | **13:53** | **14:24** | **15:26** | **16:27** | **16:58** |
| | | | | | | |
| | 65 | 14:08 | 14:50 | 15:41 | 15:51 | 17:29 |
| Minimum fitness level | **60** | **14:24** | **15:08** | **15:57** | **16:58** | **17:46** |
| | | | | | | |
| | 55 | 14:35 | 15:20 | 16:12 | 17:14 | 18:00 |
| | 50 | 14:55 | 15:26 | 16:27 | 17:24 | 18:16 |
| | 45 | 15:10 | 15:47 | 16:34 | 17:29 | 18:31 |
| | 40 | 15:26 | 15:57 | 16:58 | 17:54 | 18:44 |
| | 35 | 15:48 | 16:23 | 16:59 | 18:09 | 18:54 |
| | 30 | 15:57 | 16:35 | 17:24 | 18:23 | 18:59 |
| | 25 | 16:26 | 16:58 | 17:29 | 18:31 | 19:02 |
| | 20 | 16:33 | 17:14 | 18:00 | 18:49 | 19:21 |
| | 15 | 16:58 | 17:29 | 18:21 | 19:02 | 19:33 |
| | 10 | 17:21 | 18:00 | 18:31 | 19:30 | 20:04 |
| | 5 | 18:14 | 18:31 | 19:05 | 19:57 | 20:23 |
| | 1 | >19:25 | >19:27 | >20:04 | >20:47 | >21:06 |
| | | | | | | |

From: Cooper, K. The Aerobics Institute, Dallas, TX.

## 1.5 MILE RUN - MALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **20-29** | **30-39** | **40-49** | **50-59** | **60+** |
| | 99 | <6:29 | <7:11 | <7:42 | <8:44 | <9:30 |
| | 95 | 8:13 | 8:44 | 9:30 | 10:40 | 11:20 |
| | 90 | 9:09 | 9:30 | 10:16 | 11:18 | 12:20 |
| | 85 | 9:45 | 10:16 | 11:18 | 12:20 | 13:22 |
| | **80** | **10:16** | **10:47** | **11:44** | **12:51** | **13:53** |
| | | | | | | |
| | 75 | 10:42 | 11:18 | 11:49 | 13:22 | 14:24 |
| | **70** | **10:47** | **11:34** | **12:34** | **13:45** | **14:53** |
| | | | | | | |
| | 65 | 11:18 | 11:49 | 12:51 | 14:03 | 15:19 |
| **Minimum fitness level** | **60** | **11:41** | **12:20** | **13:14** | **14:24** | **15:29** |
| | | | | | | |
| | 55 | 11:49 | 12:38 | 13:22 | 14:40 | 15:55 |
| | 50 | 12:18 | 12:51 | 13:53 | 14:55 | 16:07 |
| | 45 | 12:20 | 13:22 | 14:08 | 15:18 | 16:27 |
| | 40 | 12:51 | 13:36 | 14:29 | 15:26 | 16:43 |
| | 35 | 13:06 | 13:53 | 14:47 | 15:53 | 16:58 |
| | 30 | 13:22 | 14:08 | 14:56 | 15:57 | 17:14 |
| | 25 | 13:53 | 14:24 | 15:26 | 16:23 | 17:23 |
| | 20 | 14:13 | 14:52 | 15:41 | 16:43 | 18:00 |
| | 15 | 14:24 | 15:20 | 15:57 | 16:58 | 18:31 |
| | 10 | 15:10 | 15:52 | 16:28 | 17:29 | 19:15 |
| | 5 | 16:12 | 16:27 | 17:23 | 18:31 | 20:04 |
| | 1 | >17:48 | >18:20 | >18:51 | >19:36 | >20:57 |

From: Cooper, K. The Aerobics Institute, Dallas, TX.

## 3.0 MILE WALK - FEMALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **20-29** | **30-39** | **40-49** | **50-59** | **60+** |
| | 99 | | | | | |
| | 95 | | | | | |
| | 90 | | | | | |
| | 85 | | | | | |
| | **80** | **<36:00** | **37:30** | **39:00** | **42:00** | **45:00** |
| | | | | | | |
| | 75 | | | | | |
| | **70** | **40:30** | **42:00** | **44:00** | **47:00** | **51:00** |
| | | | | | | |
| | 65 | | | | | |
| Minimum fitness level | **60** | **44:00** | **46:30** | **49:00** | **52:00** | **57:00** |
| | | | | | | |
| | 55 | 48:00 | 51:00 | 54:00 | 57:00 | 63:00 |
| | 50 | | | | | |
| | 45 | | | | | |
| | 40 | | | | | |
| | 35 | | | | | |
| | 30 | | | | | |
| | 25 | | | | | |
| | 20 | | | | | |
| | 15 | | | | | |
| | 10 | | | | | |
| | 5 | | | | | |
| | 1 | | | | | |
| | | | | | | |

From: Cooper, K. The Aerobics Institute, Dallas, TX.

## 3.0 MILE WALK - MALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **20-29** | **30-39** | **40-49** | **50-59** | **60+** |
| | 99 | | | | | |
| | 95 | | | | | |
| | 90 | | | | | |
| | 85 | | | | | |
| | **80** | **<34:00** | **35:00** | **36:30** | **39:00** | **41:00** |
| | | | | | | |
| | 75 | | | | | |
| | **70** | **38:30** | **40:00** | **42:00** | **45:00** | **48:00** |
| | | | | | | |
| | 65 | | | | | |
| **Minimum fitness level** | **60** | **42:00** | **44:30** | **47:00** | **50:00** | **54:00** |
| | | | | | | |
| | 55 | 46:00 | 49:00 | 52:00 | 55:00 | 60:00 |
| | 50 | | | | | |
| | 45 | | | | | |
| | 40 | | | | | |
| | 35 | | | | | |
| | 30 | | | | | |
| | 25 | | | | | |
| | 20 | | | | | |
| | 15 | | | | | |
| | 10 | | | | | |
| | 5 | | | | | |
| | 1 | | | | | |
| | | | | | | |

From: Cooper, K. The Aerobics Institute, Dallas, TX.

## 3-MINUTE STEP TEST - FEMALE

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **18-25** | **26-35** | **36-45** | **46-55** | **56-65** |
| | 100 | 72 | 72 | 74 | 76 | 76 |
| | 95 | 79 | 80 | 80 | 88 | 83 |
| | 90 | 83 | 86 | 87 | 93 | 92 |
| | 85 | 88 | 91 | 93 | 96 | 97 |
| | **80** | **93** | **93** | **97** | **100** | **99** |
| | 75 | 97 | 97 | 101 | 102 | 103 |
| | 70 | 100 | 103 | 104 | 106 | 106 |
| | **65** | **103** | **106** | **106** | **111** | **109** |
| | 60 | 106 | 110 | 109 | 113 | 111 |
| | 55 | 110 | 112 | 111 | 117 | 113 |
| | **50** | **112** | **116** | **114** | **118** | **116** |
| | 45 | 116 | 118 | 117 | 120 | 117 |
| | 40 | 118 | 121 | 120 | 121 | 119 |
| | 35 | 122 | 124 | 122 | 124 | 123 |
| | 30 | 124 | 127 | 127 | 126 | 127 |
| | 25 | 128 | 129 | 130 | 127 | 129 |
| | 20 | 133 | 131 | 135 | 131 | 132 |
| | 15 | 137 | 135 | 138 | 133 | 136 |
| | 10 | 142 | 141 | 143 | 138 | 142 |
| | 5 | 149 | 148 | 146 | 147 | 148 |
| | 0 | 155 | 154 | 152 | 152 | 151 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

From: Golding, et. al., Y's Way to Physical Fitness, Third Edition, 1989

## 3-MINUTE STEP TEST - MALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **18-25** | **26-35** | **36-45** | **46-55** | **56-65** |
| | 100 | 70 | 73 | 72 | 78 | 72 |
| | 95 | 72 | 76 | 74 | 81 | 74 |
| | 90 | 78 | 79 | 81 | 84 | 82 |
| | 85 | 82 | 83 | 86 | 89 | 89 |
| | **80** | **85** | **85** | **90** | **93** | **93** |
| | 75 | 88 | 88 | 94 | 96 | 97 |
| | 70 | 91 | 91 | 98 | 99 | 98 |
| | **65** | **94** | **94** | **100** | **101** | **100** |
| | 60 | 97 | 97 | 102 | 103 | 101 |
| | 55 | 101 | 101 | 105 | 109 | 105 |
| | **50** | **102** | **103** | **108** | **113** | **109** |
| | 45 | 104 | 106 | 111 | 115 | 111 |
| | 40 | 107 | 109 | 113 | 118 | 113 |
| | 35 | 110 | 113 | 116 | 120 | 116 |
| | 30 | 114 | 116 | 118 | 121 | 118 |
| | 25 | 118 | 119 | 120 | 124 | 122 |
| | 20 | 121 | 122 | 124 | 126 | 125 |
| | 15 | 126 | 126 | 128 | 130 | 128 |
| | 10 | 131 | 130 | 132 | 135 | 131 |
| | 5 | 137 | 140 | 142 | 145 | 136 |
| | 0 | 164 | 164 | 168 | 158 | 150 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

From: Golding, et. al., Y's Way to Physical Fitness, Third Edition, 1989

## BENCH PRESS TEST - FEMALE

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **18-25** | **26-35** | **36-45** | **46-55** | **56-65** |
| | 100 | 50 | 48 | 46 | 42 | 34 |
| | 95 | 42 | 40 | 32 | 30 | 30 |
| | 90 | 36 | 33 | 28 | 26 | 22 |
| | 85 | 32 | 29 | 25 | 22 | 20 |
| | **80** | **29** | **26** | **22** | **21** | **18** |
| | 75 | 28 | 25 | 21 | 20 | 16 |
| | 70 | 25 | 22 | 20 | 17 | 15 |
| | **65** | **24** | **21** | **18** | **14** | **14** |
| | 60 | 22 | 20 | 17 | 13 | 12 |
| | 55 | 21 | 18 | 14 | 12 | 10 |
| | **50** | **20** | **17** | **13** | **11** | **9** |
| | 45 | 18 | 16 | 12 | 10 | 8 |
| | 40 | 16 | 14 | 11 | 9 | 7 |
| | 35 | 14 | 13 | 10 | 8 | 6 |
| | 30 | 13 | 12 | 9 | 6 | 4 |
| | 25 | 12 | 9 | 8 | 5 | 3 |
| | 20 | 9 | 8 | 6 | 4 | 2 |
| | 15 | 8 | 5 | 4 | 2 | 1 |
| | 10 | 5 | 2 | 2 | 1 | 0 |
| | 5 | 2 | 1 | 1 | 0 | 0 |
| | 0 | 1 | 0 | 0 | 0 | 0 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

From: Golding, et. al., Y's Way to Physical Fitness, Third Edition, 1989

## BENCH PRESS TEST - MALE

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **18-25** | **26-35** | **36-45** | **46-55** | **56-65** |
| | 100 | 45 | 43 | 40 | 35 | 32 |
| | 95 | 42 | 40 | 34 | 28 | 24 |
| | 90 | 38 | 34 | 30 | 24 | 22 |
| | 85 | 34 | 30 | 28 | 22 | 20 |
| | **80** | **32** | **29** | **25** | **21** | **18** |
| | 75 | 30 | 26 | 24 | 20 | 14 |
| | 70 | 28 | 25 | 22 | 17 | 14 |
| | **65** | **26** | **24** | **21** | **16** | **12** |
| | 60 | 25 | 22 | 20 | 14 | 10 |
| | 55 | 22 | 21 | 18 | 13 | 10 |
| | **50** | **22** | **20** | **17** | **12** | **8** |
| | 45 | 21 | 18 | 16 | 10 | 8 |
| | 40 | 20 | 17 | 14 | 10 | 6 |
| | 35 | 17 | 14 | 13 | 9 | 6 |
| | 30 | 16 | 13 | 12 | 8 | 4 |
| | 25 | 13 | 12 | 10 | 6 | 4 |
| | 20 | 12 | 10 | 9 | 5 | 2 |
| | 15 | 9 | 9 | 8 | 4 | 2 |
| | 10 | 8 | 5 | 5 | 2 | 0 |
| | 5 | 2 | 2 | 2 | 1 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

From: Golding, et. al., Y's Way to Physical Fitness, Third Edition, 1989

## PUSH-UPS - FEMALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **20-29** | **30-39** | **40-49** | **50-59** | **60+** |
| | 95 | 37 | 36 | 32 | 30 | 30 |
| | 90 | 32 | 31 | 28 | 23 | 25 |
| | 85 | 30 | 27 | 24 | 21 | 17 |
| | **80** | **26** | **24** | **22** | **17** | **15** |
| | | | | | | |
| | 75 | 24 | 22 | 20 | 15 | 13 |
| | **70** | **22** | **21** | **18** | **13** | **12** |
| | | | | | | |
| | 65 | 21 | 20 | 15 | 11 | 12 |
| Minimum fitness level | **60** | **20** | **17** | **14** | **10** | **10** |
| | | | | | | |
| | 55 | 18 | 16 | 13 | 10 | 9 |
| | 50 | 16 | 14 | 12 | 9 | 6 |
| | 45 | 15 | 13 | 11 | 7 | 5 |
| | 40 | 14 | 12 | 10 | 5 | 4 |
| | 35 | 13 | 11 | 10 | 4 | 3 |
| | 30 | 11 | 10 | 7 | 3 | 2 |
| | 25 | 10 | 8 | 5 | 2 | 1 |
| | 20 | 9 | 7 | 4 | 1 | - |
| | 15 | 7 | 6 | 3 | 1 | - |
| | 10 | 5 | 4 | 2 | - | - |
| | 5 | 2 | 1 | - | - | - |
| | | | | | | |

From: Canadian Standardization Test of Fitness Operations Manual, Third Edition, 1986

## PUSH-UPS - MALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **20-29** | **30-39** | **40-49** | **50-59** | **60+** |
| | 95 | 48 | 36 | 30 | 28 | 25 |
| | 90 | 41 | 32 | 25 | 24 | 24 |
| | 85 | 36 | 30 | 22 | 21 | 18 |
| | **80** | **34** | **27** | **21** | **17** | **16** |
| | | | | | | |
| | 75 | 32 | 25 | 20 | 15 | 13 |
| | **70** | **30** | **24** | **19** | **14** | **11** |
| | | | | | | |
| | 65 | 29 | 22 | 17 | 13 | 11 |
| **Minimum fitness level** | **60** | **27** | **21** | **16** | **11** | **10** |
| | | | | | | |
| | 55 | 25 | 20 | 15 | 11 | 10 |
| | 50 | 24 | 19 | 13 | 10 | 9 |
| | 45 | 22 | 17 | 13 | 10 | 8 |
| | 40 | 21 | 16 | 12 | 9 | 7 |
| | 35 | 20 | 15 | 11 | 8 | 6 |
| | 30 | 18 | 14 | 10 | 7 | 6 |
| | 25 | 17 | 12 | 10 | 7 | 5 |
| | 20 | 16 | 11 | 8 | 5 | 4 |
| | 15 | 14 | 10 | 7 | 5 | 3 |
| | 10 | 11 | 8 | 5 | 4 | 2 |
| | 5 | 9 | 5 | 4 | 2 | - |
| | | | | | | |

From: Canadian Standardization Test of Fitness Operations Manual, Third Edition, 1986

## BENT-KNEE SIT-UPS - FEMALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **20-29** | **30-39** | **40-49** | **50-59** | **60+** |
| | 95 | 43 | 34 | 28 | 26 | 20 |
| | 90 | 39 | 31 | 26 | 22 | 18 |
| | 85 | 36 | 29 | 25 | 19 | 16 |
| | **80** | **34** | **27** | **23** | **17** | **15** |
| | | | | | | |
| | 75 | 32 | 26 | 22 | 16 | 14 |
| | **70** | **31** | **25** | **21** | **14** | **13** |
| | | | | | | |
| | 65 | 31 | 24 | 20 | 12 | 12 |
| Minimum fitness level | **60** | **29** | **23** | **18** | **11** | **10** |
| | | | | | | |
| | 55 | 28 | 22 | 17 | 10 | 9 |
| | 50 | 27 | 21 | 16 | 7 | 5 |
| | 45 | 25 | 20 | 15 | 5 | 4 |
| | 40 | 24 | 18 | 13 | 4 | 2 |
| | 35 | 23 | 17 | 12 | 3 | - |
| | 30 | 22 | 16 | 10 | - | - |
| | 25 | 21 | 15 | 7 | - | - |
| | 20 | 19 | 13 | 5 | - | - |
| | 15 | 17 | 11 | 3 | - | - |
| | 10 | 15 | 7 | - | - | - |
| | 5 | 11 | - | - | - | - |
| | | | | | | |

From: Canadian Standardized Test of Fitness, 1981 Survey data

## BENT-KNEE SIT-UPS - MALES

| | | AGE | | | | |
|---|---|---|---|---|---|---|
| | **PERCENTILE** | **20-29** | **30-39** | **40-49** | **50-59** | **60+** |
| | 95 | 49 | 42 | 36 | 34 | 26 |
| | 90 | 45 | 38 | 33 | 28 | 24 |
| | 85 | 43 | 36 | 31 | 26 | 23 |
| | **80** | **41** | **34** | **30** | **25** | **21** |
| | | | | | | |
| | 75 | 40 | 33 | 29 | 24 | 19 |
| | **70** | **38** | **32** | **27** | **23** | **18** |
| | | | | | | |
| | 65 | 37 | 31 | 26 | 22 | 17 |
| **Minimum fitness level** | **60** | **36** | **30** | **25** | **21** | **15** |
| | | | | | | |
| | 55 | 35 | 29 | 24 | 20 | 15 |
| | 50 | 34 | 28 | 23 | 20 | 13 |
| | 45 | 33 | 27 | 22 | 18 | 12 |
| | 40 | 32 | 26 | 21 | 17 | 11 |
| | 35 | 31 | 24 | 20 | 16 | 10 |
| | 30 | 30 | 23 | 19 | 15 | 10 |
| | 25 | 29 | 22 | 17 | 13 | 7 |
| | 20 | 27 | 21 | 16 | 11 | 2 |
| | 15 | 26 | 20 | 14 | 10 | - |
| | 10 | 24 | 17 | 11 | 8 | - |
| | 5 | 20 | 14 | 6 | - | - |
| | | | | | | |

From:Canadian Standardized Test of Fitness, 1981 Survey data

# CALCULATION OF TRAINING HEART RATE RANGE

In general, heart rate is the best indicator of exertion. Since it is measured easily, it can be used to establish appropriate exercise intensity. It is customary to calculate a range, with both lower and upper endpoints, where training is likely to be most beneficial. If an individual consistently trains below a certain level, i.e., 60% of capacity, gains will be minimal (insufficient overload). On the other hand, training above a certain level, i.e., 80% of capacity, is difficult to sustain for an appropriate length of time and can lead to injuries.

Heart rate is usually expressed in beats per minute. It is impractical however, to use this "minute" rate for exercise. An accepted approach is to think in terms of a 10 second period. This is much more practical when applied during an exercise session, as measurement beyond 10 seconds can lead to erroneous estimation since the heart rate falls so rapidly after exercise is stopped.

Measurement of heart rate, at rest or during exercise, can be taken by palpating the radial (wrist) or carotid (neck) artery. Do not palpate both carotid arteries at the same time. It is important to teach program participants how to measure their own heart rate, both at rest and during exercise sessions. This should be a tool that they use in their own personal fitness programs.

The heart rate should be measured after a "steady state" is reached, i.e., after at least 5 minutes of aerobic activity such as running. Once it is measured, it provides feedback in terms of exercise intensity. If the measured heart rate is below the calculated lower end of the training heart rate range, then the participant knows to pick up the pace. If it is above the upper end, the participant should slow down.

Measurement of actual training heart rate should be performed as follows: While still exercising, find the pulse in the wrist. Stop briefly and begin counting the pulse for a 10 second time period (a timepiece is required). It is important to begin counting as soon as possible after stopping since the pulse begins to fall immediately. The first count is actually "zero," not "one." Count 0, 1, 2, 3 and so on for the 10 second period. The steps involved in calculating the training heart rate range and an example of how it is calculated are shown on the following page.

The calculated training heart rate range, which serves as a guide, is determined as follows:

Step 1. Calculate your estimated maximum heart rate by subtracting your age from 220

Step 2. Subtract your resting heart rate.

Step 3. Multiply this number by the lower conditioning intensity (60%).

Step 4. Add your resting heart rate.

Step 5. Divide by 6 to get your 10-second value (to be used during exercise).

Step 6. Repeat Steps 3-5 using upper conditioning intensity (80%).

EXAMPLE: For a 40 year old with a resting heart rate of 70 beats per minute.

To find the lower end (60% of capacity) of the training heart rate range:

| | | | | | |
|---|---|---|---|---|---|
| Step 1. | 220 | - | 40 years | = | 180 |
| Step 2. | 180 | - | 70 | = | 110 |
| Step 3. | 110 | x | 60% | = | 66 |
| Step 4. | 66 | + | 70 | = | 136 |
| Step 5. | 136 | ÷ | 6 | = | 23 beats in 10 seconds |

To find the upper end (80% of capacity) of the training heart rate range:

| | | | | | |
|---|---|---|---|---|---|
| Step 3. | 110 | x | 80% | = | 88 |
| Step 4. | 88 | + | 70 | = | 158 |
| Step 5. | 158 | ÷ | 6 | = | 26 beats in 10 seconds |

The Training Heart Rate range for this person would be 23 to 26 beats in 10 seconds.

# COMPUTING THE TARGET ZONE PULSE RATE

Shown below is one method for computing the target zone pulse rate. The example given is for a person who is 35 years of age and has a resting pulse rate of 70.

| | Method | Example |
|---|---|---|
| Step 1: | Subtract the individual's age from 220 | 220 - 35 equals 185 |
| Step 2: | Subtract the individual's resting pulse rate. | 185 - 70 equals 115 |
| Step 3: | Multiply the remainder by 60%<br>Multiply the remainder again by 70% | 115 X 60% equals 69<br>115 X 70% equals 81 (rounded to nearest whole number) |
| Step 4: | To each number resulting from Step 3 above add the individual's resting pulse rate. The range between these two sums is the individual's target zone for exercising. | 69 plus 70 equals 139<br>81 plus 70 equals 151 |

The target zone is 139 to 151 beats per minute.

The resting pulse rate should be measured by taking a 60 second count before sitting up or getting out of bed in the morning. The pulse rate can be taken by palpating (with two fingers) the chest directly over the heart or palpating the wrist near the thumb side. The percentages entered into the formula in Step 3 above depend on how much training one has had recently. The following initial target zones are recommended:

| | |
|---|---|
| Over 30 years old, beginning exercise | 60%-70% |
| Under 30 years old, beginning exercise | 70%-80% |
| Regular aerobic exercise, more than two months | 75%-85% |
| Regular aerobic exercise, more than two years | 80%-90% |

To monitor pulse rate during exercise, it is best to use a 10-second count. A count for 10 seconds, if taken immediately after exercise, is a more accurate predictor of the pulse rate during exercise than a longer count because the heart slows down immediately after stopping exercise. The 10-second count should be multiplied by six so it can be compared to the target zone pulse rates. For example, a 10-second count of 24 multiplied by 6 is 144 beats per minute.

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