CHAPTER 1

FITNESS AND LIFESTYLE

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FITNESS AND LIFESTYLE

1. INTRODUCTION.

a. A physically fit law enforcement officer can perform their daily tasks without undue fatigue. Faced with a variety of physical demands ranging from removing a hazard in the roadway, to chasing a suspect, an officer should be proficient in all areas of fitness.

b. The American College of Sports Medicine defines physical fitness as the ability to vigorously perform daily activities. Physical fitness is characterized by such physical traits as low body fat composition, good muscular strength, and endurance. Individuals possessing such qualities are at a lower risk of developing diseases associated with physical inactivity such as hypertension and heart disease.

c. Physical fitness is comprised of the following 4 components:

(1) Cardiovascular endurance.

(2) Muscular strength and endurance.

(3) Body composition.

(4) Flexibility.

d. The greater you increase your flexibility, muscular strength, cardiovascular endurance, and decrease body fat, the less likely you will develop diseases and disabilities associated with physical inactivity.

2. CARDIOVASCULAR DISEASE.

a. The heart is a muscle composed of highly specialized tissue. All muscles in your body require a constant flow of blood to transport oxygen and other nutrients in order to remove waste products, such as carbon dioxide. The heart's blood is delivered through a special network of vessels surrounding the heart muscle called the coronary arteries.

b. Coronary artery disease is the leading cause of death in the United States and most of the industrialized Western world. Coronary artery disease is a slow

progressive disease that usually begins to manifest itself during childhood, starting as a yellow fatty streak within the artery wall of the heart. Over a period of time, fibrous plaque begins to develop causing the artery wall to thicken and narrowing the lumen (opening) of the artery. This process is known as atherosclerosis. Eventually, the artery lumen becomes too narrow for adequate blood flow to the heart muscle. This decrease in blood flow may cause pain in the chest known as angina pectoris. As the disease continues to progress, the coronary artery may eventually occlude all blood flow to a particular area of the heart muscle causing the muscle to die. This is known as a heart attack. The severity of the heart attack is dependent upon the amount of tissue damage to the heart muscle. By age 20, it is estimated that 75 percent of males have heart disease to a significant degree.

c. The cause of coronary artery disease is dependent upon several factors: preventable risk factor (modifiable), genetic susceptibility, local arterial factors, and gender. Several risk factors for the development of coronary artery disease have been identified and can be placed into 2 categories: modifiable and nonmodifiable. The more risk factors present in any individual, the greater chance they will develop coronary artery disease.

(1) The following are nonmodifiable risk factors for the development of coronary artery disease:

(a) Older age.

(b) Male gender.

(c) Family history.

(2) The following are modifiable, independent risk factors:

(a) Hypertension.

(b) Hypercholesterolemia (excess cholesterol in the blood).

(c) Smoking.

(d) Diabetes.

(e) Obesity.

(f) Sedentary lifestyle.

d. There is little doubt that proper exercise training on a continuous basis is a significant factor in reducing the severity of coronary artery disease. There are

approximately 20 mechanisms by which physical activity may reduce the occurrence or severity of coronary artery disease. The modifiable risk factors and a few of the mechanisms influenced by exercise are as follows:

(1) Reduction of serum cholesterol (amount of cholesterol in the blood).

(2) Decrease in elevated blood pressure.

(3) Decrease in body fat.

(4) Decrease in resting heart rate (increased efficiency of the heart).

(5) Increase in artery size.

(6) Increase to tolerance of stress.

3. HYPERTENSION.

a. Hypertension (or high blood pressure) is defined as having arterial blood pressure greater than the upper range of the accepted normal. Blood pressure is measured in 2 numbers; for example, a normal average blood pressure is 120/80. The top number (higher), known as systolic pressure, is the pressure in the arteries when the heart contracts, ejecting blood from the heart into the arteries. The bottom number (lower), known as diastolic pressure, is the pressure in the arteries when the heart relaxes, allowing blood to fill the chambers of the heart.

b. An adult with a systolic pressure at or greater than 140 millimeters of mercury (mm/Hg) or a diastolic pressure of 90 mm/Hg or greater is diagnosed as having hypertension.

c. The lethal effects of hypertension are caused primarily in 3 ways:

(1) Excessive workload on the heart leads to early development of congestive heart disease and/or coronary artery disease, often causing death from a heart attack. Hypertension has 2 principal effects on the development of atherosclerosis: damages the inner walls of the artery by increasing shear forces, torsion, and lateral wall pressure; and the higher pressure is thought to increase the filtration of cholesterol into the walls of the arteries.

(2) High blood pressure frequently ruptures a major blood vessel in the brain, followed by clotting, and then death of a portion of the brain. This is commonly known as a stroke.

(3) High blood pressure causes multiple hemorrhages in the kidneys, destroying kidney function and eventually kidney failure.

d. Although there is no known cure for hypertension, clinicians suggest alterations in lifestyles of persons with hypertension may help decrease blood pressure. These lifestyles changes include:

(1) Reduce your intake of salt. Salt causes retention of body fluid, resulting in a greater volume of blood which raises blood pressure. It also contributes to narrowing the small artery passageways, providing less room for the blood to squeeze through.

(2) Avoid saturated fats (e.g., egg yolk, butter, and heavy creams) in your diet.

(3) Avoid refined sugar. Too much sugar induces the pancreas to produce extra insulin. This causes the sugar in the bloodstream to be absorbed rapidly, resulting in low blood sugar. The symptoms resulting from this process include varying bouts of energy and tiredness, along with an erratic and nervous temperament often connected with high blood pressure.

(4) Maintain a lean body weight. Blood volume increases with body weight. It has been estimated that approximately 1 mile of capillaries are needed to nourish each extra pound of fat. Consequently, in overweight individuals, the heart must pump more blood through a larger system of blood vessels.

(5) Avoid caffeine. Hypertension is closely related to the nervous system. Caffeine not only strongly stimulates the central nervous system, but also speeds up the heart and raises blood pressure.

(6) Exercise regularly. It has been shown that the blood pressure of hypertensive individuals was lowered as a result of a physical conditioning program.

4. NUTRITION. The mind and body cannot function optimally without the proper supply of nutrients and energy obtained from food. Making intelligent decisions about nutrition is important since the diet you choose and follow can keep you healthy. Your body is nourished by 3 basic classes of nutrients: proteins, fats, and carbohydrates. Minerals, vitamins, and water are also essential for life.

a. Protein.

(1) Protein is made up of amino acids, which are the building blocks for the body to maintain, build, and repair tissue. Therefore, if protein requirements

are not met, you cannot expect an increase in lean muscle mass even with a strength training program. Although protein is not a large source of fuel during daily activities, it does contribute to the energy needs during endurance events (lasting 60 minutes or longer).

(2) The Recommended Daily Allowance of protein is 0.36 grams per pound of body weight for adults. However, it has been proven that strength athletes may require 0.6 to 0.9 grams of protein per pound of body weight a day and endurance athletes may require 0.5 to 0.9 grams of protein per pound of body weight daily. As an athlete, an easy way to make certain you are ingesting adequate protein is to get 10 to 20 percent of your daily intake from protein. For example, a physically active individual consuming 2,600 calories a day will require up to 130 grams of protein daily.

(3) Foods richest in essential amino acids are animal proteins (meat, poultry, and fish) and milk. Plant proteins contain some, but not many, of the essential amino acids. Therefore, to meet protein needs with plant protein requires not only more, but a wide variety of vegetables, such as soy beans, nuts, and legumes.

b. Fats.

(1) Fats contain 9 calories per gram as compared to 4 calories per gram for protein and carbohydrates, allowing fat to produce more than twice the amount of energy per unit of weight.

(2) Dietary fat comes in 3 principal forms: cholesterol, saturated fat, and unsaturated fat. The body stores ingested fat within adipose tissue (fat cells). Stored fat is continually being used as fuel during periods of rest and exercise.

(3) Most nutritionists agree, for health reasons, dietary fat should be limited to 30 percent of the total energy intake with saturated fat contributing less than 10 percent of the total.

c. Carbohydrates.

(1) Simple and complex sugars are referred to as carbohydrates. Simple sugars include glucose, fructose (fruits), sucrose (table sugar), and maltose. Complex sugars include starch (vegetables), glycogen, and fiber (vegetables).

(2) At rest, about two-thirds of the body’s energy source comes from fat and one-third comes from carbohydrates. During endurance exercise, carbohydrates become the primary fuel source, reversing the percentages; two-thirds carbohydrates and one-third fat. However, as the duration of the

exercise increases, the amount of fat utilized as fuel increases as well. Nevertheless, it is important for persons that exercise to obtain approximately 60 percent of their calories from carbohydrates, preferably from vegetables and whole grains.

d. Vitamins.

(1) Vitamins are neither body-building nor energy-giving, but are essential for certain processes in the body. Vitamins are necessary in relatively small amounts and help the efficiency, mobilization, and assimilation of other nutrients.

(2) Vitamins are divided into 2 major groups. Water-soluble vitamins (C and the B-complex) require water for their absorption into the body and are lost through urination. They are not stored in the body and a constant dietary supply is necessary to avoid depletion. Fat-soluble vitamins (A, D, E, and K) require the presence of dietary fats for absorption. They are not lost in urination and tend to be stored in fat molecules in the body. Fat-soluble vitamins can cause illness if taken in excess, for they may accumulate in the body until their concentration becomes toxic.

e. Minerals.

(1) Minerals are nonorganic elements that are essential for a variety of vital bodily functions. Sodium, potassium, chlorine, magnesium, zinc, copper, iron, iodine, calcium, and several other essential elements make up the dietary minerals. Minerals give strength and rigidity to certain body tissues, are involved in the maintenance of cell membranes, the conduction of nerve impulses and muscle contraction, as well as numerous other body functions. Minerals are found in almost everything we eat and most people can acquire sufficient amounts simply by following a good diet.

(2) Sodium (salt) is one of the most abundant minerals in the blood. The average American consumes about 10 times the minimum sodium requirement they need each day. People who exercise regularly lose very little sodium and even less potassium in their sweat. What active people actually lose in sweat and need to replace is water.

(3) When a sweating athlete ingests too much salt, 2 very harmful things can happen. Water is pulled away from the working muscles where it is needed most, as well as other parts of the body, in order to dilute the high salt concentration in the stomach. This internal dehydration builds dangerously

high salt concentrations in the blood, which can lead to kidney problems. High salt intake is also associated with high blood pressure and heart disease.

f. Sugar.

(1) Refined table sugar has no nutritional value, contributing little but empty calories to a diet. There are several reasons why sugar should be avoided or reduced. Sugar is a refined substance and is rapidly absorbed into the body's system. As soon as it enters the blood stream, a sudden demand is placed on the pancreas to supply insulin to move the sugar from the blood to the cells. This creates extreme highs and lows in the blood sugar level. You might feel an "energy high" soon after eating something with a high sugar content, but because the pancreas overreacts to the sudden rise in blood sugar, it produces more insulin than is necessary to move the sugar molecules out of the bloodstream into the cells. As a result, the blood sugar level drops to a lower level than before, causing an extreme "energy low" and feelings of fatigue, lethargy, and irritability. This energy low is often counteracted by eating more sugar, resulting in continued peaks and valleys of the blood sugar throughout the day.

(2) Refined sugar is an incomplete carbohydrate. Sugar lacks the nutrients that are needed to metabolize it. If these nutrients are not with the sugar at the time of ingestion, they must come from the body's reserve, which robs the body of many of the B-complex vitamins, magnesium, cobalt, and other substances.

g. Fiber.

(1) There are 2 major components in complex carbohydrates: starch, which is digestible and is utilized for energy production; and fiber, which is nondigestible but very important for proper gastrointestinal (GI) function.

(2) It has been found a high-fiber diet (one containing fresh fruits, whole-grain breads, and fresh vegetables) helps prevent certain diseases, including cancer of the colon and heart disease. There are several reasons for this. First, because fiber is undigestible, it adds bulk to the feces, preventing constipation. Second, the greater the bulk of nondigestible GI contents, the less time it takes for it to move through the GI tract and be eliminated. Such diseases as appendicitis, diverticulitis disease (out-pocketings in the wall of the lower intestine), and cancer of the colon and rectum are related to the fact that low-bulk stools (from low-fiber diets) remain in the GI tract too long.

(3) High-fiber foods generally take 8 to 18 hours to move through the GI tract, whereas low-fiber foods such as highly refined flour, sugar, and meats, may take as long as 18 to 36 hours to travel the same distance.

h. Alcohol.

(1) Due to the effects of alcohol on the human body, it is not advisable to exercise after drinking. Alcohol is a dehydrating substance that blocks the release of the antidiuretic hormone which helps regulate the amount of water lost in the urine. Vital minerals associated with muscle contraction and nerve conduction such as potassium, calcium, and magnesium are lost as the body dehydrates.

(2) Alcohol also destroys vitamins (especially vitamin B-1, a key factor in energy metabolism) and has a direct, toxic effect on many organs, including the liver and kidneys.

i. Nutritional Guidelines.

(1) Eat a wide variety of foods daily.

(2) Avoid saturated fat and cholesterol. Try to limit your intake to unsaturated and polyunsaturated fats.

(3) Eat foods high in complex carbohydrates and fiber such as fresh fruits, vegetables, and whole grains.

(4) Restrict your intake of refined sugars and foods containing hidden sugars. Carefully check food and beverage product labels. Refined sugar is often labeled under a variety of names such as sucrose, fructose, corn syrup, and molasses.

(5) Reduce your intake of salt.

(6) If you drink alcohol, do so in moderation.

(7) Avoid artificial colorings, artificial flavorings, thickeners, preservatives, and other food additives.

5. WEIGHT CONTROL.

a. Body Composition.

(1) Body composition can be divided into 2 components: lean body mass, and body fat. The lean body mass includes bone, muscle, water, connective tissue, and organs. The body fat component includes essential fat found in organs, nerves, and mammary glands and the nonessential fat stored in adipose tissue (fat cells).

(2) Using a weight scale to estimate body composition can be inaccurate. When using this method, it is impossible to determine if a fluctuation in weight is due to a change in muscle, body water, or fat. The size of a person cannot necessarily determine their percent body fat. For example, a man weighing 220 pounds may be overweight according to height-weight standards yet he may have 10 percent body fat. Likewise, a man weighing 160 pounds may be an ideal weight for height-weight standards yet have 20 percent body fat.

(3) The following chart provides body fat percentages for varying degrees of physical fitness in adult men and women.

PERCENT FAT IN BODY COMPOSITION			
		MEN	WOMEN
Very lean	Excellent	8-10 percent	8-11 percent
Lean	Good	11-14 percent	12-16 percent
Average	Average	15-20 percent	17-22 percent
Fat	Fair	21-24 percent	23-27 percent
Obese	Poor	25-28 percent	28-32 percent

b. Exercise and Weight Control.

(1) Exercise is crucial for a long term weight control program. Although a single bout of exercise results in very little fat loss, regular exercise can make a substantial difference in fat loss. A person expending 300 calories, 4 times a week, can expect a loss of 23 pounds in 1 year, provided the amount of calories consumed does not change. This may not seem like a lot, but the weight loss was from fat, not the combination of muscle, water, and fat. A weight loss program with calorie restriction only may represent 45 percent of the loss from lean mass. In turn, the loss of lean mass decreases the amount of calories required to sustain the body's function, requiring even fewer calories to lose excess fat.

(2) The amount of fat loss from exercise is dependent upon the duration and intensity of the exercise. The longer and harder the exercise, the more calories you will expend. If more calories are expended than consumed, weight loss will result.

(3) As lean body mass increases and fat body mass decreases, body weight may not change. Additionally, since muscle is denser than fat, it takes less space. Hence, one may become thinner with no change in weight. Conversely, as a result of inactivity, one may increase body fat and lose lean body mass without a change in weight.

(4) Individuals who exercise, as compared to sedentary individuals, have a higher resting metabolism and greater fat utilization during exercise, both contributing to fat loss.

c. Sensible Weight Reduction.

(1) In order to achieve permanent fat loss, you must change your long-term eating habits and levels of physical activity. Successful fat loss and permanent weight control require a lifestyle change.

(2) Moderation is the key to a successful fat loss plan. Eat smaller quantities of food and spread your meals over the entire day. Avoid highly processed foods that have little nutritional value and are high in calorie value, such as refined sugar and starches, rich sauces, butter, margarine, mayonnaise, and other fats.

(3) It is estimated that 70 percent of dieters will regain the fat loss within 1 year. By reducing body fat gradually and systematically, the probability of a permanent reduction in body fat is enhanced. Many people are anxious to lose excess weight as quickly as possible with crash and fad diets; weight loss of more than 2 pounds a week. Crash diets do not work because they are short-lived, meaning the lifestyle has not been altered. A fat loss of 2 pounds a month (24 pounds a year) is more likely to bring long-term success.

(4) It is fat, not weight, that is the enemy. Active changes in metabolism are the solution, not short-lived nutritional manipulations.

d. Dangerous Diets.

(1) Fasting.

(a) Fasting actually encourages your body to become fatter. When deprived of food, the body is stressed and will try to lay down extra fat for the “emergency.” Do not make the mistake of fasting or eating just 1 big meal a day. Eating only 1 meal a day is translated by the body as a 23-hour fast.

(b) Fat was originally meant to be a safety device against famine and when your body senses that there is no food entering it, fat-depositing enzymes are produced at a greater rate. When you finally eat that 1 big meal, your body cannot utilize all of the nutrients at once and the excess is stored as fat. Also, if you fast for more than 12 to 24 hours, you will lose vital muscle tissue, glycogen, vitamins, and minerals.

(2) High Protein–Low Carbohydrate Diets.

(a) Several popular weight loss plans consist of a high protein, low carbohydrate diet. Often these diets are also very high in fat. Although people do lose weight on these diets, they can be dangerous.

(b) One reason for their seeming effectiveness is that high protein consumption tends to cause loss of body water. For every 10 pounds lost, 2 or 3 pounds are water. Protein metabolism releases toxic waste products. If you eat more protein than your body can use, your kidneys and liver must work harder to detoxify and remove these potential poisons. Since the body must form more urine to dispose of these waste products, it becomes dehydrated. Vital minerals such as potassium, calcium, and magnesium are also lost.

(c) A big danger in these diets is that they cause muscle loss and lead to degeneration of muscle tone and efficiency. The brain must have glucose, a product of carbohydrate metabolism. If the glucose level in the blood is low due to a lack of carbohydrates in the diet, your body will feed on itself, breaking down muscle tissue (protein) and converting it to glucose. The muscle tissue is not repaired because the protein you eat is also needed for production of glucose. The end result is that muscles break down and are not repaired, which results in a loss of lean body mass.

e. Preventing fat gain is ultimately the best defense against obesity. Once gained, fat has a tendency to stay. A change in lifestyle that leads to more sedentary habits is often the beginning of a problem. Keep up activity levels and reduce calorie intake when you notice yourself adding fat.

6. STRESS.

a. Stress is defined as a nonspecific response of the body to any demand made upon it. Just about everyone has experienced stress at one time or another. Not all stressful situations are harmful, however. Some circumstances present challenges that, when overcome, become positive growth

experiences. Unfortunately, there are times when unusually strong and recurrent stress factors can result in the development of many kinds of illnesses.

b. There are many stress-related illnesses that are the result of a physical response to emotionally charged life situations and events. Among these are high blood pressure, asthma, arthritis, ulcers, and skin problems.

c. The key to dealing with stress is to change some aspect of life or to change the way situations are experienced. The best way to deal with stress is to replace stressful ways of living with beliefs, attitudes, and behaviors that eliminate sources of conflict, tension, and anxiety.

7. SMOKING.

a. Smoking is one of the greatest obstacles in achieving an optimal fitness level. Each year more than 400,000 Americans die from diseases related to smoking: heart disease, emphysema, stroke, lung cancer, and other diseases. Smoking is also associated with hypertension and high cholesterol, and strongly linked to atherosclerosis. It is also the most significant controllable risk factor in developing cardiovascular disease.

b. Smoking reduces the ability to exercise by decreasing lung function and decreases oxygen exchange between the lungs and blood, limiting the amount of oxygen that is available to the exercising muscle.

8. AGING. After the age of 30, physiological functions (fitness level) start to decline at approximately 1 percent a year. The decline is characterized by decreases in cardiovascular endurance, muscle strength and size, flexibility, and increases in body fat.

a. Cardiovascular endurance decreases approximately 30 percent by age 65. This is primarily due to the heart's ability to pump as much blood to the working muscles during exercise.

b. Maximum muscular strength generally occurs between the ages of 25 to 30 years. By 75 years of age, strength has been reduced by 80 percent. Strength decrease is a result of a decline in neural function, muscle size, and the number of muscle cells.

c. Years of wear-and-tear on joints can cause the accumulation of scar tissue. This fibrous material makes connective tissue stiffer and thicker, decreasing the range of motion of a joint.

d. Body weight increases steadily beginning in the 20s until about 60 years of age. This weight gain is marked by an increase of body fat and decrease in lean mass. Males average 15 percent body fat at age 18 to about 28 percent body fat at age 60. Females change from an average 25 percent body fat at age 18 to about 39 percent body fat at age 60.

e. Aging is an inevitable part of life. However, exercise training can improve the quality of life by slowing the deterioration in physical capacities. Exercise training allows an individual to maintain more muscle strength and size, greater flexibility, higher levels of cardiovascular endurance, and lower percentages of body fat as compared to the sedentary individual.

9. CONCLUSION. Two major health problems in the United States are cardiovascular disease and obesity, and regular exercise training can help reduce the risk of developing both. Exercise also slows the deterioration of the physical capacities. This is a brief overview of disease, nutrition, body composition, and aging in respect to exercise.

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