Chapter 4: Nutrition

ACE Personal Trainer Manual
Third Edition
Introduction

• SCAN - group of dieticians who practice in sports and cardiovascular nutrition [SCAN]; locate local SCAN dieticians by contacting the American Dietetic Association and ask for the SCAN referral list.
Nutrients

Six (6) Classes of Nutrients & Recommended Intake

• Protein (50-70g daily)
• Carbohydrate (350-400g Optimum)
• Fat or Lipids (30-65g daily)
• Vitamins (Refer to RDA)
• Minerals (Refer to RDA)
• Water (2-3 quarts daily)
## Nutrients

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Recommended Intake</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protein</strong></td>
<td>50-70g Daily; 12-20% of caloric intake as protein</td>
<td>Build &amp; repair body tissue</td>
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<tr>
<td></td>
<td></td>
<td>Major component of enzymes, hormones, and antibodies</td>
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<tr>
<td><strong>Carbohydrate</strong></td>
<td>125g Daily Minimum; 350-400g Optimum; 55-65% of caloric intake as carbohydrate</td>
<td>Provides a major source of fuel to the body</td>
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<td>Provides dietary fibers</td>
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<tr>
<td><strong>Fat (Lipids)</strong></td>
<td>36-65g Daily; 25-30% of caloric intake from fat</td>
<td>Chief storage form of energy in the body</td>
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<td></td>
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<td>Insulate and protect vital organs</td>
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<td></td>
<td></td>
<td>Provide fat-soluble vitamins</td>
</tr>
<tr>
<td><strong>Vitamins</strong></td>
<td>Refer to RDA</td>
<td>Help promote and regulate various chemical reactions and bodily processes</td>
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<td></td>
<td></td>
<td>Do not yield energy themselves, but participate in releasing energy from food</td>
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<tr>
<td><strong>Minerals</strong></td>
<td>Refer to RDA</td>
<td>Enable enzymes to function</td>
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<tr>
<td></td>
<td></td>
<td>A component of hormones</td>
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<td></td>
<td></td>
<td>A part of bone &amp; nerve impulses</td>
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<tr>
<td><strong>Water</strong></td>
<td>2-3 Quarts Daily</td>
<td>Enables chemical reactions to occur</td>
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<td>About 60% of the body is composed of water</td>
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<td>Essential for life as we cannot store it, nor conserve it</td>
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</tbody>
</table>
Nutrients

• Essential Amino Acids: the eight (8) amino acids needed to make proteins; called essential because they cannot be manufactured by the body and must be obtained from the diet.

• The eight (8) essential amino acids are isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine.
Recommended Dietary Allowances (RDA)

- The Recommended Dietary Allowances (RDAs) are nutrient recommendations designed to meet the needs of essentially all people of similar age and gender.

- RDAs are established by the Food and Nutrition Board of the National Academy of Science, and they are a general guide for estimating your nutritional needs.
Recommended Dietary Allowances (RDA)

- Fat soluble vitamins are vitamins able to be dissolved in fat; generally stored in the body fat, principally in the liver.

- Taking large amounts of any vitamins or minerals (especially fat soluble vitamins) can result in toxicity problems.
Dietary Guidelines

- The U.S. Department of Agriculture & Department of Health & Human Services issue Dietary Guidelines, and they were recently revised in 2000.
Dietary Guidelines

- The Food Pyramid consists of five (5) major food groups:
  1. Whole Grain Breads, Cereals, Rice, & Pasta
  2. Vegetables
  3. Fruit
  4. Milk, Yogurt, & Cheese
  5. Meat, Poultry, Fish, Dry Beans, Eggs, & Nuts

- Go easy on the fats, oils, & sweets at the top of the Pyramid.
Dietary Guidelines

- Leading causes of death in the United States include:
  - Heart disease
  - Stroke
  - High blood pressure
  - Diabetes
  - Osteoporosis
Dietary Guidelines

The 2000 edition of the Dietary Guidelines are as follows:

1. Aim for a healthy weight.
2. Be physically active each day.
3. Let the Pyramid guide your food choices.
4. Choose a variety of whole grains daily.
5. Choose a variety of fruits & vegetables daily.
7. Choose a diet that is low in saturated fat and cholesterol and moderate in total fat.
8. Choose beverages an foods to moderate your intake of sugars.
9. Choose and prepare foods with less salt.
10. Only drink alcoholic beverages in moderation.
Food Guide Pyramid

- The Food Guide Pyramid serves three (3) main purposes:
  1. It graphically displays the dietary guidelines;
  2. It replaces the Basic Four Food Groups that most individuals learned in the third grade; and
  3. It reflects contemporary nutrition knowledge.
Food Guide Pyramid

- It is important to keep the following three (3) main points in mind when using the Pyramid:
  1. The guide does not apply to infants or children under the age of two;
  2. Variety is the key to the plan and is guaranteed by choosing foods from all groups and selecting different foods within each group; and
  3. Consuming moderate amounts of calories from fat & sugar will help maintain a healthy diet.
Food Guide Pyramid

• Advise clients to follow three (3) easy steps when making food choices:
  1. Eat foods from each food group every day.
  2. Include a variety of foods from each food group.
  3. Practice moderation.
Nutrient Density - a measure of nutrients per calorie. A nutrient-dense food provides more nutrients at a low-caloric cost, whereas a non-nutrient-dense food (potato chips, cake, cookies, soft drinks) is a food that contains more calories and/or fat and fewer nutrients.

Ex., whole foods such as whole-grain bread versus white bread
Nutrient Needs for the Physically Active Adult

- Carbohydrates are the most important nutrient for exercising muscles.

- The principal functions of carbohydrates are to:
  - Serve as the primary energy source for working muscles;
  - Ensure that the brain and nervous system function properly; and
  - Help the body use fat more efficiently.
Nutrient Needs for the Physically Active Adult

• Stored carbohydrates, in the form of glycogen, are the primary fuel for exercise.

• Individuals who work out more than one (1) hour every day should consume close to 65% of their calories as carbohydrates.

• Individuals who work out every other day should consume around 55-60% of their calories from carbohydrates.
Nutrient Needs for the Physically Active Adult

- The recommended carbohydrate intake in gram weight is 4-6 grams of carbohydrate per kilogram of body weight, depending on activity level.

\[
4-6g \text{ carbohydrate} \times 1kg \text{ body weight} = \text{recommended intake}
\]

\[
84kg \ (185\#) \times 4-6g \text{ carbohydrates} = 336-504g \text{ daily}
\]
Nutrient Needs for the Physically Active Adult

• Carbohydrate loading can nearly double an individual’s muscle glycogen stores.

• Most carbohydrate loading is completed by an exhaustive training session followed by three (3) days of low-carbohydrate intake.

• The major drawback of carbohydrate loading is that the days of reduced carbohydrate intake can cause hypoglycemia and ketosis.
Nutrient Needs for the Physically Active Adult

- Hypoglycemia - low blood sugar
- Ketosis - increased blood acids

- These two (2) conditions are associated with nausea, fatigue, dizziness, and irritability.
Nutrient Needs for the Physically Active Adult

• It takes about 24 hours before muscle glycogen is fully restored.

• High-glycemic foods, such as simple carbohydrates, raise blood glucose, insulin levels, and facilitate glycogen thesis.
Protein

- The principal role of protein in the body is to build and repair body tissues, including muscles, ligaments, and tendons.

- Protein is also important for the synthesis of hormones, enzymes, and antibodies, as well as for fluid transport and energy.

- Proteins are structural and regulatory molecules made up of specific combinations of 20 different amino acids.
Protein

- Available research suggests that an active adult needs about 0.8-1.0g of protein per kilogram of body weight.

\[
0.8-1.0g \text{ protein} \times 1\text{kg body weight} = \text{recommended intake}
\]

\[
84\text{kg (185#)} \times 0.8-1.0g \text{ protein} = 67-84g \text{ daily}
\]
Protein

• In general, protein recommendations for athletes are about 1.2-1.8 grams of protein per kilogram of body weight.

1.2-1.8g protein x 1kg body weight = recommended intake

84kg (185#) x 0.8-1.0g protein = 101-151g daily
Protein

- Consuming more protein that the body can use should be avoided:
  - Diets high in protein often compromise carbohydrate status preventing top performance;
  - Diets high in protein are also usually high in fat;
  - High protein diets often have a hypercalciuric effect (affecting calcium balance) and is especially bad for women.
Protein

- Protein or amino acid supplementation in the form of powders or pills is not necessary and should be discouraged.

- Taking large amounts of these supplements can lead to dehydration, loss of urinary calcium, weight gain, and kidney and liver stress.

- Some amino acid supplements actually interfere with the absorption of certain essential amino acids.

- Amino acid imbalances and toxicities are also possible.
Fat

- Fat is the primary fuel for light- to moderate- intensity exercise.

- Fat provides essential fatty acids and is necessary for the proper functioning of cell membranes, skin, hormones, and for transporting fat-soluble vitamins.

- Following a low-fat, high-carbohydrate diet is important for increased power output and speed as well as health reasons (i.e., cardiovascular disease, obesity, diabetes, and cancers).
Fat

- Recognize the many sources of hidden fats in foods:
  - Dairy products (cheese, ice cream, whole milk)
  - Bakery items
  - Granola bars,
  - French fries,
  - Avocados,
  - Chips,
  - Nuts, and
  - Many processed foods.
Heart Disease

- Atherosclerosis - progressive narrowing of the arteries due to deposited cholesterol and scar tissue.
Heart Disease

- Low-Density Lipoproteins (LDLs) - a plasma complex of lipids and proteins that contains relatively more cholesterol and triglycerides and less protein. High LDL levels are associated with an increased risk of coronary heart disease; labeled “bad” cholesterol because it deposits cholesterol on the artery walls.

- High-Density Lipoproteins (HDLs) - a plasma complex of lipids and proteins that contains relatively more protein and less cholesterol and triglycerides. High HDL levels are associated with a low risk of coronary heart disease; labeled “good” cholesterol because it removes excess cholesterol from the body.
Heart Disease

- LDL can be lowered by exercising, losing weight, incorporating more monounsaturated and polyunsaturated fats into the diet, and decreasing the overall percentage of fat calories consumed.

- Some clients with extremely high LDL levels may need medication to control LDL cholesterol.
Heart Disease

- HDL can be raised by regular, consistent exercise.

- Moderate alcohol consumption also appears to raise HDL levels, but most health professionals recommend exercise as a better method.
Heart Disease

- Triglyceride - the storage form of fat consisting of three (3) fatty acids and glycerol.

- Hydrogenation is the process of breaking the double bonds in unsaturated fats (liquid at room temperature), thereby turning them solid. This reduces the number of double bonds and make them more saturated and more resistant to spoilage.
Vitamins and Minerals

- Vitamins and minerals are food components that serve as coenzymes in the metabolic reactions that release energy, transport and consume O₂, and maintain cell integrity.

- Ergogenic acids - substances thought to enhance energy availability or utilization to improve endurance or strength.
Vitamins and Minerals

- Nutrient deficiencies for the exercising population are similar to those of the general population:
  - Folate
  - Vitamin B₆
  - Antioxidants
  - Calcium
  - Zinc
  - Iron & B₁₂ may also be of specific concern to women and vegetarians.
Vitamins and Minerals

• Most people do not need to take vitamin supplements; however, it may be appropriate to suggest a one-a-day vitamin supplement to clients who limit their food selection and calories.

• There are two (2) types of vitamins:
  1. Water-Soluble (B complex & C)
  2. Fat-Soluble (A, D, E, & K)
Vitamins and Minerals

- Antioxidants are compounds that preserve and protect other compounds in the body from free radical damage.

- Five (5) nutrients have been identified as having antioxidant properties:
  1. Beta Carotene
  2. Vitamin C
  3. Vitamin E
  4. Sulfur
  5. Selenium
Vitamins and Minerals

• Iron is critical for the formation of hemoglobin.

• Iron plays a key role in numerous reactions; it is vital to the transport and activation of O₂, and is present in several pathways that create energy.
Vitamins and Minerals

Minerals are divided into two (2) groups:

1. Macro minerals (calcium, phosphorous, magnesium, sodium, potassium, chloride, and sulfur)
2. Trace minerals (copper, iodine, zinc, cobalt, fluoride, selenium)
Vitamins and Minerals

• Lactose intolerance is the inability to digest significant amounts of lactose, the predominant sugar of milk.

• This inability results from a shortage of the enzyme lactase, which is normally produced by the cells that line the small intestine.
Fluid and Hydration

- Exercising individuals must drink plenty of fluids before, during, and after a workout.
- Relying on thirst as an indicator of how much fluid is lost is not an accurate method.
Fluid and Hydration

Clients can self-monitor their fluid levels by one of two methods:


2. Check urine color. A dark gold color indicates dehydration. A pale yellow or no color means the client is headed toward a state of hydration. Clients who consume a lot of caffeine, alcohol, or other diuretic will have pale or clear urine even though they are, in fact, dehydrated.
Fluid and Hydration

Most experts will now recommend sports drinks to exercising individuals, especially if their workout lasts longer than 60 minutes.
Fluid and Hydration

Guidelines for Fluid Replacement

• Consume 1-2 cups (8-16 ounces) of fluid at least one (1) hour before the start of exercise. If possible, consume 8 ounces of fluid 15-30 minutes before the start of exercise.

• Consume 4-8 ounces of fluid every 10-15 minutes during the workout.

• Consume 16-24 ounces during the 30 minutes after exercise, whether thirsty or not.