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DEVELOPING PHYSICAL FITNESS

CHAPTER

15



After completing this chapter you should be able to:

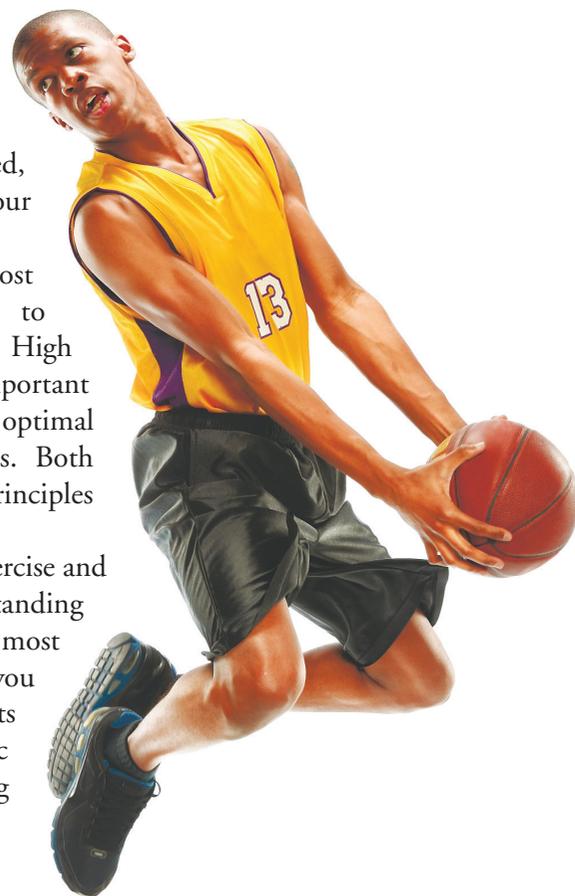
- identify the fitness training principles and describe their characteristics;
- describe the components of physical fitness and motor ability;
- discuss the benefits of different types of fitness training activities;
- design a training program to meet specific fitness goals.

The health, joie de vivre, and creativity of a well-developed personality depend to a great degree upon general fitness levels. Fitness is your functional readiness and level of effectiveness that are required for everything you do. It involves the ability to adapt to the demands and stresses of daily life and is directly related to the amount and intensity of your physical activity. The term *fitness* is used in many ways and has many dimensions, including physical, emotional, social, and intellectual. The focus of this chapter is physical fitness.

Physical fitness is more than just a concept – it is a way of life that incorporates many components important for health, such as muscular strength, muscular endurance, cardiorespiratory endurance, flexibility, and body composition. Each of these components offers unique benefits and advantages that affect your health in a positive way. Engaging in physical exercise provides numerous benefits that help you control your weight, manage stress, and boost your immune system, as well as protect you against disease. Not only does exercise help you look and feel good, but it allows you to have fun while achieving a state of health and vitality. Fitness need not be boring and monotonous, or restricted to running and cycling; there are many options available, and all you need to do is discover what activities interest you most. Exercise is one of the most important, and indeed, most controllable, factors affecting your general health.

General physical fitness is of utmost importance to athletes who strive to achieve high levels of performance. High levels of general fitness are important prerequisites for the effective and optimal development of sport-specific fitness. Both develop on the basis of the training principles governing exercise.

In order to get the most out of exercise and physical activity, you need an understanding of how to exercise properly and most effectively. This chapter will provide you with concepts related to components of fitness and equip you with basic knowledge that governs training principles and their interrelationships.



“Those who think they have no time for bodily exercise will sooner or later have to find time for illness.”

EDWARD STANLEY

Fitness Training Principles

Before we discuss the various components of physical fitness and the types of training activities, it is important to know something about the principles that govern training. A program that adheres to these well-established principles is more likely to generate the greatest improvements in your fitness level.

FITT Principle

The **FITT principle** is a simple method that can be used to help you recall the four important design elements of any training program: Frequency, Intensity, training Time, and Type of activity. Each of these components is described in more detail here.

THE FITT PRINCIPLE

The mnemonic FITT can be used as a simple method of recalling the four important design elements of any training program:

Frequency – How often should I train this component?

Intensity – How hard do I need to work to achieve a benefit?

Time – How long should I train for?

Type – What activities should I do?

“Does the training program FITT?”



Training Frequency

The number of times a person exercises each week is known as **training frequency**, which can depend on an individual's goals, abilities, fitness level, and sport. If the goal is to maintain an achieved level of fitness, two or three sessions per week are sufficient; however, if the goal is to improve physical fitness, four to six sessions are recommended.

Training Intensity

In order to achieve a fitness benefit or see an improvement, a person needs to work at a certain **training intensity**. This intensity level is measured differently for each physical fitness component. For instance, intensity in cardiorespiratory endurance training is monitored by measuring the pulse, or heart rate, with the goal of keeping the heart rate between 50 and 85 percent of the predicted maximum. Other measures of intensity include resistance to be overcome, number of repetitions, speed of movement, and percentage of maximum performance effort.

Another intensity consideration is the **work-to-rest ratio** (e.g., 1:2 – the rest phase is two times the length of the work phase). The rest phase allows for recovery from muscle fatigue. Generally, the lower the intensity of exercise, the shorter the rest periods required.



The work-to-rest ratio indicates how long the rest phase should be relative to the length of the work phase. Generally, the lower the intensity of exercise, the shorter the rest periods have to be.

Training Time

The total time devoted to developing fitness is called **training time**, which is based on the duration of each training session. **Training volume**, another element of exercise time, is measured in various units depending on the type of activity. For instance, in cyclic movements (e.g., walking, running, swimming, kayaking, rowing), the total distance in one workout or several workouts over the course of one week represents the volume of training.



DID YOU KNOW



In his youth, Milon of Croton (disciple of Pythagoras, scholar, and multiple Olympic wrestling champion in ancient Greece) decided to become the strongest man on earth. To achieve this he lifted and carried a calf every day. As the calf grew and became heavier Milon's body adapted to the growing weight of the animal and became increasingly stronger. When the calf had grown into a bull and Milon a man, he had become the strongest man of his time.

For strength training, the volume may refer to (a) the total number of all repetitions of each exercise, (b) the total of all repetitions during a workout, (c) the total resistance moved, or (d) the number of times a circuit was completed.

Type of Activity

Choosing a type of exercise is also important. Physical activity can include **formal fitness activities**, where the development of fitness is the main goal (e.g., circuit training, group fitness classes, jogging, weight training), or **informal fitness activities**, which emphasize the social aspect of exercising – such as camaraderie, cooperation, and fun – as the main goal, with fitness being a by-product (e.g., pickup street hockey, social dancing, three-on-three basketball, mall walking).

Often the participant will determine whether an activity falls into the formal or informal category. One person may engage in pickup hockey or mall walking to improve fitness, while another may participate in these activities to meet people and make new friends. It's important to set specific goals in order to maximize your training experience.

Overload Principle

For improvement to occur, training demands must be higher than normal performance requirements in order to stress the capacity of the targeted muscle or body system. This **overload principle** can be applied by increasing the frequency, intensity, or time of the exercise program.

Progression Principle

After a period of training, the load that previously created a level of stress will no longer provide an adequate overload stimulus. This stimulus is now a “normal” load, and to ensure that the muscles or systems continue to improve, the stimulus must be periodically increased. This is called the **progression principle**.

There are various ways to increase load, depending on one's fitness level and the method of training used. Gradually increasing the training load, in small steps from one training cycle to another, is recommended for beginners and recreational trainees. An example is shown in the box *How to Overload*.

▶▶▶▶ HOW TO OVERLOAD

One way to determine whether to increase the load is by judging the number of times a given weight can be lifted before causing fatigue. For example, if you start lifting 55 pounds (25 kg) 10 times and, after training for a length of time (two to five sessions), you can now lift the same weight 15 times, then to increase muscle strength, the load should be increased to what can be lifted maximally (until exhaustion) 10 times. This new weight will most likely be 65 pounds (30 kg). This ensures that the muscles are working in the overload zone and the “signals” that stimulate adaptation are being sent to the muscles.



Reversibility Principle

Illness, injury, or even a short vacation can cause an unavoidable break in your training routine and schedule. While rest periods are necessary for recovery in between workouts, extended rest intervals like these can have a negative effect on fitness levels. According to the **reversibility principle**, extended training interruptions result in stagnation or a temporary decline in performance. Conversely, detraining effects can be reversed when training resumes. The length of the detraining period and the training status of the individual will dictate how much performance is lost during time off from training.



Be prepared for a loss in performance when a break in training occurs, but don't be discouraged – these effects can be reversed!

Research has clearly shown that endurance athletes can lose up to 10 percent of their performance VO_2max following a one-week layoff from cardiorespiratory training. This illustrates the reversibility principle and emphasizes the need to use it or lose it!



Generally, cardiorespiratory and muscular endurance performance declines faster than maximal strength and power performance. Motor ability performance factors such as coordination and muscle integration also decline with training interruptions because these factors are all interrelated. Remember the saying “Use it or lose it!”

Specificity Principle

Specific activities and exercises cause specific physiological responses or changes. The **specificity principle** dictates that if you wish to improve a particular fitness or skill component, you must select a training modality that is as close in action as it can be to the end result.

When You Exercise for Performance, Be Specific!

- If you train arm strength by pushing with bent arms against immovable walls, you will become strong at pushing walls but not at doing push-ups, which require dynamic contractions.
- It makes little sense for basketball players to practice shooting at an 8-foot basket if they shoot at a 10-foot one in a game or for hockey players to practice shooting drills without a goalie in the net.
- If a person has to lift 50-pound boxes at work, it makes little sense to use a 10-pound resistance while training to improve work efficiency.
- Performing bench presses will not help you improve the endurance of your leg muscles.
- Sprinters will do themselves little good if they train by running long distances.

Think of specificity in terms of the types of changes the body makes in response to training. Over time, your body becomes better able to meet the demands of a specific skill as it adapts to training. Stated another way, “What you do is what you get.”

Components of Physical Fitness

“Commit to be fit.”

Physical fitness incorporates various components important for general health that are essential for people of all ages and abilities (Figure 15.1). These components – muscular strength, muscular endurance, cardiorespiratory endurance, flexibility, and body composition – were examined in previous chapters, but they will be discussed in this section as they relate to achieving health-related fitness.



Figure 15.1 The six major components of physical fitness.

Muscular Strength



The ability of a muscle or muscle group to exert force against a resistance is known as **muscular strength**. The greater the muscle diameter, the greater the force it should be able to generate. As discussed in Chapter 10, girls and boys have similar levels of strength before puberty. Because of the influence of testosterone during and after puberty, however, males have the capacity to develop larger muscles and thus can generally develop greater strength.

In sports, the force generated by a muscular contraction may be applied against a movable object, as in weightlifting, or against a fixed object, such as the starting blocks in sprinting. If you think of sports that require great strength, the athletes that participate in these sports have large muscles. However in daily life, the average person



The amount of strength required in our daily lives depends to a large extent on our age, occupation, and specific life circumstances.



needs only enough strength to manipulate his own body weight; lift and carry items such as a backpack, groceries, or children; or carry work-related items such as tools.

As you learned in Chapter 6, we can differentiate between absolute and relative strength. **Absolute strength** is the total force a person can apply in a single effort against a resistance: how much weight or mass she can move regardless of her weight or mass. **Relative strength** takes the mass of the body into account and is calculated by taking the person's maximum (absolute) strength and dividing it by the mass of her body. For example, a 14-year-old girl who can do a chin-up can lift her own body weight. A year later, after gaining 10 pounds (5 kg), her upper body may be just as strong, but she may no longer be able to do a chin-up. She has maintained her absolute strength, but her relative strength has decreased.

Training Muscular Strength

It is important to give muscles time to adapt to training – normally at least 48 hours is required between strength training sessions. It is during this time between sessions that optimal muscle adaptation occurs (i.e., increased size,

DID YOU KNOW ?

Although muscle loss is a very real medical condition in the elderly population, resistance weight training can halt or even reverse **sarcopenia** (Greek for “vanishing flesh”), enabling older people to continue functioning independently in their golden years.

RESISTANCE TRAINING TERMINOLOGY

What is a set? What is a rep? What is resistance?

Resistance is the amount of mass you move. It can be your own body weight or the specific weight of a dumbbell, barbell, or weight machine (often based on a percentage of one repetition maximum, or 1RM).

Number of reps (repetitions) is the number of times you do a movement without stopping.

A **set** is one group of reps.

Example:

A student bench presses 100 pounds 12 times, rests 3 minutes, and repeats. This is recorded as 2 x 12 x 100.

