

# 2

## **Properties of a Quality Strength and Conditioning Program**

A quality strength and conditioning program has five characteristics:

1. *All workout sessions begin with a minimum of 10 minutes devoted to general "warm-up" exercises and stretching.* General warm-up refers to such activities as calisthenics, jumping rope, and jogging, which are active in nature. Passive methods of warm-up, such as massage and heat rubs, may be of value in some situations, but active warm-up is usually more important. Indications are that warming up has a positive effect on most types of physical activity and may help to reduce injury potential. The physiological effects of warming up help explain its value. For example, increased muscle temperature results in increased contractile force and speed, while increased blood temperature and flow rate result in increased oxygen delivery to working muscles. A major benefit of warming up is to reduce the likelihood of cardiac ischemia (insufficient blood supply to the heart) during the start of exercise. Experiments have shown that firemen exhibit irregular heartbeats if they go from resting to immediate running, as occurs during work situations. The psychological effect of making a gradual rather than an immediate transition from rest to strenuous

physical activity may be another major benefit of warming up.

Part of the overall warm-up process should be devoted to stretching, which aids in developing and maintaining flexibility. Flexibility refers to the range of single and multiple joint motions possible and the ease with which full range movements can be performed. It was once thought that strength-oriented exercises would limit or reduce flexibility, but this has been proven false if weight lifting exercises are performed properly through the entire movement range possible whenever safe to do so.

One important instance when you should limit your movement range slightly is when performing the squat or deep knee bend exercise. The recommended procedure is to squat slowly downward until the thighs are parallel to the ground, and then return to the starting position. Most individuals could squat lower, with more knee flexion, but I discourage this due to the large physical stresses that squatting lower generates at the knee joint. Knee flexibility is usually not a problem and squats will not reduce it, especially when intelligently selected stretching exercises are practiced regularly. The vast majority of lifting exercises can be executed safely using the fullest possible range of motion.

Flexibility may be a contributing factor to reduced injury potential. When

selecting a group of stretching exercises, you should include movements that work every joint from the feet and ankles to the neck and to the wrists and fingers. Of the vast number to choose from, pick stretching exercises that you like and that you won't skip because they're uncomfortable to perform. Some stretching may be done between exercises or at the end of a workout, as well as during warm-up.

Incidentally, I recommend that you do passive rather than dynamic or ballistic stretching. The passive method requires slow movement into the position needed to stress the joints and muscles being worked. Movement continues until you feel slight discomfort in the muscles or joint areas being stretched, at which point you hold the position for about 10 seconds. Relax slightly for 5 to 10 seconds, then start another period of stretching. Repeat this procedure several times for each joint or combination of joints being worked.

Ballistic stretching involves bouncing, with the momentum of other body parts forcing joint structures, such as ligaments and tendons, to elongate. The bouncing action also causes sudden stretches to be imposed on the associated muscles, with the possibility of a nervous system reaction called a "stretch reflex." This reflex facilitates contraction of the stretched muscle—just the opposite of the relaxation which is needed. In addition, "viscoelastic" proper-

ties of connective tissue cause it to resist stretch more forcefully when pulled rapidly rather than slowly. Thus, ballistic stretching is physiologically untenable and may even result in tiny tears of the muscles and connective tissues involved.

A second type of warm-up, which can be just as important as general warm-up, is called specific warm-up. This is simply practicing the physical activity you are about to engage in, but at a low intensity. Sprinters run short distances from the starting blocks with less than maximal effort. Basketball players take shots and do lay-up drills before the game. Baseball players take batting practice. For strength training you begin any lifting exercise with relatively light weights before moving up to the heaviest load for that workout. General and specific warm-ups, including stretching, should totally prepare you physically for a productive period of exercise.

So much for warming up. The remaining properties of a quality strength and conditioning program are:

2. *The program is complete and simple.* This means that the exercises in your program should work all the major muscle groups in your body (completeness) and that as few exercises as possible should be used to accomplish this goal (simplicity). Completeness is desirable for balanced development, while simplicity is desirable to shorten the duration of workouts and permit higher intensity and better focus of available energy. Some advanced or specialized programs may violate this concept, but these are an exception.

3. *The components of the program are repeated periodically.* That is, the same exercises, or groups of exercises that work muscle groups in a similar way, should be done at regular time intervals. The classic three-day-per-week (Monday-Wednesday-Friday or Tuesday-Thursday-Saturday) strength program seems to work best for most beginners. The method of periodic repetition may become somewhat complex within the four- to six-day-per-week programs often used by more advanced trainees.

4. *The program is progressive.* This concept is usually misunderstood. It means, for strength exercises, that the weight you lift in a given exercise should be increased regularly but *not* continuously. One simple way to do this when on a three-day-per-week program is to have one heavy, one light, and one medium training day each week. The weights lifted on the heavy day are increased every few weeks, and this results in heavier weights on the light day and on the medium day, which are about 80 and 90 percent of the heavy day, respectively. Different methods of being progressive in a consistent way, while incorporating the technique of variability, are presented in Chapters 5 and 7. Some kind of variability must be incorporated into any type of training program

if progress is to be maintained. The same exercise done day after day and week after week will result in total adaptation of the body and a cessation of progress, or overtraining, and a decrease in performance. Knowledgeable runners, for example, run different distances at different paces (intensity) from day to day and week to week during a training cycle. During the cycle, however, the intensity tends to increase while the distance fluctuates less and less from the race distance being trained for.

5. *The program is compatible with the trainee's abilities and goals.* The severity of your program should match your physical and mental capacities. If the program is not stressful enough, little or no adaptation will occur; if too stressful, you may not recover from your workouts and you may become "overtrained." A frequent error is for a beginner to copy the program of an advanced athlete or bodybuilder from an article in a periodical. Likewise, the components of the training program should be designed to match the desired end result. A high jumper trains differently from a distance swimmer or someone who is training only to improve general fitness. Some of the exercises may be the same, and the general principles on which the program is based may be the same, but the details will vary considerably. These ideas are considered in the circuit training example below and in Chapters 5 and 7.

To review, five basic characteristics of a quality strength and conditioning program are warm-up, completeness and simplicity, periodicity, progressiveness, and compatibility. Reasons for unsatisfactory results from a training program can usually be related to a violation of one or more of these properties.

## TWO BASIC SYSTEMS OF STRENGTH TRAINING: PRIORITY AND CIRCUIT SYSTEMS

### The Priority System

Physical activity that produces and maintains an elevated heart rate of about 150 beats per minute for 20 minutes or longer will result in considerable cardiovascular (CV) conditioning for the average person. Typical weight training workouts are conducted in what is called a *priority system*, where one of several exercises included in the workout is completed (highest priority) before going on to the second exercise, and so on. Each bout of activity with a given exercise is called a set, and it consists of a number of repetitions (reps). In a priority system, three sets of 10 lifting reps per exercise is most common. During the activity period or set, the heart rate increases considerably, but it

drops off rapidly during the rest between sets. The rest period is needed for partial recovery so that the weight can be lifted for the required reps in the next set. Experiment has shown that the heart rates of competitive weightlifters doing typical training lifts, which require simultaneous use of the large muscle groups in the leg, hip, back, and shoulder areas, fluctuate between 110 and 160 beats per minute, if rest intervals are kept at one minute. Fluctuations in this range for 15 to 30 minutes or more will produce CV benefits for most individuals, but not as extensive as would occur if the heart rate remained close to 150 for the same period of time. The reason most individuals obtain minimal CV benefit from priority system weight training is that they rest too long (three to five minutes or more) between sets, either so they can lift heavier weights or because they are lazy. There is a real need for such longer rest intervals when a heavy weight must be lifted for several reps in multiple sets to achieve the goals of a strength-oriented program.

## The Circuit System

Most individuals, however, including even high-level athletes at certain times during a training cycle, want—indeed, need—more general conditioning for muscle endurance, strength, and cardiovascular fitness. If such is your case, you can use a procedure called *circuit training*, which you can modify in several ways to help you achieve specific goals.

A circuit for a workout consists of a collection of stations, each station being an area or piece of equipment for a chosen exercise to be performed. Not all stations need be for a weight lifting or a strength exercise—one could be for stretching or rope jumping. But the example that follows will consider only the former type of exercises.

The idea behind circuit training is that you go from station to station through the circuit and repeat the circuit a number of times. If the circuit is properly designed, so that the muscles principally used alternate somewhat from station to station, you can keep moving and maintain a high heart rate. There is no doubt that, for a given exercise in the circuit, you could lift more weight for a specified number of reps using the priority rather than circuit system. But, as pointed out above, the circuit method's purpose is to develop other components of fitness in addition to strength. Besides, the specificity of exercise principle tells us that you must sacrifice something in strength gains to achieve additional training benefits such as CV fitness and endurance.

As an example of the variety of goals that you can attain with circuit training, consider this circuit:

1. Leg press—for hip and knee extensors
2. Dumbbell rows—for lats, deltoids and elbow flexors
3. Leg curls—for hamstrings and calf
4. Bench press—for pecs, deltoids and elbow extensors
5. Situps—for abdominals and hip flexors
6. Hyperextensions—for spinal erectors

Instructions for performing the exercises in this circuit are given in Chapter 4. Note that it is a complete program since all major muscle groups are worked, and that it is simple since it involves only six exercises. This circuit can easily be done three days per week to satisfy the periodic repetition rule and can be made progressive in a number of ways that we'll discuss later. It would also be compatible with the needs of a variety of trainees at the beginning or intermediate level of experience in overload exercise.

You may now be wondering how many times you should go through a given circuit, how many reps you should perform at each station, how much weight you should use, and how much rest, if any, you should take between stations. The answers depend on whether you want to emphasize *cardiovascular fitness and muscle endurance* in your program or *strength development*. Making this decision is sometimes referred to as finding a training point on the strength-endurance continuum. To help you in your decision, and to tailor your program to your needs, you should understand that each type of program has its own characteristics. A CV and endurance-oriented program, for example, is characterized by:

1. Little or no rest between stations; or performing an activity like jogging in place, jumping jacks, jumping rope, or pedaling a stationary bicycle for 30 seconds to a minute between stations
2. Higher reps at each station (10–20)
3. Many excursions through the circuit (5–10)
4. Lower weights lifted at each station (relative to your maximum lifting ability)

By contrast, a strength-oriented circuit program is characterized by:

1. Rest periods between stations (about one minute)
2. Lower reps at each station (3–8)
3. Fewer excursions through the circuit (3–5)
4. Heavier weights lifted at each station (relative to your maximum lifting ability)

Some coaches who work with a large number of students or athletes at once will have one person start at each of the available stations and will signal when to start exercising, when to stop and rotate to the next station, when to start exercising again, and so on. This limits the number of reps at a given station by time and makes maximum use of available equipment. The weights used in this case should be adjusted by each of the individuals so that they can "keep going" during each exercise interval but are really working hard just before the interval ends. When a fixed number of reps is assigned at each station, the weight should be chosen so that the last couple of reps are difficult to complete, especially the final time or two through the circuit. This is especially true when the workout session is meant to be a heavy training day.

Circuit weight training is often called aerobic weight training. This is inaccurate. A muscle must be continuously active for more than about two minutes to shift primarily to aerobic metabolism, and since a circuit should be designed to alternate muscle groups from station to station, the time criterion

is not satisfied. A significant amount of aerobic metabolism certainly occurs during the repetitive work-recovery cycles within a circuit program, but it is not generally the primary energy supply system while work (exercise) is being performed. The anaerobic (non-oxidative) energy system and stored ATP satisfy most of the muscles' energy needs during the work.

Note that weight machines are not needed to do circuit weight training. Indeed, though they make changing weight easy, they have some disadvantages as we'll see. In crowded public gyms and spas with limited equipment, you may find circuit training impractical due to use by other people of equipment you may need for one of your stations. If this is the case, you can orient a priority system toward an emphasis on cardiovascular fitness and endurance by doing higher rep sets with little rest between them, or by alternating just two or three exercises at a time rather than all exercises as in a single complete circuit.

Any circuit system that you set up should satisfy the five properties of a quality program given earlier. Training cycles (discussed in some detail in Chapters 5 and 7) can incorporate both circuit and priority training. You can, for example, train for a month or two on a circuit system with overall conditioning the emphasis, and then switch to a priority system for a similar period to build strength. The next chapter will discuss places to train and the advantages and disadvantages of various types of equipment. Chapter 4 will describe a large variety of strength training exercises that you can use to construct your program. Later chapters provide more detailed examples of programs and training cycles.