5

Putting Your Program Together

Now that you know how to do a variety of exercises, putting your strength training program together is easy if you incorporate the principles and concepts outlined in Chapter 2. You'll remember that one basic characteristic of your quality program must be periodic repetition and another must be compatibility with your goals and abilities. Since many of you may be new to or have limited experience with strength training, we'll start by discussing several simple three-day-a-week programs. Later we'll go over examples of more complex and advanced programs. Remember: *You should try to use as uncomplicated a program as possible, so long as it gives you favorable results.* Never start with an advanced, sophisticated program. If you do, then when progress drops off you'll find it difficult to change the program in such a way as to restimulate progress. Advanced training techniques are like tools. If you use them all initially, what will you have left to use when they wear out?

TWO SIMPLE GROUPS OF EXERCISES

A three-training-day-a-week program has been found by experiment and practical experience to produce excellent results even for reasonably experienced trainees. It satisfies the periodic repetition principle, and, if weight training is your primary means of exercise, it satisfies the generally accepted concept that three workouts a week of about one hour each is the minimum amount of exercise compatible with good health.

We know that the first principle of a quality program is to include a period of warm-up, preferably with stretching, at the start of each workout.

The next step in constructing your program is to pick exercises from those you learned in the last chapter, being sure to satisfy the principle of completeness and simplicity. As reasonable suggestions, consider the two groups of exercises listed below:

Set A	Purpose	Set B
1. Bench press	Upper-body pushing	1. Incline press
2. Leg press	Leg and hip extension	2. Lunge
3. Upright row	Upper-body pulling	3. Shoulder shrug
4. Machine leg curl	Hamstring work	4. Boot leg curl
5. Pull-up	Upper-body pulling	5. Lat pull-down
6. Good morning	Low back work	6. Stiff leg deadlift
7. Trunk curl	Abdominal work	7. Leg raise

Note that both groups satisfy the "complete and simple" principle. A fast and easy way to check this important point is to ask yourself if an upper-body pushing and pulling movement and a leg and hip thrusting (extension) movement have been included with torso strengthening exercises. In both Set A and Set B, exercises 6 and 7 are for torso strengthening (abdominals and lower back), exercises 3 and 5 are upper-body pulling exercises, exercise 1 is an upper-body pushing exercise, and exercise 2 is a leg and hip thrusting movement. You probably should review these classifications in Chapter 4. Doing exercise 4 in either set helps balance strength development for knee flexion (hamstring muscles) with the knee extension strength developed by exercise 2. Thus, you could replace any exercise in Set A with the same numbered exercise from Set B without affecting the completeness of the program. Or, a number of other exercises from Chapter 4 could be substituted, for example, an upper-body pulling movement, such as the dumbbell row. Also, a second upper-body pushing movement, such as the overhead press, could be added to the exercises of either Set A or Set B to place more emphasis on your pecs, triceps, or anterior deltoids.

The point is, you can use many different collections of exercises to form a reasonable program, just so long as you satisfy the "complete and simple" principle, and don't overdo it. Maybe one upper-body pulling exercise is enough for you to start with, rather than two as given in Sets A and B above. The program must be compatible with your abilities, and it's better to do too little work with a muscle group than too much. Later on, I'll show you example programs with as few as five, and as many as 12, exercises in them.

OTHER POINTS TO CONSIDER

So far we have taken a number of steps in constructing the first basic example program. We know you'll train three days every week (Monday-Wednesday-Friday, Monday-Thursday-Saturday, etc.), that you'll do warm-up exercises at the start of each workout (discussed in detail in Chapter 2), and that the program will consist of seven exercises (Set A or Set B). But we're not finished yet. We still have to decide whether you will use a priority or a circuit system, how many sets and reps of each exercise you will do, and how much weight you will use for each exercise in your workouts. These decisions depend largely on your goals.

Circuit or Priority System?

If muscular endurance and cardiovascular fitness are your primary goals, then a circuit system will probably be most efficient to achieve them. You should do the circuit with little or no rest between stations (or do light aerobic exercise between stations), with higher reps per set (10 to 15), and a greater number of excursions through the circuit—perhaps 5 to 10. As mentioned in Chapter 2, you'll find that this program design will force you to use less weight in each exercise, relative to your maximum, than would be possible with most other program designs, since you're constantly on the move with little or no rest. The weight you use in each exercise should permit you to do the scheduled number of reps—let's say 15—but the last one or two should be difficult to complete, especially the final time or two through the circuit. This is particularly true on the training days that you plan to be heavy ones. (More on light, medium, and heavy training days shortly.)

If your training goal is primarily strength development, you could still use a circuit system, but with the modifications discussed at the end of Chapter 3, namely, rest between stations, lower reps per set, and heavier weights relative to your maximum. A *priority system* however, is the most productive. *When you're going for strength gains,* with a priority system you would do, say, the exercises in Set A, in the order of their importance to you relative to your goals.

A general rule is to do the exercises that involve the largest muscle groups first. Thus, if leg and hip strength development is most important to you, do all sets of leg presses first. If upper-body strength is most important to you, do bench presses first. Put the rest of the exercises in an order so that smaller muscle groups or single-joint movement exercises, such as leg curls, which involve only knee flexion, come last.

Let's say that upper-body strength is your priority; a reasonable order for Set A in a priority system would be:

1. Bench press (many muscles of the upper body involved)
2. Leg press (large leg and hip extensors)
3. Good morning (large back and hip extensors)
4. Pull-up (large upper back muscles)
5. Trunk curl (abdominals)
6. Upright row (shoulder and shoulder girdle muscles)
7. Leg curl (hamstrings)

Trunk curls were placed between the pull-up and upright row because the latter two both involve the arms and shoulders. Placing them back to back would not give the elbow flexor muscles rest time, and would force you to use less weight in the upright row. *Remember, if strength is your goal, you should use as much weight as possible on heavy training days for the number of repetitions you're scheduled to do.* Keep in mind as you set up your priorities that the exact exercises used always influence the order to some extent, despite the general guidelines given above. For example, if you decide to do lunges or squats rather than leg presses, then good mornings should not follow, since the back muscles (spinal erectors) are worked heavily in both exercises. Instead, place an exercise not involving the back muscles in between.

How Many Sets and Reps?

Once you've determined the order of exercises in your priority system, you must decide how many sets and reps to do. Since we are now considering strength as a primary goal, you will want to handle fairly heavy weights relative to your maximum in each movement. Classic studies by the strength training pioneers Drs. Richard Berger and John "Pat" O'Shea in the early and mid-1960s indicated that three sets of five or six reps in core exercises (that is, those, such as bench presses or squats, that work larger muscle groups), performed three days a week, resulted in greater strength gains than do other set and rep combinations. Because of these research results, many people do three sets of five or six reps in the major exercises in their program. This is a productive way to train, and doing three sets of five reps in the bench press, then in the leg press, and so on, as listed above will certainly result in good strength gains. I recommend, though, that you do more reps than this in abdominal work and other exercises that work smaller muscles or single muscle groups. In leg curls, for example, do 10 to 15 reps.

Limitations

There are, however, some other considerations. The studies done by Berger and O'Shea typically involved college-aged students participating in a required weight training class. The experiments with these classes continued anywhere from 6 to 12 weeks. People respond to a given weight training program differently depending on previous strength training experience, exercise background in general, age, and genetic traits. There is no assurance, for example, that a middle-aged person who has already trained regularly with weights for a 10-year period would make the best strength gains by doing three sets of five reps in core exercises, as the novice college students did. Also, and perhaps most important, what happens to progress after 6, 10, or 12 weeks of three sets of five reps? Can progress be maintained? This is where the ideas about variation of training programs and training cycles become critical.

Before getting into details with additional examples, let's try to develop an understanding of why these variational methods work by discussing a generalized theory about the stages and processes your body goes through while trying to adapt to regular exercise.

THE GENERAL ADAPTATION SYNDROME

A theory formulated in the middle of this century by Dr. Hans Selye is sometimes called his "stress theory," but more commonly the General Adaptation Syndrome. "GAS" provides a framework from which most exercise programs and training cycles can be designed. Dr. Selye's clinical observations with humans and experiments with mice and rats led him to propose a three-stage process employed by any living organism when adapting to a stimulus that tends to disrupt its normal functional state (*homeostasis*). The disrupting stimu-

lus is called a *stressor* and may be beneficial (exercise) or harmful (germs). GAS proposes that when any stressor—such as physical trauma, infection, heat, fright—is imposed on a living organism, the organism's initial response results in a decrease in its ability to cope with additional stressors. This is called the *shock* or *initial alarm stage* of GAS. If you are exposed to a flu virus, for example, your ability to cope with exercise is greatly reduced. As time passes after the stressor exposure, however, your body should make internal adjustments that result in adaptations so that future exposure to the original stressor in particular, and to other stressors in general, will be less disrupting to homeostasis.

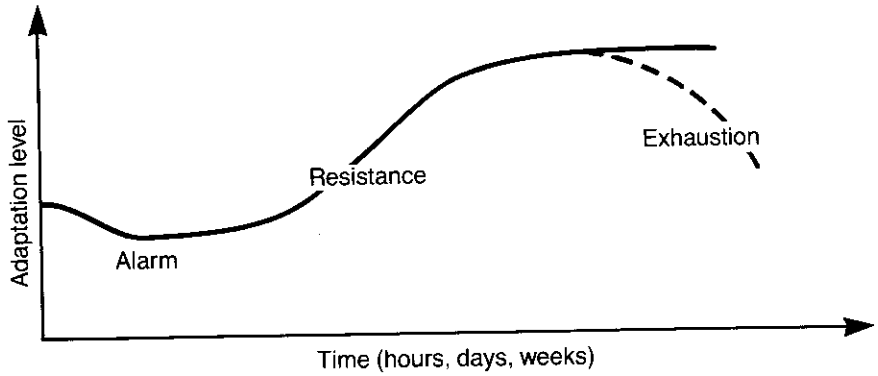
Reversal of the shock phase is termed *counter shock,* and it leads to the *resistance phase* of GAS. The effect of adaptation to a given stressor on your body's ability to cope with other stressors is called *cross-resistance.* This is why, for example, a person who stays in shape through regular exercise can better withstand the pressures of work or the common cold.

If multiple stressors are imposed on your body, counter shock may not occur, or the resistance phase may deteriorate into the third or exhaustion phase of GAS. The possible negative effects of multiple stressors is referred to as *cross-sensitization.* Failure to recover from the shock phase, or the exhaustion phase of GAS, may also occur from a single very potent stressor, or exposure to a given stressor for a prolonged period of time. Severe physical trauma from a car crash, for example, may result in death. In a less extreme illustration, heavy physical exercise day after day for many weeks will probably result in "overtraining," which is a manifestation of the *exhaustion phase* of GAS.

The phasic structure of Dr. Seyle's adaptation theory is the basis for the concept of variation and training cycles for both general exercise and specialized conditioning for athletes at all competitive levels—as we shall see in this chapter and in Chapter 7.

An additional and very important concept of GAS is that of the body's *specific* and *non-specific* responses to stressors. The adaptations we discussed in Chapter 2 for muscle fibers were, of course, specific to the exercise demands made on the fibers (exercise specificity principle). The new concept here is that *no matter* what type of exercise demand, or what stressor in general, is imposed on your body, *a non-specific response will also occur.* Non-specific responses affect your body as a whole through the nervous system and hormonal and other biochemical processes.

The ultimate concept for you to grasp is that *all stressors* of whatever type *result in essentially the same non-specific effects in addition to their own specific effects.* A burned finger elicits a specific response to guard against infection and



Graphical representation of the three phases of the general adaptation syndrome

repair damaged tissue, plus a non-specific response. A strenuous workout program results in specific bodily adaptations and the *same* non-specific responses that were caused by the burned finger, or the pressure at work, or the term paper due next week. Since non-specific stressor responses are additive, the exhaustion phase of GAS may result as a cumulative effect of many seemingly minor stressors.

Thus, in planning your exercise program, it is prudent to consider the other stressors in your daily life, as well as during special periods of abnormal pressure and commitments. World-class athletes in a number of countries are monitored regularly for signs of excess stress, which is technically defined as the total result of bodily responses to stressors. Typically their blood and urine parameters are monitored, as well as their resting heart rate and blood pressure. You, however, can suspect excess stress if you experience a loss of appetite and weight, sleep disorders, gastrointestinal ulcers, a lack of, or decrement in, training progress, or just a general feeling of constant fatigue and ill health. The fastest and only real cure for this problem, if indeed it is a manifestation of the exhaustion phase of adaptation, is to decrease the level of stressors acting on your body. Maybe you need to take a vacation, or to reduce the intensity and duration of your exercise program, or to cut back on other activities—whatever you can manage at the time.

Application of GAS

An application of the above theory to exercise program planning indicates that (1) exercise programs should start gradually to ease through the shock or initial alarm phase of GAS, and then slowly, over a period of weeks, intensify to the

desired level (an initial decrease in your strength or physical feeling may occur, this is the alarm stage of GAS); (2) the content, intensity, and duration of workouts should *not* remain constant, since the body could rapidly adapt to a constant stressor level and improvement would stop; and (3) occasional breaks or layoffs from your regular exercise program are needed to reduce and change stressor input to your body, and thus to avoid the exhaustion phase of GAS. Typical periods to apply these three concepts are one or two weeks for an initial phase of training (or so-called readaptation after a layoff), six to ten weeks for the major portion of a training cycle, and one or two weeks for a break or, better still, a change to some other physical activities resulting in what's referred to as "active rest."

GAS is cyclical and fluctuating in nature, and by training in a similar manner you can expect to make greater gains over longer periods.

The basic ideas of GAS can also be applied to responses of your body that occur over other periods. You can consider, for example, a single one- or two-hour workout as composed of a shock phase at the start when you feel tight and uncomfortable, followed by a resistance phase once you're "warmed-up" and accustomed to the activity level, and finally an exhaustion phase when fatigue sets in. Dr. Selye himself has made an analogy of GAS to the human lifespan by analyzing characteristics of childhood, adulthood, and old age. For the purposes of conditioning our bodies, training cycles of a few months' duration will be the main focus of examples applying GAS to exercise in this chapter and Chapter 7. After a few examples that illustrate additional important concepts, I'll show you a specific strength training cycle.

HEAVY, LIGHT, AND MEDIUM WORKOUTS—HOW TO QUANTIFY THEM

At the beginning of this chapter, we saw how to use the principles of completeness and simplicity to pick two appropriate groups of exercises for a strength training program. We then discussed how to use such a group of exercises in a circuit system to emphasize either muscular endurance and cardiovascular fitness (higher reps, etc.) or strength (lower reps, etc.). We also learned about a priority system workout and how to pick sets and reps to maximize strength gains. All those examples are productive programs that you can use according to your goals and lifting experience. But all programs have limitations. The following examples will illustrate techniques, programs, and cycles that will permit you to effectively utilize the guidelines of GAS in a variety of ways.

Consider the following workout:*

1. *Power clean:* 80 × 5 (meaning 5 reps with 80 pounds), 100 × 5 × 3 (meaning three sets of five reps with 100 pounds)
   Total: 20 reps, 1,900 pounds
2. *Bench press:* 100 × 5, 120 × 5 × 3
   Total: 20 reps, 2,300 pounds
3. *Parallel squat:* 120 × 5, 140 × 5 × 3
   Total: 20 reps, 2,700 pounds

   Grand total: 60 reps, 6,900 pounds
4. *Leg curls:* 20 × 10, 30 × 10 × 2
5. *Sit-ups:* 2 sets of 25 reps

Volume: 60 reps
Load: 6,900 pounds
Intensity: $\frac{Load}{Volume} = \frac{6{,}900 \text{ pounds}}{60 \text{ reps}} = 115 \text{ pounds per rep}$

There are a number of interesting features about this type of workout and the method used to evaluate it quantitatively (that is, describe it objectively by numbers). It is based on three core exercises and two assistance exercises. Yet with only five total exercises (simplicity), it satisfies the completeness characteristic of a quality program, working all the major muscle groups of the legs, hips, torso, back, chest, shoulders, and arms. Quantitatively, the volume for each exercise is the total number of lifts done in that exercise—20 in the above example; and the volume of the workout as a whole is the total number of lifts (repetitions) done during the entire workout—60 in the above example. Reps should be counted only for major exercises, so leg curls and sit-ups are not included in the above example calculation. Additional examples that follow will help you decide which exercises to include in volume counts for your workouts. The volume in major lifting movements is important to consider, since it represents a quick estimate of the total effort demanded from your body during a workout.

Load is an even more accurate calculation of the work your body does.

*This example and the two that follow are an expansion of ideas presented in Bill Starr's book *The Strongest Shall Survive—Strength Training for Football*, listed under "Further Readings" at the end of the book.

A load measurement is obtained simply by multiplying the weight used in each set by the number of reps, and adding the values from the whole workout together. In the bench press of the example above, $100 \times 5 = 500$, plus $120 \times 5 \times 3 = 1{,}800$, for a load of 2,300 pounds. The same is then done for the other core exercises. By themselves, load figures would not be of much more value than volume figures in quantifying the total demands or stressors imposed on your body by a given workout. By dividing the load figure by the volume figure, however, you get the very important and useful parameter of *intensity.*

Volume and intensity considered together clearly define the effort required by a given workout. Think of it this way: *Volume* is a measure of *quantity of work,* just as the distance covered by a jogger during a run, or the number of jumps or throws by a track-and-field athlete in a workout is a quantity measure. *Intensity,* on the other hand, is a measure of *quality of exercise.* For a jogger, intensity would correspond to his running speed and is measured in average minutes per mile—for example, 8.5 minutes per mile. For throwers and jumpers, intensity is the average distance thrown or jumped during the workout. In weight training, *intensity* is simply the average weight lifted per repetition. As seen in the example, it is calculated as total weight lifted (load) divided by total repetitions (volume). In other words, *intensity equals load over volume* ($I = L/V$).

In our example above, the heaviest weight lifted was 140 pounds, in the squat. The lightest weight lifted in a major exercise was 80 pounds, during

warm-up for power cleans. By calculating load and volume as shown, the intensity formula *(I = L/V)* tells us that the average weight lifted was 115 pounds per rep.

The absolute value of volume and intensity for your training sessions is important in analyzing workouts, planning future workouts, and measuring improvement. For example, I have mentioned the concept of having heavy, light, and medium training days in your strength program. Let's assume the workout just analyzed was your heavy day. The next workout should be light, which means about 75 to 85 percent as hard as the heavy day. We'll use approximately 80 percent of the heavy-day weights as an example.*

Light day (about 80 percent of previous heavy day)

1. *Power clean:* 65 × 5, 80 × 5 × 3
   Total: 20 reps, 1,525 pounds
2. *Bench press:* 80 × 5, 95 × 5 × 3
   Total: 20 reps, 1,825 pounds
3. *Parallel squat:* 95 × 5, 110 × 5 × 3
   Total: 20 reps, 2,125 pounds

   Grand total: 60 reps, 5,475 pounds
4. *Leg curls:* 20 × 10 × 3
5. *Sit-ups:* two sets of 25 reps

Volume: 60 reps
Load: 5,475 pounds
Intensity: 5,475/60 = 91 pounds per rep

The third workout of your training week should be medium in the demands it places on your body, and be in the range of about 85 to 95 percent of the heavy day. We'll use approximately 90 percent of the heavy-day weights for our example.

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*Either before or after studying the next two examples, which also calculate *V, L,* and *I,* you may want to test your ability to determine these values from the weights, sets, and reps listed in the following sample workout:

1. *Power clean:* 50 × 5, 60 × 4, 70 × 3, 80 × 2, 85 × 1, 50 × 3
2. *Bench press:* 40 × 8, 50 × 6, 60 × 4, 75 × 2, 85 × 1, 50 × 5
3. *Parallel squat:* 75 × 5, 90 × 5, 90 × 5, 90 × 5, 75 × 5

(*Answers:* *V* = 69 reps, *L* = 4540 pounds, *I* = 65.8 pounds per rep.)

Medium day (about 90 percent of the heavy-day weights)

1. *Power clean:* 70 × 5, 90 × 5 × 3
   Total: 20 reps, 1,700 pounds
2. *Bench press:* 90 × 5, 110 × 5 × 3
   Total: 20 reps, 2,100 pounds
3. *Parallel squats:* 110 × 5, 125 × 5 × 3
   Total: 20 reps, 2,425 pounds

   Grand total: 60 reps, 6,225 pounds
4. *Leg curls:* 20 × 10, 25 × 10 × 2
5. *Sit-ups:* 2 sets of 25 reps

   Volume: 60 reps
   Load: 6,225 pounds
   Intensity: 6,225/60 = 104 pounds per rep

The arithmetic for quantitative evaluation of the heavy, light, and medium workouts above shows that:

1. From workout to workout during a week, the training load and intensity have considerable variation—about 21 percent from the heavy (L = 6,900 pounds, I = 115 pounds per rep) to light (L = 5,475 pounds, I = 91 pounds per rep) day.
2. The absolute volume, or total number of reps performed in core exercises, is constant from workout to workout (60) and, therefore, from week to week (180).
3. The total weekly load (6,900 + 5,475 + 6,225 pounds, or 18,600 pounds in all) will change little from week to week due to the relatively small changes possible week to week in exercise weights.

Point (1) is a favorable property of the program, although the variation from heavy to light day in load and intensity could be larger (30 percent to 40 percent) in more advanced programs. Point (2) is not a favorable property of the program but is acceptable and productive for beginners and for advanced trainees over shorter periods (two to four weeks). Programs for advanced trainees are generally designed to vary the volume, as well as the load and intensity, from workout to workout during a week. Likewise, total weekly volume can be adjusted occasionally as a means of introducing additional variation into a program. Making these types of adjustments helps avoid the unfavorable property of the current example listed as point (3) above.

Volume, load, and intensity were introduced with this example because the calculations and meaning of the values should be easier for you to follow here than with a more complex example. The examples that follow will illustrate additional ways to plan strength programs, and the methods of quantitative analysis just introduced will be used to pick out the good and bad features of each program.

WHEN AND HOW MUCH TO INCREASE WEIGHTS

Before going on to new examples, I should point out that if you actually use the current example program, or any program using H-L-M days (which means almost all programs!), the weights are increased on a heavy day if you completed all sets and reps successfully on the heavy day of the previous week. In the current example, power cleans may increase to 105 × 5 × 3, bench presses to 125 × 5 × 3, and squats to 150 × 5 × 3. These represent increases of about 5 percent, which are very manageable for a beginner. In your first weeks of strength training you may be able to increase a little more than this, but don't push yourself too hard. More advanced lifters may make increases of only 2 or 3 percent, such as from 200 pounds to 205 pounds, in a given exercise. Warm-up sets can also be increased slightly. With the above changes, the intensity of the heavy-day workout would increase from 115 to about 122 pounds per rep (see if you can do the calculations to get I = 122). Since light and medium days are percentages of the heavy day, the weights handled on these days and the resulting intensity would also increase. This type of program should be followed for about 10 weeks, after which some type of change is needed, as indicated by the guidelines based on GAS. A number of changes are possible, such as different exercises, more or fewer sets and reps, or a whole new program design—perhaps four workouts a week rather than three. Some suggestions are presented in the following examples.

THE SINGLE-HEAVY-EXERCISE-PER-DAY PROGRAM—ITS LIMITATIONS

You may find it difficult, both physically and psychologically, to push yourself to a limit in three or more core exercises on the same (heavy) day. One seeming solution to this potential problem that some people try is to go heavy in only

one exercise each day. Here's a sample program, modified from the previous example, but using the same set, rep, and weight values for each exercise on different days. You may find this type of program attractive, but be warned: It does have certain limitations, as we'll see.

Monday

1. *Power clean* (heavy—20 reps, 1,900 pounds)
2. *Bench press* (medium—20 reps, 2,100 pounds)
3. *Full squat* (light—20 reps, 2,125 pounds)
4. *Secondary exercises* (leg curls, sit-ups)

Total: 60 reps, 6,125 pounds
Volume: 60 reps
Load: 6,125 pounds
Intensity: 6,125/60 = 102 pounds

Wednesday

1. *Bench press* (heavy—20 reps, 2,300 pounds)
2. *Full squat* (medium—20 reps, 2,425 pounds)
3. *Power clean* (light—20 reps, 1,525 pounds)
4. *Secondary exercises* (leg curls, sit-ups)

Total: 60 reps, 6,250 pounds
Volume: 60 reps
Load: 6,250 pounds
Intensity: 6,250/60 = 104 pounds

Friday

1. *Full squat* (heavy—20 reps, 2,700 pounds)
2. *Power clean* (medium—20 reps, 1,700 pounds)
3. *Bench press* (light—20 reps, 1,825 pounds)
4. *Secondary exercises* (leg curls, sit-ups)

Total: 60 reps, 6,225 pounds
Volume: 60 reps
Load: 6,225 pounds
Intensity: 6,225/60 = 104 pounds

Note that in this system, on each day you first do the exercise in which you are going heavy, then the medium, and then the light exercise. (Again, the values for volume and load are taken from H, L, or M days of the previous example.) The exercise done heavy on one day is done light on the following training day. Thus, you need to do only one exercise heavy each day! That may sound great, but there are problems with this type of program design, which are easily seen by looking at the volume, load, and intensity numbers. The absolute volume is 60 reps per day because of the program structure, as was the case with the previous example. But the load and intensity values give us very important information: namely, *there is very little variation in this program.* The daily load ranges from 6,125 to 6,250 pounds, and the intensity from 102 to 104 pounds per rep. Compare these values with those in the standard H-L-M program first presented, where the load ranged from 5,475 to 6,900 pounds, and the intensity from 91 to 115 pounds per rep. That's quite a difference, and there are two significant points to consider:

1. As you develop a larger and larger backlog of strength training, the variation of load and intensity in the weekly training cycle becomes critical. A beginner (roughly the first year) can generally make good progress with little or no variation. With more training experience, however, variation becomes necessary, based on the ideas of GAS, and even that shown earlier in the standard H-L-M program could be insufficient.
2. Remember that strength training may be only one part of your total conditioning program. Programs similar to the earlier example of a standard H-L-M program might fit in very well with other training. On the light day, more time could be spent on the court or field or in the water. The heavy day might be the only one that requires a considerable cutback in other training or physical activity. By contrast, the "single heavy exercise per day" type of program might not fit in so well with your other physical activities, since every day is about the same in load and intensity. Other activities might reduce the weight you can handle in the heavy exercise, reducing the strength training stimulus, or, if you lift weights first, muscle fatigue may decrease your performance in or enjoyment of the physical activities you do next.

Thus, the "single heavy exercise per day" type of program just presented has definite limitations. It can be productive if you're a beginner or if you're a more advanced trainee and use it for a few weeks as a change from the standard H-L-M system to handle heavier weights in each of the core exercises (since you wouldn't be doing heavy lifts in each on the same day, you won't be as fatigued).

EXERCISE SUBSTITUTION AND SET-REP VARIATION

There are ways to add additional variation to either the standard H-L-M or the "single heavy exercise per day" type of program. If you simply change the core exercises occasionally—perhaps the power clean to a deadlift and shrug, bench press to an incline press, and squat to a lunge—you do add variation though the unfavorable characteristic of constant daily and weekly volume will remain. *If, however, you use one substitute exercise each day, as shown below, and also change the number of sets and reps for that exercise from what would have been used for the original exercise, then the daily volume can be made to fluctuate.* With intelligent planning, this procedure will add variation to your daily volume while maintaining it for load and intensity.

As an illustration of adding variety to your weekly exercise movements and daily volume, let's *use a substitute exercise to replace a core exercise on either its light or its medium day in the previous "single heavy exercise per day" program.* The substitute exercise should work the same muscle groups, in a similar movement pattern, as the original core exercise. It should usually be a movement in which you can handle less weight than in the original exercise. Otherwise, the light or medium nature (on that workout day) of the exercise that it's replacing will be lost.

In the following example, notice the substitutions made in the previous "single heavy exercise per day" program listed on page 160 (they are marked with an asterisk *), and the set and rep (volume) changes.

Monday

1. Power clean (heavy)—4 sets of 5 reps ($V = 20$)
2. Bench press (medium)—4 sets of 5 reps ($V = 20$)
3. *Front squat or leg press—3 sets of 10 reps ($V = 30$)
4. Secondary exercises
   Total volume: $20 + 20 + 30 = 70$ reps

Wednesday

1. Bench press (heavy)—4 sets of 5 reps ($V = 20$)
2. Full squat (medium)—4 sets of 5 reps ($V = 20$)
3. *Snatch or clean from knee level—3 sets of 3 reps ($V = 9$)
4. Secondary exercises
   Total volume: $20 + 20 + 9 = 49$ reps

Friday

1. Full squat (heavy)—4 sets of 5 reps ($V = 20$)
2. Power clean (medium)—4 sets of 5 reps ($V = 20$)
3. *Incline press or overhead press—4 sets of 5 reps ($V = 20$)
4. Secondary exercises
   Total volume: $20 + 20 + 20 = 60$ reps

In this example, the substitutions were made for core exercises on the day they were to have been done lightly. The substitutions could have been made on one or more medium days instead, or occasionally a heavy day could be used to go to your maximum in the replacement exercise. The reason for doing 3×10, 3×3, and 4×5 in the substitute exercises is that they are productive set-rep combinations that will vary the daily volume.

Even the original core exercise set-rep combinations could be changed to achieve the desired daily volume changes. Doing 3×5 ($= 15$ reps) rather than 4×5 ($= 20$ reps) could be used on a light day for a given core exercise to reduce that day's volume.

The possibilities for variation are many, so you must use your common sense, background knowledge, and experience to make proper choices based on your goals and capabilities. Three to six sets is a common range, as is 3 to 10 or 15 reps. But remember things like the physiological differences in doing low versus high reps (Chapter 2), and the effects of different rest intervals between sets, when planning the details of your strength and overall conditioning program.

Before moving on, you should be aware of a few other important points:

1. All the example programs given so far could be done in either a circuit or a priority system.

2. The past three examples used quantitative calculations that involved only the core exercises, but the total programs should include several secondary exercises, such as abdominal work and leg curls. These do not have to be done as hard as the core movements—that is, they needn't require as many sets, or as high a percentage of maximum weight—and do not need as much variation unless they serve an unusually important purpose in the program.

3. Keep a written record of all your workouts so that you can analyze and accurately monitor your progress. Believe me, you will forget workout details if you don't record them. Also write down outside influences that may affect you, such as lack of sleep, exams at school, or overtime at work. With an inexpensive pocket calculator, you can easily do the arithmetic to determine the volume, load, and intensity of your workouts from the data in your notebook.

HOW TO CHANGE VOLUME WEEK TO WEEK—THE UNLOAD WEEK METHOD

Up to this point, we've paid little attention to total *weekly* (as opposed to daily) volume, load, and intensity changes, other than noting that they changed little, if at all, from week to week in our example programs. There are several methods to vary weekly volume, load, and intensity, just as there are to vary them daily.

Perhaps the simplest and most effective is called *the unload week method,* which is often used by competitive lifters. It works like this: After every two or three weeks of hard training, depending on your experience level and the duration of your current program, you plan an overall light week. The light week has considerably lower total volume and load, and lower intensity. Let's say, for example, you're doing core exercises for four sets of five reps during the heavier "work" weeks. During the unload week you could do them for three sets of three reps. For three core exercises, the total weekly volume would drop from 180 reps in the work weeks (4 sets $\times$ 5 reps $\times$ 3 exercises $\times$ 3 days) to 81 reps (3 $\times$ 3 $\times$ 3 $\times$ 3) in the unload week (a 44 percent decrease!). This is more of a reduction than needed to produce sufficient variation, but it is typical of what some top competitors actually do. Normal ranges for unload-week decreases are five or six sets dropping to three, ten reps per set dropping to five or six, and five or six reps per set dropping to three. The total weekly volume decrease should be in the range of 30 to 50 percent. The amount of weight used in each exercise drops much less, maybe 10 percent each day of the week, resulting in about a 10 percent reduction in intensity for the unload week. As an example, let's look at what happens with one core exercise, such as the overhead press. During a work week on the heavy day, you might be doing 80 $\times$ 5 $\times$ 3 so that $V = 15$, $L = 1{,}200$, $I = 80$. A good choice for the unload week would be 70 $\times$ 3 $\times$ 3 so that $V = 9$, $L = 630$, $I = 70$. V was reduced 40 percent; L, 47 percent; and I, 12 percent.

Remember, this is only one method for varying weekly volume, load, and intensity. Others involve adding or excluding assistance, and even core exercises, from week to week, or changing the number of training days per week to produce the desired program variation. These methods are *all* advanced, and you needn't worry about unload weeks until you've been training for at least a few months, and maybe a year or more, depending on your physical condition and how your body responds to exercise. GAS affects us all a little differently.

SPLIT-ROUTINE PROGRAMS

Some advanced trainees prefer to include a rather large number of exercises in their programs, perhaps more than a dozen. Limitations on time and energy for one workout make it necessary to divide the exercises used into two groups performed on alternate days. This training format is called a "split-routine" program. Bodybuilders generally use this type of system. They may use one group of exercises involving primarily arm, chest, and abdominal muscles and a second group working back, leg, and hip muscles. A split routine can work well even for beginners, if fewer total exercises are used. It is particularly helpful if limited time is available for each workout—your lunch hour, for example—but you can train four to six days a week.

Here are typical sample groupings for a split-routine program that could work well for many of you.

Group 1	Group 2
Bench press	Lunges
Dumbbell flys	Shoulder shrugs
Overhead press	Leg curls
Dumbbell curls	Lat pull-downs
Tricep press	Stiff leg deadlift
Trunk curls	Calf raises

Group 1 exercises could be done Monday and Thursday with Group 2 exercises done Tuesday and Friday, resulting in a four-workout-a-week program. This schedule allows one workout a week to be a heavy day for each group, with the other days light to medium. If you are an advanced trainee, you can intensify the program by doing *each* group three days a week, following the heavy-light-medium system. A possible scheme for one week of training would look like this:

Day	M	Tu	W	Th	F	Sa	Su
Group 1	H	—	L	—	M	—	—
Group 2	—	M	—	H	—	L	—

Obviously, there can be other variations. In a split-routine program, the numbers of sets and reps are based on the considerations we've discussed previously. It is very common for bodybuilders to do 8 to 10 reps in most of the exercises in this type of program, since they want to do more work to burn more calories and keep their body fat low while they build up (hypertrophy) or define their muscles. Abdominal and calf exercises are usually done for higher reps—perhaps 20 or more, depending on the resistance. Load, volume, and intensity are calculated as shown in the previous examples. Trunk curls and calf raises are not generally counted due to the light weight, if any, typically used in the former, and the disproportionately high number of reps, short movement range, and heavy weights typical of the latter. But leg curls should be counted in this type of program if the weight used is comparable to that used in most of the other exercises in the program.

Since split-routine programs often involve dumbbell work, you should know how to calculate load, volume, and intensity for dumbbell exercises. If

you use dumbbells *simultaneously in each hand,* add their weight together and count the number of reps done. For example, dumbbell flys done for three sets of ten reps, with 20-pound dumbbells, would count as a volume of 30 reps and a load of 1,200 pounds ($40 \times 10 \times 3$). In this case $I = 1{,}200/30 = 40$ pounds, or twice the individual dumbbell's weight. If you use one dumbbell, first with one hand and then the other, use the weight of the dumbbell and add the number of reps done by each hand. For example, dumbbell rows done for three sets of eight reps with each hand, using a 30-pound dumbbell, would count as a volume of 48 reps and load of 1,440 pounds ($30 \times 16 \times 3$). Here $I = 1{,}440/48 = 30$ pounds, the weight of the single dumbbell used.*

"SUPER SETS"

The exercises in the sample split-routine program above could be done in a circuit each day (with some changes in order), but would more commonly be done in a priority system. Also, there's a technique called "super setting" that can be used in a priority system but should not involve "total body" exercises. It requires doing two related exercises consecutively, with no break. For example, if you did a set of dumbbell curls and followed it immediately (without rest) with a set of tricep presses, you'd have done a "super set" for the arm muscles. After a few minutes rest, this super set would be repeated. Typically, you'd do three super sets for each body part to be worked in this manner.

A super set usually works antagonistic muscle groups in a given area of the body, such as the upper arm in the example just given. This technique usually results in a "pumped up" feeling in the muscles used as they are being flushed with blood. This pumped or tight feeling is readily obtained when exercising smaller muscle groups, such as in the forearm, upper arm, and calf.

I *strongly discourage* anyone with cardiac problems from pumping their muscles up this way, since blood pressure rises to force blood through the tight muscles. If you fall into this category but have your doctor's OK to lift weights, emphasize exercises that work the larger muscle groups, or multiple muscle groups together, and never do super sets.

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*As a test for yourself, calculate *V, L,* and *I* for the following workout:

1. *Incline dumbbell presses:* two 25-pound dumbbells for three sets of 10 reps
2. *Dumbbell rows:* a 40-pound dumbbell for three sets of 10 reps with each arm
3. *Upright rows:* a 50-pound barbell for three sets of eight reps

(*Answers:* $V = 114$ reps, $L = 5{,}100$ pounds, $I = 44.7$ pounds per rep.)

THE "CYCLIC" METHOD OF STRENGTH TRAINING

After you've trained with a fixed program or two over several months' time, or if you've been weight training in the past, the use of training cycle concepts could really help you increase or renew progress. A large amount of experimental evidence in this area has resulted from recent studies by Drs. Michael Stone and Harold O'Bryant. The basic plan of their research to compare cyclic strength training to a common conventional strength program is summarized by the accompanying table.

STRENGTH TRAINING CYCLE VERSUS CONVENTIONAL PROGRAM

Week:	1	2	3	4	5	6	7	8	9	10
Cycle group	3 sets of 10 reps			3 sets of 5 reps				3 sets of 3 reps		
Conventional	← 3 sets of 6 reps →									

The same collection of exercises, mainly core movements such as bench presses and squats, was done by each group of subjects. As you can see, the conventional group subjects did 18 reps per day in each exercise (not counting warm-up lifts), while the cycle group did 30 reps per exercise per day during Weeks 1 through 3; 15 reps during Weeks 4 through 7, and 9 reps during Weeks 8 through 10. Thus, the cycle group had large variations in volume during the program. Intensity increases were also large for the cycle group, since considerably heavier weights could be used as the reps decreased from 10 to 5 to 3. The conventional group had no volume variation during the 10 weeks—18 reps per exercise every day—and little intensity increase, since the weight they lifted for three sets of six reps could be increased only gradually.

The results of this representative comparison were very impressive. The cycle group experienced significantly greater increases in strength (as measured in the bench press and squat lifts) and power (as measured with vertical jumps) at the end of the training period.

Many different groups of subjects have been tested in recent years in similar experiments, and the results have always been essentially the same: The cycle group always shows the greater strength and power improvement.

Each phase of such a cycle does not have to be three or four weeks long, as in the example, but the length of each phase should be similar. Phases of two to six weeks would be reasonable. The high-rep phase of this type of cycle helps build muscle tissue, reduce body fat, and prepare the body for more intense work. The medium- and low-rep phases develop strength and power in the "potentiated" muscle.

This sample strength training cycle is a straightforward way of applying the basic concepts of variation and the General Adaptation Syndrome. Variation during any one week can be introduced by the simple heavy-light-medium day system or by the more complex alterations discussed previously in this chapter. Additional components of your overall conditioning program, such as running, swimming, or tennis, can easily be blended in.

ADDITIONAL SET-REP SEQUENCES

The Plateau System

Remember our discussion in Chapter 2 about the relationship between the number of reps done per set and the goals of a circuit program? Higher reps for endurance, lower reps for strength, and so forth? The same ideas hold true for choosing reps in a priority system of training. Several examples presented earlier in this chapter involved a *plateau system,* in which, after warm-up, the weight stayed constant—for example, 100 × 5, 120 × 5, 120 × 5, 120 × 5. In a plateau-priority system it is not uncommon for advanced trainees to do as many as five sets at the highest weight. Five reps were used in many of our examples to emphasize strength gains. You can use the same type of plateau system with higher or lower reps per set depending on your goals or the phase of a training cycle you are in.

The Step System

Another system of sets and reps is to keep the reps fixed—say, three per set—but increase the weight in each set until a maximum is reached. An example would be 80 × 3, 90 × 3, 100 × 3, 110 × 3, 120 × 3, 130 × 3. I don't highly recommend this system, but you can use it occasionally for variety, perhaps, in place of 80 × 3, 100 × 3, 120 × 3, 120 × 3, 120 × 3, or for determining the maximum weight you could lift for three reps of a given exercise. All the warm-up sets in the above sequence will tend to hold the maximum weight down a little, especially if you're doing more than three reps per set, but you can still get a good estimate of your 3RM—that is, maximum weight for three reps, or 3 Rep Max.

The Pyramid System

The pyramid system of sets and reps, too, can be used to add variety to your program. It also can be used to estimate your 1 RM—the maximum weight you can lift for one rep in an exercise. In a pyramid, the weight used in each set increases while the reps per set decrease. An example would be 80 × 10, 90 × 8, 100 × 6, 115 × 4, 130 × 2, 140 × 1, 100 × 5. Note that the last set calls for medium weight and reps for the purpose of "tapering off," rather than stopping abruptly, after a maximum weight.

Pyramids are generally used only with core-type exercises, not assistance or single-joint exercises. Pyramids can occasionally be used to add variety to a plateau system program, or can be used for a separate phase of a cycle. For example, three weeks of 12 rep sets, three weeks of 6 rep sets, three weeks of 3 rep sets, and three weeks of pyramids. This would probably be followed by a week off from weight training before starting a new cycle.

The Reverse-Pyramid System

Some people also "reverse" the pyramid. For example, they might do sets of 8, 6, 4, 2, 1, 2, 4, 6, 8 reps, with the weight increasing as the reps decrease and decreasing as the reps increase. This sequence represents a lot of work and I don't recommend it for most trainees. Also, I strongly advise against doing a *pure reverse pyramid,* such as 1, 2, 4, 6, 8, 10 reps, since such a sequence lacks specific warm-up. The idea behind a pure reverse pyramid is that it allows you to handle the heaviest weight before any fatigue develops. It is true that all the sets and reps before the single rep set in a standard pyramid will cause some fatigue and slightly decrease the maximum weight you can lift. But if you are in good shape, the effect will be small. If you want to lift a truer maximum, simply warm up with low rep sets—but always warm up before lifting heavy weights. A typical sequence, if your maximum squat were, for example, 120 pounds, would be 60 × 3, 80 × 3, 100 × 2, 115 × 1, 125 × 1 (for a new personal record, called a PR), 90 × 5.

MUSCULAR ENDURANCE AND ENDURANCE TRAINING

There are several important considerations relative to training for muscular endurance and endurance-oriented programs that you should keep in mind:

1. When muscle groups become stronger, they work at a lower percentage of their maximum contractile force when performing at a given absolute workload. This means they won't fatigue as fast at that workload as they would with the original strength level, which is an improvement in endurance. If you're a runner, for example, and initially have a maximum pace of 6 minutes per mile, then added leg and hip strength would result in that pace requiring a lower percentage of your maximal force output. This means you could run at that pace longer, or at a faster pace for the same length of time that you originally ran at the 6-minute-per-mile pace.

2. Using very high reps, 20 or more, is *not* the best way to develop muscular endurance for endurance-oriented activities. *It is better to use weight workouts to build strength and to rely on the endurance activity itself to build the endurance.* Increased strength, of course, will aid in developing endurance as discussed above. If, however, for some reason such as injury or bad weather, you can't do the endurance activity, then higher-rep sets in weight lifting can be a satisfactory short-term alternative.

3. Research has shown that endurance or aerobic-type exercise can have a negative effect on performance in explosive power-oriented activities, as well as on strength levels, particularly for highly trained strength-power athletes. Power refers to large forces being generated rapidly, as for sprinting, jumping, throwing, and Olympic-style weightlifting. Clearly, the fast-twitch-type muscle fibers, discussed in Chapter 1, with their high tension development and contraction speed, are important for power activities. Research into muscle adaptations has shown that with extensive aerobic exercise, fast twitch fibers can develop a large capability for oxidative metabolism, as with slow twitch fibers. This can be seen in the table of fiber adaptations on page 31. This type of fiber is then referred to as an "intermediate" fiber, with contraction tension and speed being between the typical values found for "normal" fast and slow twitch fibers. Such an adaptation is one important cause of the reduced power potential resulting from extensive endurance training.

You should not interpret the above information to mean that a strength-power athlete should never do any endurance type exercise. The recovery process after high intensity, short duration work is very dependent on oxidative metabolism. Thus, it is reasonable for even a power-oriented athlete to do some training that will maintain the oxidative system at an adequate level. Similarly, a long distance runner may need to sprint at the end of a race or retain a certain strength level in key muscle groups to maintain proper running form during a race. The value of an athlete including some of the apparently opposing types

of exercise in training is real, but it must be done in proper amounts at selected times during a conditioning cycle. The concept of cycles in exercise programs can be important to you and everyone, not just athletes, and will be discussed again in Chapter 7.

SUMMARY

The sample programs presented in this chapter apply the principles we covered in earlier chapters. Some of the concepts illustrated in the examples are advanced, however, and you shouldn't try them if you're a beginner. To make good progress, neophytes need only choose exercises that satisfy the "completeness and simplicity" rule of Chapter 2, train with light, medium, and heavy workouts each week, and be progressive over a period of weeks, without missing workouts. As months and years go by, if you're a serious trainee, you will need to use more and more of the advanced training concepts presented to continue making progress. If you make the mistake of starting with very advanced training techniques, your initial progress is likely to be *no* faster than with a good basic program, and there will be little in the way of sophistication to add to improve your program as time goes by. In the long run, starting with advanced programs will shorten your years of progress.

Some individuals desire a strength and overall conditioning program that will get them "in shape." In the Introduction, I discussed the components of total physical fitness. Being in shape refers to a certain level of physical conditioning relative to muscular endurance, cardiovascular fitness, reasonable body fat levels, joint flexibility, and muscular strength and power. If you run the same distance at the same pace five days each week, or go through the same weight workout at the health spa three days each week, you will maintain a certain level of fitness. By the General Adaptation Syndrome, though, your level of fitness will not increase unless you increase the exercise stress level in a consistent way. Rather than being satisfied with a fixed fitness level, you can apply the concepts of variation presented in this chapter to your program and see real fitness improvement with little extra time or effort.

I should also mention that similar weight training programs can produce quite different results in similar individuals due to seemingly minor changes in factors such as reps per set and diet. Consider two similar individuals, A and B, who do the same five or six exercises three days each week. A does 10 or 12 reps per set and eats a balanced, low-calorie diet. B does five or six reps per set and eats everything in sight (the so-called "see food" diet). A would be

expected to lose body fat, lose or maintain body weight, and develop stronger muscles with good definition. B would be expected to gain or maintain body fat, gain body weight, and develop larger and much stronger muscles but with less definition. Sex differences also affect the results of a given strength program. Women tend to develop less muscle size and definition and tend to maintain higher body fat levels, due to hormonal differences.

Finally, the speed at which you do the exercise movements also affects the way your body adapts to them. As a general rule, if the muscle groups being exercised are used "explosively" in the activity you are training for—such as Alpine skiing, sprinting in tennis, blocking in football, jumping in basketball or volleyball—then some of the time you should do appropriate exercise movements fast. This will help in neuromuscular learning—training your nervous system—and in the recruitment of fast motor units. It will also prepare your tendons and other connective tissues to better withstand rapidly developed forces and large accelerations. These considerations are obviously of great importance for athletes who in their sport are almost always moving in an explosive manner.