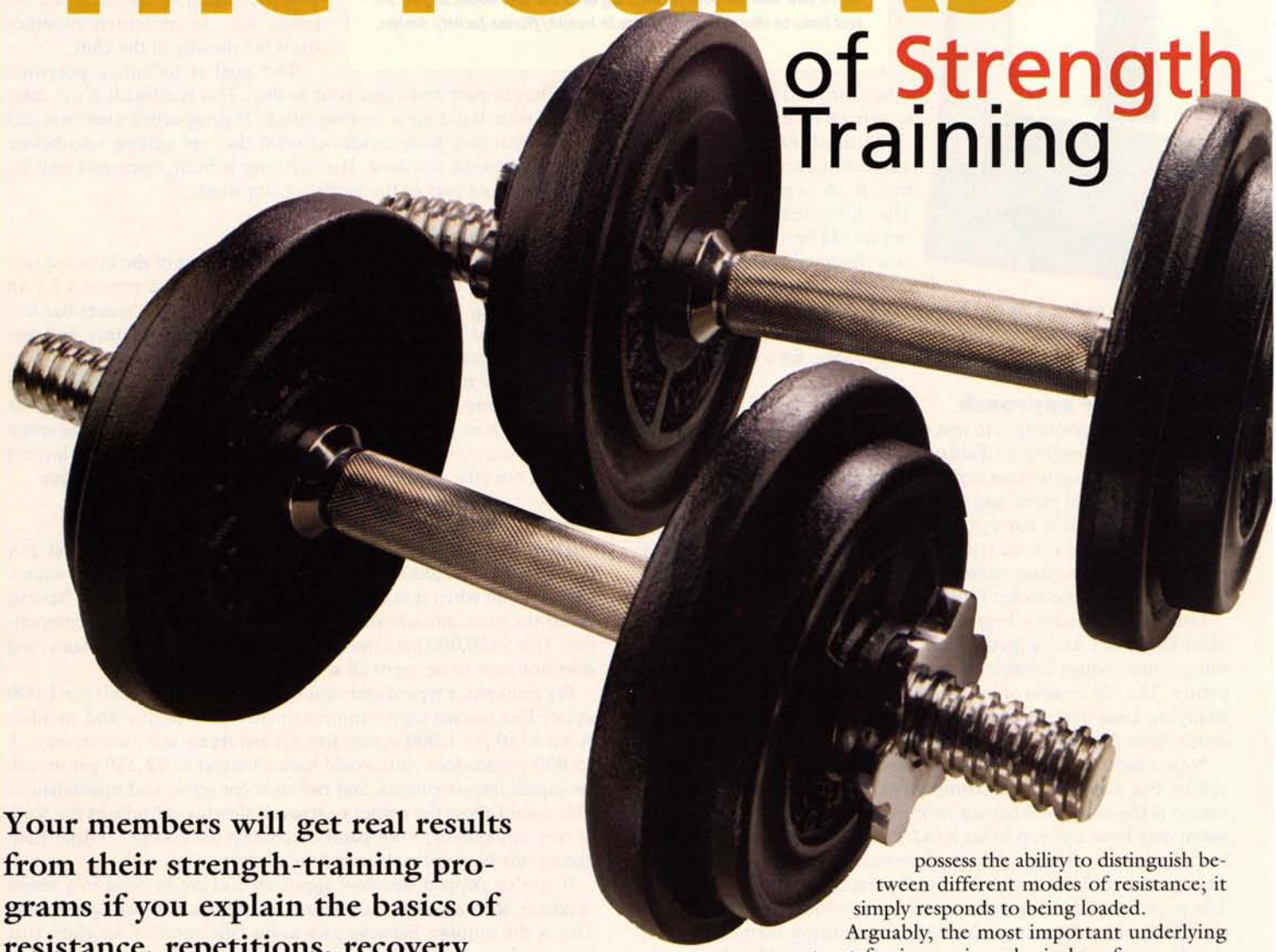
The Four Rs of Strength Training



Your members will get real results from their strength-training programs if you explain the basics of resistance, repetitions, recovery and records.

By Matt Brzycki

Strength may be defined as the ability of a muscle to produce force. Strength training, then, is *improving* the ability of a muscle to produce force. A program to enhance this ability must encourage the implementation of several fundamental concepts: Much like the three Rs of elementary education — reading, 'riting and 'rithmetic — the four Rs of strength training provide a solid foundation of basic essentials upon which the framework of a program can be built. Those basic essentials are resistance, repetitions, recovery and records.

Resistance

For a muscle to increase in strength, it must be "loaded" with some type of resistance. It matters little whether the resistance is applied to a muscle via machines, barbells, dumbbells, stretch cords, sandbags, bricks or even other human beings. A muscle does not possess the ability to distinguish between different modes of resistance; it simply responds to being loaded.

Arguably, the most important underlying construct for improving physical performance — whether it is strength, endurance or flexibility — is the overload principle. As far as strength training is concerned, the principle states that for a muscle to increase in strength, it must be stressed, or "overloaded," with a workload that is beyond its present capacity.

Also, the resistance, or the "load," must be made progressively more challenging over time. A muscle will adapt to the overload (in this case, a heavier amount of resistance) by increasing in strength. Without imposing greater demands, there will not be any "compensatory adaptation," because a muscle will literally have no reason to get stronger. Stated otherwise, a muscle must be exposed to demands that it has not yet experienced.

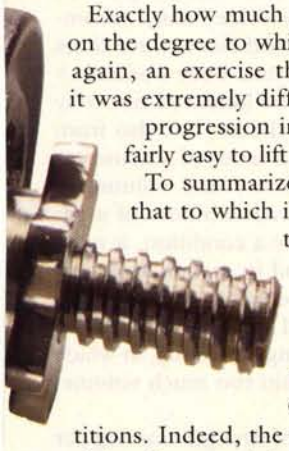
In practice, this means that the resistance must be increased once it can be lifted for the maximum number of prescribed repetitions. However, the resistance need not be increased in Herculean increments. A muscle will respond more favorably if the increases in resistance are relatively small: usually about 5 percent or less.

When smaller progressions are made, the slightly heavier load is virtually undetectable, and the repetitions aren't likely to decline much, if at all. In other words, it's much easier for a muscle to adapt to subtle increases in resistance than to larger ones. As an example, imagine that an exercise has a repetition range of 15 to 20, and the exerciser manages to lift 100 pounds with 20 repetitions

(100/20). If they make a 10-percent increase in resistance the next time they perform that exercise (to 110 pounds), they'll certainly notice the heavier load much more than if they made a 2.5-percent increase in resistance (to 102.5 pounds). The 10-pound increase can be made in several small progressions instead of one large progression and, as a result, the muscle is allowed to adapt to the resistance more gradually. The point is, a muscle will adapt to smaller increases in resistance more favorably than to larger ones.

Exactly how much the resistance should be increased depends on the degree to which the exercise was challenging. Consider, again, an exercise that has a repetition range of 15 to 20. If it was extremely difficult to perform 20 repetitions, a smaller progression in resistance should be made than if it was fairly easy to lift for 21 or 22 repetitions.

To summarize, a muscle must encounter a load beyond that to which it is accustomed. If 200 pounds were lifted today for the maximum number of prescribed repetitions, then the resistance should be increased for a subsequent workout.



Repetitions

Quality programs begin with quality repetitions. Indeed, the most basic and integral aspect of strength training is a repetition. Unfortunately, there is often no understanding of, or little attention to, how repetitions are performed. Yet, poor repetitions lead to poor sets; poor sets lead to poor workouts; and poor workouts basically mean that a muscle won't realize its strength potential.

There are two key components to the performance of a repetition. First, it is important to perform each repetition in a manner that is both effective and safe. Regardless of the exercise, each repetition should be performed in a deliberate, controlled fashion without any jerking movements, so that momentum does not play a significant role in the raising or lowering of the resistance. If it does, the effectiveness and safety of the exercise will be compromised. Second, each repetition must be performed throughout the greatest possible range of motion (ROM) that is orthopaedically safe. This ensures that flexibility is maintained (or perhaps increased) and that the entire muscle is being exercised, not just a portion of it. Clearly, a limited ROM will yield a limited effect.

Resistance and repetitions are inextricably linked. Recall that, according to the overload principle, a muscle must be stressed with

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a workload that is beyond its present capacity. As noted earlier, an overload can be accomplished by increasing the resistance when a target number of repetitions can be completed. An overload can also be achieved by performing more repetitions with the same resistance. A muscle will adapt to this overload (in this instance, a greater number of repetitions) by increasing in strength. Either way, a muscle will be exposed to demands that it has not experienced previously.

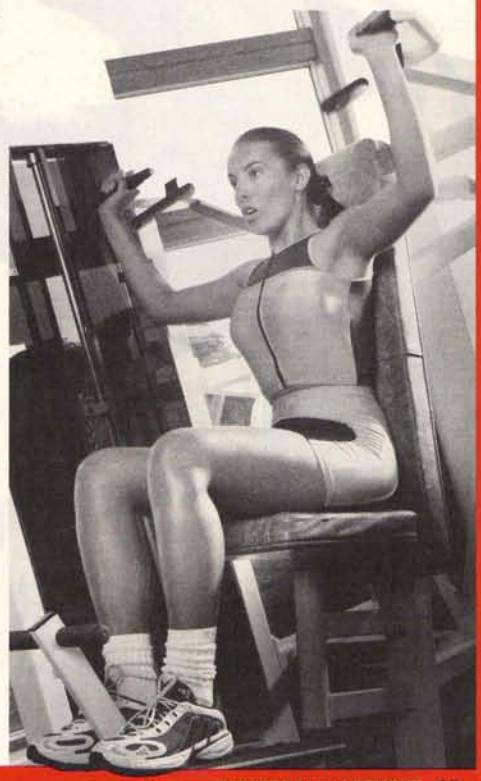
Determining an appropriate repetition range depends on a number of factors and, even then, has some degree of variability. Understand first that strength training is not an aerobic activity that is comprised of long-term, low-intensity efforts. Rather, it is an anaerobic activity that is characterized by short-term, high-intensity efforts. Therefore, the duration of a series of repetitions (a set) should be in the anaerobic domain. Efforts that last from a split second to several minutes are considered to be anaerobic (assuming, of course, that the level of effort is great enough to justify an anaerobic response). Since intense efforts at the lower end of this time frame carry a higher risk of injury, and those at the other end have a greater reliance on aerobic metabolism as the primary source of energy, narrowing the window of time from 30 to 120 seconds represents a safe and effective duration for strength training. Based on a six-second repetition, this corresponds to a repetition range of five to 20 lifts, with higher repetitions being assigned to larger muscles, and lower repetitions to smaller ones. Thus, repetition ranges might be 15 to 20 for a hip exercise, 10 to 15 for a leg exercise, and eight to 10 for an upper-torso exercise.

These repetition ranges will be effective for most people. However, slightly higher repetition ranges are suggested for certain populations, including pregnant women, younger teenagers, older adults, hypertensive individuals and those who suffer from orthopedic problems. Slightly higher repetition ranges might be 20 to 25 for exercises involving the hips, 15 to 20 for the legs, and 10 to 15 for the upper torso. These higher repetition ranges necessitate the use of a lighter resistance, thereby reducing the orthopedic stress that is placed on the bones, joints and connective tissue.

People who have inherited a relatively large percentage of slow-twitch (ST) muscle fibers may also benefit from using slightly higher repetition ranges. This would be advantageous because ST fibers are more suited for endurance. Conversely, people who have inherited a high percentage of fast-twitch (FT) muscle fibers may profit from performing slightly lower repetition ranges. This would be helpful because FT fibers are less suited for endurance. Slightly lower repetition ranges might be 10 to 15 for exercises involving the hips, nine to 12 for the legs, and six to 10 for the upper torso.

Recovery

Strength training places a great deal of demands (stress) on a muscle. In response to this stress, compensatory adaptation occurs during the recovery process. But if a muscle does not receive an adequate amount of recovery between workouts, it will not be able to adapt to those demands. Remember, a muscle does not get stronger during a workout: A muscle gets stronger after a workout. If the demands are of sufficient magnitude, a muscle is literally torn. Although these tears are quite small (microscopic, in fact), the recovery



process is essential in that it allows the damaged muscle enough time to repair itself. Think of this as allowing a wound to heal. In a sense, the recovery following a workout is a process in which damaged tissue (muscle tissue) is healed.

There are individual variations to recovery ability — everyone has different levels of tolerance for physical exertion. However, at least 48 hours is necessary for a muscle to recover sufficiently from an intense workout. Keep in mind, too, that intense strength training relies heavily upon carbohydrates as the primary source of energy. Adequate recovery is required to return the carbohydrate stores to their pre-activity levels. About 48 hours are also needed to replenish carbohydrate stores that are depleted as a result of intense physical exertion. As such, it's suggested that strength training is not performed more frequently than every other day (such as on Monday, Wednesday and Friday). This advice is consistent with the position stand of the American College of Sports Medicine, which recommends strength training be performed two to three times per week. (Note that this assumes total-body workouts.)

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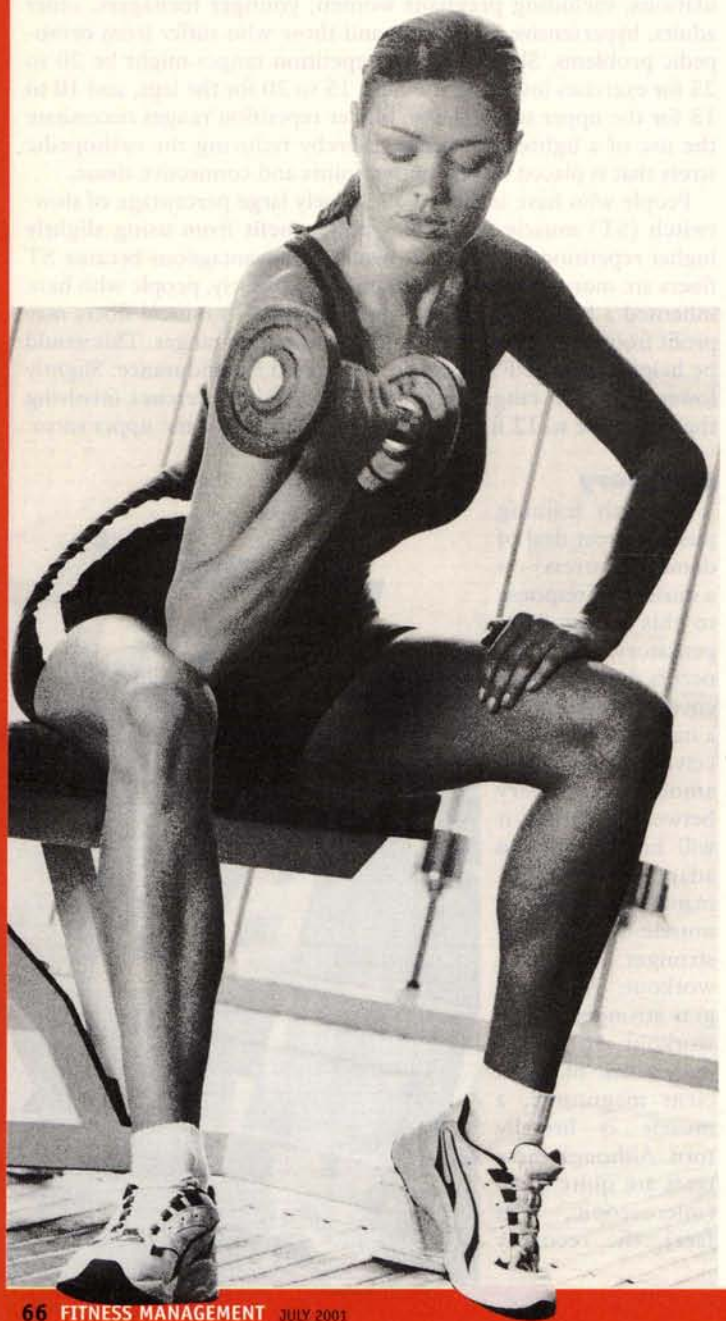

Be aware that recovery can be hindered not only from performing too many workouts, but also from performing too much volume (in terms of sets and exercises). An appropriate frequency and volume of strength training can be compared to a dose of medication. For medicine to improve a condition, it must be taken at specific intervals and in certain amounts. Taking medicine at a greater frequency or in a larger quantity beyond what is needed can have harmful effects. In the same way, an "overdose" of strength training, in which workouts are performed too often or contain too much volume, can also be detrimental.

Performing any more than three "doses" of strength training per week can gradually become counterproductive, if the demands that are encountered by a muscle have exceeded its ability to recovery. How do you know if a muscle has had an adequate amount of recover? There should be a gradual improvement in the amount of resistance and/or number of repetitions that can be performed over the course of several weeks. If not, then a muscle is probably not getting enough recovery between workouts, which again, could be the result of performing too many workouts, too many sets or too many exercises. The bottom line is that strength training will be effective if it provides an overload, not an overdose.

Records

The belief that it isn't necessary to maintain records because the resistance and repetitions are easily remembered is probably the result of performing the same resistance and the same repetitions for so long that those numbers have become firmly entrenched in long-term memory. The fact is, it is absolutely critical to keep written records that are accurate and detailed if strength training is to be as productive as possible.

Why is record-keeping important? For one, records document the history of what was accomplished during each exercise of each strength session. Records can also be used to identify exercises in which a plateau has been reached. In the unfortunate event of an injury, the effectiveness of the rehabilitative process can be gauged if there is a record of pre-injury strength levels.

Record keeping need not be elaborate; a spiral notebook or workout card will suffice. However, it is important to be able to record bodyweight, the date of each workout, the weight used for each exercise, the number of repetitions performed for each exercise and the order that the exercises were completed.

Maintaining records in this manner can be a valuable tool to monitor progress and to make workouts more meaningful. And if records indicate that progress has been made, then the first three Rs of strength training (resistance, repetitions and recovery) have been applied appropriately. **FM**

Matt Brzycki is the coordinator of health, fitness, strength and conditioning programs at Princeton University. He has authored more than 200 articles on strength and fitness, and is the editor of *Maximize Your Training: Insights from leading strength and fitness professionals.*