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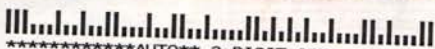
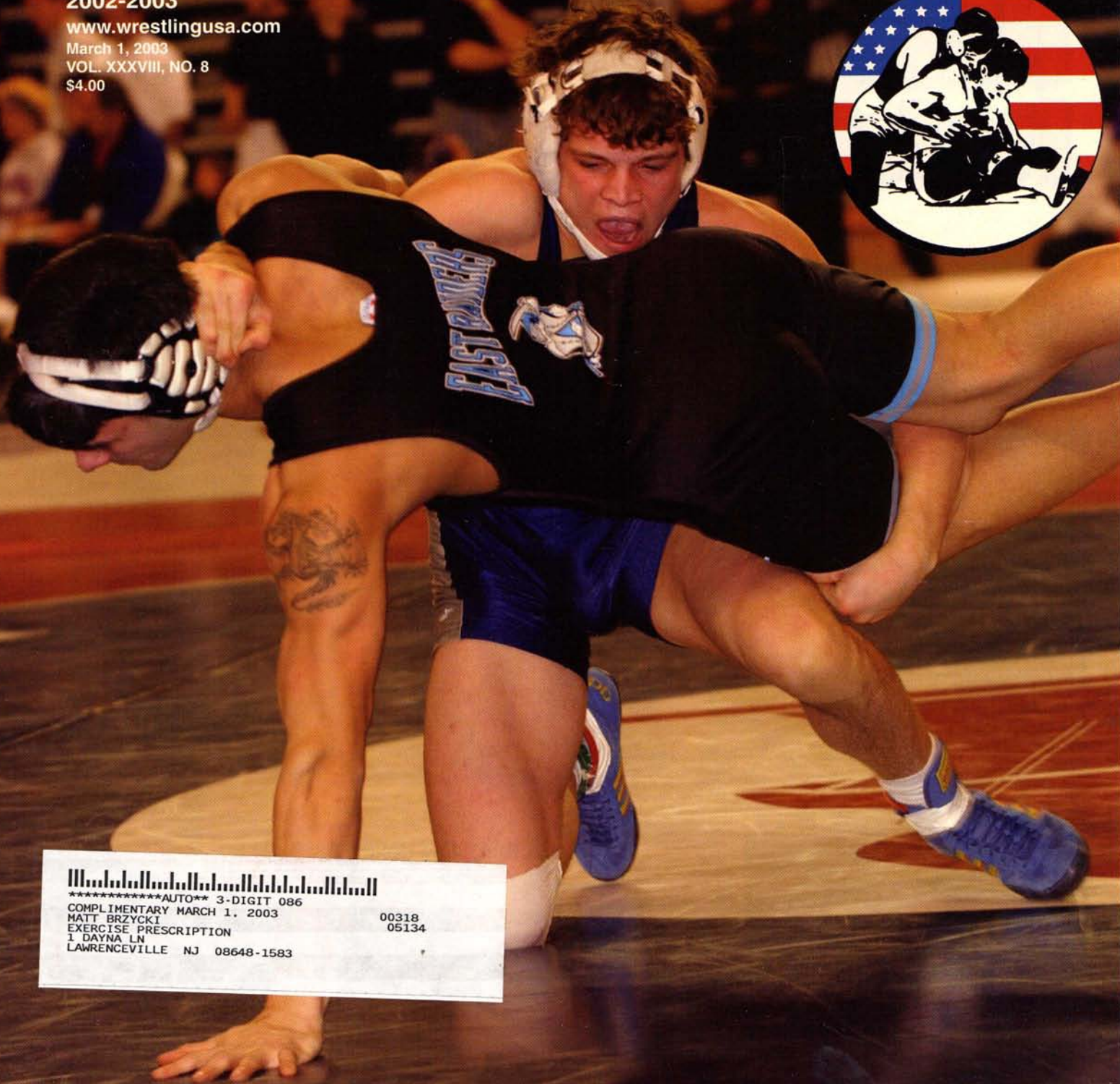
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Five Steps for Productive Reps

By Matt Brzycki

Regardless of the type of strength-training program that you utilize, a productive program begins with productive repetitions or "reps." Remember, the repetition is the most basic and integral aspect of a strength-training program. If your repetitions are not productive, your sets will not be productive. If your sets are not productive, your workouts will not be productive. And if your workouts are not productive, your program will not be productive. You can perform productive reps by following these five steps:

STEP #1: Raise the weight in a deliberate, controlled manner.

A repetition starts with the raising of the weight. (This is sometimes referred to as the "positive phase" of a repetition and involves a concentric muscular contraction.) You should raise the weight in a deliberate, controlled manner without any explosive or jerking movements.

Raising a weight in a rapid, explosive fashion is not recommended for two main reasons. First of all, high-velocity repeti-

tions that are performed in a ballistic manner are actually less productive than low-velocity repetitions that are performed in a controlled manner. Here's why: When weights are lifted explosively, the muscles produce tension during the initial part of the movement . . . but not for the last part. In simple terms, the weight is practically moving by itself. In effect, the load on the muscles is decreased and so are the potential gains in muscular strength.

Unfortunately, the reduced muscular loading that occurs as a result of excessive momentum is demonstrated in weight rooms on a daily basis. As an example, have you ever seen others raise a weight so quickly on a leg-extension machine that the pad left their lower legs halfway through the repetition? Well, think about it: The pad is attached to the movement arm of the machine which, in turn, is connected to the weight by some means (such as a chain, cable or strap). If the pad is no longer in contact with the lower legs, there is no load on the muscles. If there is no load on the muscles, there is no stimulus - or reason - for them to adapt. There is no question that the more momentum is used to raise a weight, the less productive will be the repetitions.

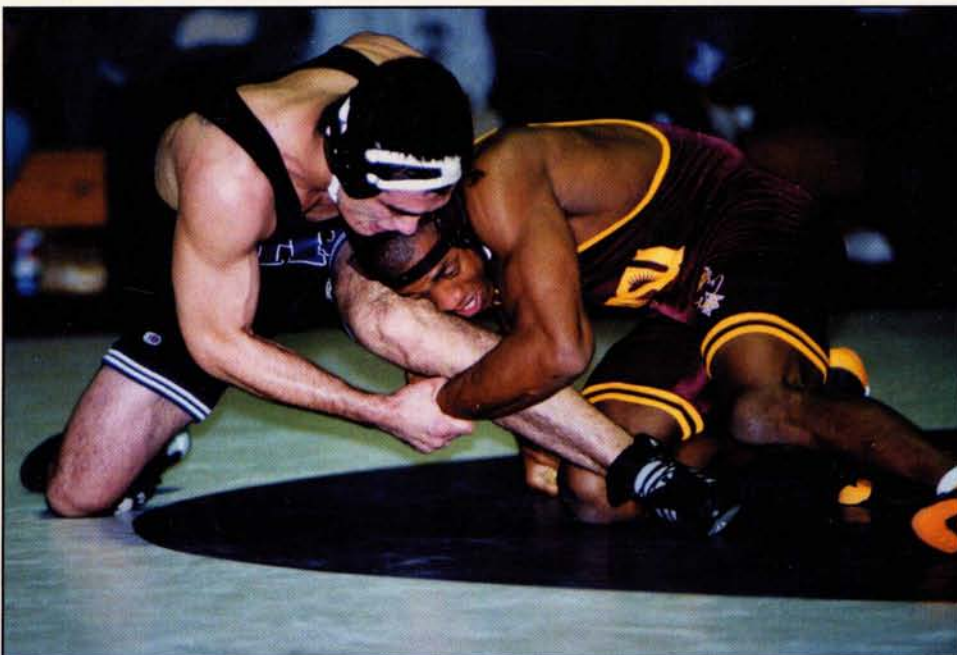
Secondly - and more importantly - high-

velocity repetitions also carry a greater risk of injury than low-velocity repetitions. Using an excessive amount of momentum to raise a weight increases the internal forces encountered by a given joint; the faster a weight is raised, the higher these forces are amplified - especially at the point of explosion. In one study, a subject squatting with 80% of his four-repetition maximum incurred a 225-pound peak shearing force during a repetition that took 4.5 seconds to complete and a 270-pound peak shearing force during a repetition that took 2.1 seconds to complete. This is clear evidence that a slower speed of movement reduces the shearing forces on joints. When the forces exceed the structural limits of a joint, an injury occurs in the muscles, connective tissues or bones. Also consider this: Dr. Fred Allman, a past president of the American College of Sports Medicine states, "It is even possible that many injuries . . . may be the result of weakened connective tissue caused by explosive training in the weight room." In other words, explosive lifting done inside the weight room can predispose you to a future injury *outside* the weight room. To ensure that your repetitions are safe and productive, it should take at least 1 - 2 seconds to raise a weight.

STEP #2: Pause briefly in the position of full muscular contraction.

After raising the weight, you should pause briefly in the position of full muscular contraction or the "mid-range" position. Where is the mid-range position of a repetition? These two examples should help make it clear: When performing a leg extension, the mid-range position is where your legs are completely extended (or as straight as possible); when performing a bicep curl, the mid-range position is where your arms are completely flexed (or as bent as possible).

Most people are very weak in the mid-



Arizona State 17, UNI 16. 157 lb. Chris Bitetto, UNI, decisioned Patrick Williams, ASU, 3-0. Photo by G. Wyatt Schultz.

range position of a repetition because they rarely, if ever, emphasize it. Pausing momentarily in the mid-range position allows you to focus your attention on your muscles when they are fully contracted. Furthermore, a brief pause in the mid-range position permits a smooth transition between the raising and lowering of the weight and helps reduce the influence of momentum. If you cannot pause momentarily in the mid-range position, it is likely that you are raising the weight too quickly and throwing it into position.

STEP #3: Emphasize the lowering of the weight.

A repetition ends with the lowering of the weight. (This is sometimes referred to as the "negative phase" of a repetition and involves an eccentric muscular contraction.) The importance of emphasizing the negative phase of a repetition cannot be overstated. Numerous studies have reported that repetitions involving both concentric and eccentric contractions produce greater increases in strength than those involving just concentric contractions. Studies have also shown that optimal increases in muscular size are not

obtained from weight training unless eccentric contractions are incorporated in the repetitions.

Understand that the same muscles which are used to raise a weight are also used to lower it. In a bicep curl, for example, your biceps are used in raising the weight as well as in lowering it. The only difference is that when you raise the weight, your biceps are shortening against the load and when you lower the weight, your biceps are lengthening against the load. So, by emphasizing the lowering of a weight, each repetition becomes more productive. Because a muscle lengthens as you lower a weight, emphasizing the negative phase of a repetition also ensures that the exercised muscle is being stretched properly and safely.

For any given exercise, your eccentric strength is greater than your concentric strength. From an application standpoint, this means that you can lower more weight than you can raise (again, for any given exercise). In fact, research has shown that an unfatigued muscle can lower approximately 40% more than it can raise. Stated differently, if the most weight you can raise is 100 pounds, you can probably lower about 140 pounds. Because you can lower more weight than you can raise, it stands to

reason that the lowering of the weight should take more time to complete than the raising of the weight. To ensure that your repetitions are safe and productive, it should take at least 3-4 seconds to lower a weight back to the starting/stretched position.

In effect, it should take at least 4-6 seconds to perform a productive rep. Most strength coaches who are opposed to explosive, ballistic movements in the weight room consider a four- to six-second repetition to be an acceptable guideline for lifting a weight "under control" or "without an excessive amount of momentum." A 16-week study demonstrated a 50% increase in upper-body strength and a 33% increase in lower-body strength in a group that performed each repetition by raising the weight in two seconds and lowering it in four seconds. More recently, an eight-week study reported an average increase in muscular strength of 55% in 17 subjects and another eight-week study showed an average increase in muscular strength of 58.2% in 31 subjects. In both of these studies, the subjects also used the same six-second guideline for raising and lowering the weight.

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STEP #4:

Exercise your muscles throughout the greatest possible range of motion that safety allows.

A productive rep is done throughout the greatest possible range of motion (ROM) that safety allows - from a full stretch to a full muscular contraction and back to a full stretch. Exercising throughout a full ROM will allow you to maintain (or perhaps increase) your flexibility. Moreover, it ensures that you are stimulating your entire muscle - not just a portion of it - thereby making the repetition more productive. This point is underscored by many studies in which doing full-range repetitions were found to be a requirement for obtaining full-range effects. This does not imply that you should avoid limited-range repetitions altogether. During rehabilitation, for example, you can exercise throughout a pain-free range and still manage to stimulate some gains in muscular size and strength. Full-range repetitions are more productive, however, and should be performed whenever possible.

STEP #5: Reach concentric muscular fatigue within a prescribed range of repetitions.

The most important factor that determines your results from weight training is your inherited characteristics (which includes the insertion points of your tendons, your predominant muscle-fiber type and so on). Unfortunately, you cannot control the genetic cards that you were dealt. The most important factor that you *can* control is your level of intensity (or effort). For the most part, the harder you train, the better your response. In the weight room, a high level of intensity is characterized by exercising to the point of concentric muscular fatigue or "failure": when you have exhausted your muscles to the extent that you literally cannot raise the weight for any additional repetitions.

Failure to reach a desirable level of intensity - or muscular fatigue - will result in strength gains that are less than optimal. Evidence for this concept is found in the Overload Principle - a term that was first coined in 1933 by Dr. Arthur Steinhaus. This principle is one of the most widely referenced in exercise physiology. According to Dr. Roger Anoka - a biomechanist and author of the excellent college text *Neuromechanical Basis of Kinesiology* - the Overload Principle states, "To increase their size or functional ability, muscle fibers must be taxed toward their present capacity to respond." He adds: "This principle

implies that there is a threshold point that must be exceeded before an adaptive response will occur." Stated otherwise, a minimum level of muscular fatigue must be produced in order to provide a stimulus for growth. Your intensity of effort must be great enough to exceed this threshold so that a sufficient amount of muscular fatigue is created to trigger an adaptation. Given proper nourishment and an adequate amount of recovery between workouts, your muscles will adapt to these demands by increasing in size and strength. The extent to which this "compensatory adaptation" occurs then becomes a function of your inherited characteristics.

One final point regarding muscular fatigue: Each repetition that you do is a little more productive than the previous one (as long as the number of repetitions is not excessive). In other words, the tenth repetition of your set is more productive than your ninth repetition. So, when you can no longer perform any further repetitions, the exercise is as productive as possible. Clearly, the most productive rep of a set is the last rep.

THE BOTTOM LINE

It is much safer and more productive to raise and lower the weight in a deliberate, controlled manner without any jerking or explosive movements. Raising the weight in at least 1 - 2 seconds and lowering it in at least 3 - 4 seconds ensures that momentum did not play a significant role in the performance of the repetition.

Remember, how well you lift a weight is more important than how much weight you lift. Your strength-training program will be safer and more productive when you incorporate the five steps for productive reps.

Matt Brzycki has been involved in the strength and conditioning of collegiate wrestlers for more than 20 years. Since 1986, he has authored more than 60 articles for *Wrestling USA Magazine*. Reprints of 42 of these articles have been updated and adapted into book form (*Wrestling Strength: The Competitive Edge* and *Wrestling Strength: Prepare to Win*) and are available through Cardinal Publishers Group (800-296-0481). He is also the author of *A Practical Approach to Strength Training* and the editor of *Maximize Your Training*, a 455-page book that features chapters written by more than 30 strength and fitness professionals. 🐾

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