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Slow down on reps

BY MATT BRZYCKI

When I asked a detective with the Readington Township Police Department to give me some ideas for topics that I could address in this column, one of his colleagues asked about the suggested speed at which repetitions should be performed in the weight room. As it turns out, this is a very critical aspect of training.

Matt Brzycki

MOMENTUM

To better appreciate repetition speed, it's important to understand the dynamics of lifting a weight. Momentum can be defined as "mass times velocity." Assuming that the mass – or in this case, the weight – of the object stays the same, momentum is then a function of velocity: As the velocity increases, so does the momentum.

Momentum affects the efficiency and safety of an exercise. Let's see just how this comes into play.

EFFICIENCY

High-speed repetitions that are performed in an "explosive" manner are less productive than low-speed repetitions that are performed in a controlled manner. Here's why: When weights are lifted too quickly, an excessive amount of momentum is produced. As a result, the muscles generate tension during the initial part of the repetition 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 – or eliminated – and so are the potential gains in muscular size and strength.

Have you ever seen others raise the weight so quickly on a leg-extension machine that the pad left their lower legs partway through the repetition? Well, think about it: The pad is attached to the movement arm of the machine that, in turn, is connected to the resistance by some means (such as via a chain, cable or belt). If the pad is no longer in contact with the lower legs, there's no load on the muscles. If there's no load on the muscles, there's no stimulus – or reason – for them to adapt.

Sure, they will obtain some benefit when their muscles were loaded during the first part of the repetition (when the pad was in contact with their shins). However, they will not obtain any benefit when their muscles were unloaded during the last part of the repetition (when the pad wasn't in contact with their shins).

SAFETY

High-speed repetitions carry a greater risk of injury than low-speed repetitions. Using an excessive amount of momentum to raise a weight increases the shearing (side-to-side) forces that are 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 who squatted with 80% of his four-repetition maximum incurred a 225-pound peak shearing force in the knee joint 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.

Think about that for a minute. When the repetition speed increased (from 4.5 seconds to 2.1 seconds), the peak shearing force increased (from 225 pounds to 275 pounds). This is clear evidence that a slower speed of movement reduces the shearing forces on joints.

Here's an important point: If the shearing forces (or compressive forces, for that matter) exceed the structural limits of a joint, an injury occurs to a muscle, bone and/or connective tissues. I've said it before but I'll say it again: Getting injured while doing your job may be heroic but getting injured while doing your physical training is horrific.

SUGGESTED SPEED

So, what's the optimal speed for doing repetitions? Well, absolutely no one knows. But one thing is certain: Regardless of whether you're using free weights or machines, it's more efficient and much safer to perform repetitions using a controlled speed without jerking or throwing the weight. Raising the weight in at least 1 - 2 seconds and lowering it in at least 3 - 4 seconds will ensure that momentum doesn't play a significant role in the efficiency or safety of the exercise. Effectively, then, it should take at least 4 – 6 seconds to perform a repetition.

Now, those time frames aren't set in stone. To a degree, the repetition speed depends upon the range of motion (ROM) of an exercise. Remember, all exercises don't have the same ROM. For

instance, the elbow joint normally has a ROM that's more than 135 degrees during the bicep curl and tricep extension; in comparison, the wrist joint normally has a ROM that's less than 90 degrees during wrist flexion and wrist extension. Hence, any exercise that has a relatively large ROM might take about six seconds per repetition; any exercise that has a relatively small ROM might take about four or five seconds per repetition.

WHAT THE RESEARCH SAYS

Research using free weights and machines has shown that slow-speed repetitions are at least as good as fast-speed repetitions for improving muscular size, strength and power. In one study that used the barbell squat, for example, the subjects were divided into two groups: One group was to "explode upward as fast as possible" and the second group was to "raise the bar in a slow and controlled manner so that acceleration [was] minimized." Both groups were instructed to "lower the weight in a slow and controlled manner." After 7.5 weeks of training, both groups significantly increased their one-repetition maximum squat, vertical jump and muscular size (of the thigh). There were no significant differences between the groups.

In addition, 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. And using the same six-second guideline for raising and lowering the weight, two different eight-week studies reported average increases in muscular strength of 55% in 17 subjects and 58% in 31 subjects.

OTHER CONSIDERATIONS

In some cases, it may be in your best interests to use a repetition speed that's somewhat slower than what has been noted. If you're rehabbing an injured area, for example, slowing the repetition speed will decrease the orthopedic stress that's encountered by a given joint.

As the injury heals, you can gradually return to your preferred repetition speed. Then again, you may find that an extra-slow speed is more appealing and continue using it after you complete your rehab. Or perhaps you may even adopt a slower repetition speed to train other areas that aren't injured.

Another instance where a slower repetition speed is more desirable pertains to older individuals. Again, the slower speed decreases the stress on the joint – a critical consideration for the older population since they're more susceptible to orthopedic problems. And by "older," I don't necessarily mean someone who's eligible for a senior discount. Many individuals can exhibit signs of orthopedic disorder in various joints – the shoulder, knee and lower back quickly come to mind – in their 40s or earlier. If this description fits you, try using a slower repetition speed.

THE BOTTOM LINE

When it comes to the speed at which repetitions should be done, follow this advice: Slow down!

Matt Brzycki is the Coordinator of Recreational Fitness and Wellness at Princeton University. A former Marine Drill Instructor, he has authored, co-authored or edited 16 books on strength and fitness, including SWAT Fitness (available at www.operationaltactics.org).