

The Repetition Range Selection Process

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So exactly how many reps should you perform if you want to pack on more muscle? It's a loaded question, but one that is asked too frequently to ignore. It is also a question that is typically answered with such nonchalance and seamless simplicity by trainers and trainees alike; it's down right frightening. Frightening because, there really is no clear-cut answer when you consider the wide-range of variables involved. In this article we will discuss some of these variables and show how they can help you determine the proper rep-range for maximizing muscle growth. More importantly we will take the topic to another level of understanding that will help to clear up much of the confusion and help to separate fact from fiction.

It is easy to suggest that a particular rep range, say 6-8, will influence muscle hypertrophy, while 3-5 will result in a strength increase, or that a high-rep range is ideal for improving muscular endurance. But at the end of the day, are any of these suggestions true?

The answer to that question is, *yes and no*. Although there is science to back claims made regarding the impact of training within a specific repetition range what often gets lost in the conversation is how the implications made by the science apply per individual. From there it becomes an issue of how the individual executes those suggestions, which will then determine its validity and effectiveness.

Consider the quality, intensity or speed of the reps an individual is performing compared to the next person and it becomes apparent that the very general suggestion of performing X number of reps to get a certain response, may not be an accurate or appropriate suggestion. For example you can have two individuals of seemingly equal size and physical make-up, both with the goal of increasing the size of their quadriceps. We may see that one responds better to a higher-rep-range and the other may respond more favorably to a low-rep-range. But this response may not just be a result of genetic differences between the two but in the execution of those reps and the set as a whole.

Again there are so many variables involved in determining the proper rep-range that we need to think beyond the simplicity of attaching specific numbers to a specific response. When it comes to rep-range and muscle growth things are not as clear-cut as, X number of reps results in this and Y results in that.

First, the Science

As most of you are already aware, the two major energy systems we rely upon when exercising are the anaerobic (without oxygen) and aerobic (with oxygen) energy systems. The anaerobic system can be further divided into two categories, anaerobic *alactic* and the anaerobic *lactic*. We will discuss the differences between the two in greater detail momentarily.

Keep in mind that when you exercise the anaerobic and aerobic energy systems are both active. However the degree to which each is working depends upon the intensity (effort) and duration of the exercise being performed. Although exercise of a low-intensity and long-duration is typically characterized, as being aerobic and exercise of high-intensity and short-duration is typically considered anaerobic, *how* aerobic or *how* anaerobic an exercise is depends mainly on how much physical effort is being exerted during that time. Thirty-second's worth of biceps curls with a very light, unchallenging weight *is not* anaerobic exercise. Just like running 1-mile as fast as you can is not purely aerobic but requires a great deal of anaerobic energy.

As bodybuilders our first priority when exercising is to be sure that the work we are doing is as anaerobic in nature as possible. This assures us that we will be utilizing the chemical resources (ATP, Creatine Phosphate and glycogen) and muscle fibers (Fast-twitch) responsible for muscular size and strength, as well as secreting the release of the hormones (GH, testosterone, IGF-1) also responsible for these increases.¹

Unfortunately many bodybuilders take this objective to an extreme that may actually hinder their ability to optimize muscle growth.

Earlier I mentioned the anaerobic *alactic* and anaerobic *lactic* energy systems. The anaerobic *alactic* system utilizes Creatine Phosphate for energy, no O₂ and produces our strongest and fastest muscle contractions.² However it also has the least amount of chemical reactions of all the energy systems with its peak power

output occurring within one second and sustaining for only 20-30 seconds. Good news if you are a sprinter, powerlifter, Olympic lifter, football linemen or baseball pitcher. Bad news if you are Bodybuilder.

While recruitment of Fast-twitch muscle fibers is high priority for any bodybuilder, what is of even higher priority is recruiting *the greatest number* of FT fibers and utilizing the most amount of chemical energy (ATP, CP and glycogen) a muscle has available. Only by stimulating more muscle fibers and creating an environment where the muscles must “make room” to store more energy, will optimal muscle growth occur.

This brings us back to the anaerobic *lactic* system. This systems peak power output occurs within 20-30 seconds but may sustain for upwards of two minutes.³ What this translates to for us as bodybuilders are set lengths of 40 seconds minimum and 120 seconds max, for muscle hypertrophy. Obviously this is a pretty broad range and in a moment we will discuss more of the factors that go into determining the ideal set length. What we should take from this right now is that if your sets are not lasting *at least*, 40 seconds then you are probably not getting as much out of them, in regards to stimulating muscle development via fiber recruitment and energy expenditure, as you should be.

Now I understand that many of you have probably already made some great muscular gains and never performed a set that lasted close to forty-seconds and please bear in mind that I am not disparaging you from doing what has worked up to this point. In fact for those of you that are truly genetically gifted, possessing an abundance of FT muscle fibers throughout your body or in particular muscle groups, less than 40 seconds of time-under-tension (TUT) may actually be ideal! For you, recruitment of FT fibers happens very rapidly and quite overwhelmingly. For the rest of us who are not as genetically inclined, which is about 98% of us, I am trying to explain how we can achieve even greater gains by making each set, and consequently, our entire workout, more effective.

Putting it in the Proper Context

Let's put things in perspective before going further. The goal of any individual—genetically inclined or cursed—looking to improve muscular development should be to perform *the least* amount of exercise needed to get the desired response, i.e. increased muscle mass. The reason being is simple and

something you've undoubtedly heard a thousand times before, which is; *muscles do not grow in the gym!* Workouts are nothing more than the stimulus for growth and development and the time spent recovering from that stimulus is when the growth actually occurs. So my point is, commit to doing the least amount of total work within a workout necessary to stimulate muscle growth so that you have more time available to recover and reap the benefits of your training.

Place the quality of your workouts ahead of the quantity. Just because you perform 24 sets for chest in a single workout does not mean that any of them, or the workout as a whole, will be successful in stimulating growth. The emphasis should be on making each rep of each set of each exercise, *harder* as opposed to simply completing an arbitrary amount.

Time is of the Essence

Some may argue, "If my sets are short, I can just perform more of them to make up the time difference". My answer to which is, *true*, you will make up the time difference but that's only if you are taking very short rests between sets (i.e. 5-30 seconds). When rest periods get in the range of sixty-seconds and higher, you recover many of the same muscle fibers you just worked for that particular exercise. So in effect you are re-training the same group of muscle fibers (ST and mixed) over and over again, especially if the first few sets were not very challenging. In order to train the larger FT fibers your set must be long enough and demanding enough to call upon this group. This is a factual statement supported by The Size Principle.

The Size Principle states: *the recruitment of fiber types usually occurs in a preferential manner according to the size of the motor neuron supplying the fibers: the smallest is recruited first, and the largest, last.*⁴

What this basically means is that muscle fibers are recruited on an "as needed" basis relative to "how hard" the work is. At the beginning of a set, when the effort and force output needed to perform the lift is lowest, the smaller ST fibers are recruited to perform the work. As the set continues each rep progressively becomes more difficult to complete as the muscles gradually fatigue. In order to continue completing reps greater force must be generated by the muscles to fight the resistance. As a result more and more of the larger muscle fibers (mixed/intermediate & FT, in that order) are recruited as only they can generate the force needed to contend with the increasing demands of the exercise.

Approaching muscular failure motor neurons are firing their fastest, trying to

recruit as many FT fibers as are available. When no more FT fibers are available or cannot be recruited (because of neurological ability/limitations) muscular failure results.

Individual results will vary

If you read that last sentence again you will notice a very important point made. That being that muscle fiber recruitment is largely neurological in nature. That certain individuals are able to call upon FT fibers much more quickly and readily, compared to other individuals. In essence this is what makes a power athlete a power athlete. He/she is capable of recruiting FT fibers much faster and in greater numbers than the average individual who possesses less FT fibers and whose motor neurons fire at a slower rate.

Although a person can train themselves to become more efficient and stronger at performing exercises/skills involving short bursts of powerful contractions by practicing them, it still does not resolve the issue of recruiting/training the greatest number of FT fibers a muscle has available. That can only be accomplished by performing an exercise long enough to completely exhaust all the ST and Mixed fibers *first*, as indicated by The Size Principle. Remember that the anaerobic *lactic* system takes 20-30 seconds to reach *peak* power output. In other words it takes 20-30 seconds of increasingly difficult work before the larger FT fibers begin to be recruited. However, just because you are beginning to recruit these fibers does not mean you have worked long enough to fully exhaust all or most of them.

For individuals who possess a greater number of ST and/or Mixed fibers it can take even longer before FT fibers are recruited. Some individuals, at the far end of the continuum may not possess any FT fibers at all. These are usually your elite distance runners, those incapable of building any significant amount of muscle or strength but have extraordinary muscle endurance. It is this variance in the percentage of each muscle fiber type from one muscle group to another which determines that muscle's TUT, or set length.

So, how many reps?

The answer to this question is simple. The number of reps performed depends upon the rep cadence. If I knew that my triceps responded best to sixty-seconds of TUT and I perform my triceps extension with a 3-1-4 count (3 sec. positive, 1

sec. hold, 4 sec. negative) then I would need to perform 7-8 repetitions to reach my 60 second TUT. If I did the exercise in a count of 3-3, then I would need to perform at least 10 reps.

It is not the number of reps that is important but the TUT appropriate per muscle group. The number of reps performed is simply a by-product of rep cadence, which should always be slow and controlled relative to the ROM and with constant tension on the target muscle(s).

Just like determining the proper number of sets, determining the proper rep-range—or more specifically, the proper TUT—will take some meticulous note taking and objective observance of your response to training within specific TUT's. For those looking for more of a short-cut there are certain methods of testing a muscle groups Fiber Type make-up and rate-of-fatigue, which I've put together in a report titled *Determining Your Muscle Fiber Type* which you can get by sending an email to me (MikeL@PurePhysique.com) with Fiber Type in the subject heading.

Using Variety

Sure it's important to constantly disrupt what your body and muscles are accustomed to in order to stimulate greater gains. This does not mean however that you need to grossly vary your rep range throughout your workout or from one workout to the next or even from time to time in order to hit all the different muscle fibers. Utilizing the appropriate TUT with a high-intensity is enough to ensure that all fibers will get worked sufficiently.

Disrupt what your body is accustomed to by using various exercises, changing the order, even changing the way an exercise is performed, but do not stray a far from what you must do consistently to get the best result. That means staying within the proper rep-range, working with a high level of intensity and only training with a volume and frequency of exercise *necessary* to get results.

In Closing

Our only concern is making sure we recruit and exhaust as many FT muscle fibers as possible and utilize as much chemical energy a muscle will offer. If a set or, a workout, is not serving this purpose then what purpose does it serve? Other than draining you of valuable resources that could be put to better use by

performing a productive set of high-quality/high-intensity exercise these types of sets and workouts serve little purpose, except to maybe provide a reprieve at times when training should not be as demanding so that the body's resources can be utilized for recovery.

Take the time to uncover *your* proper rep-range. Balance it with appropriate intensity, volume and frequency and then watch your muscle growth take-off!

References

¹

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³ Johnston, Brian D. Exercise Science: Theory and Practice, BODYworx Publishing 2003, p.22

⁴ Kreighbaum, E., Barthels, K.M., *Biomechanics: A Qualitative Approach for Studying Human Movement*, 4th Edition. Allen & Bacon Needham Heights, MA 1996 pg.65