STRENGTH TRAINING
by John Platero

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Strength training usually occurs in the second or third phase of an annual fitness plan for the average fitness participant, but for many athletes, a strength program may begin at the end of a rest period following a competitive period or season. It all stems from the concept of **Periodization.**

I've just read a wonderful book on strength training called "Modern Trends in Strength Training," by Charles Poliquin and I think you'll find this information interesting.

In order to have a successful resistance training program for strength, you must consider the concept of **maximal voluntary contraction.** This can be defined as the ability or attempt to recruit as many motor units as possible to develop force. Intensity is the key here. In order to increase intensity, a person must work at a higher percentage of their maximum ability by lifting heavier weights or moving the weight faster. Proponents of the "super slow" weight-training programs claim their programs are more intense however, reducing the speed of movement merely increases the time under tension not the intensity.

The intensity of an exercise can be expressed in terms of a **1 RM max**. For example, the maximum weight that can be correctly lifted six times without significant rest would be known

as a 6RM. Working with 1RM loads enable an athlete to achieve *maximal motor-unit activation* or *MUA* with each contraction. Achieving MUA will stimulate neural adaptations leading to enhanced strength. It's important to not only consider the amount of reps but the speed of the repetitions as well. Lower reps emphasize neural adaptations and higher reps emphasize muscular or metabolic adaptations. This is a practical tool that will help you design programs to achieve your clients goals.

Repetition continuum versus training effect
(Poliquin 1991)

1 3 5 7 9 11 13 15 17 19 21 23
< >

Neural adaptations<----------> *Metabolic adaptations*

Muscular Strength

The development of muscular strength is best accomplished by using 70-100 percent of maximum or 1-12 repetitions. The key is what is considered minimum intensity. Each repetition equates to roughly 2.5% of a 1RM. If someone lifts 10 reps, then they would be lifting 25% of their 1RM.
Remember this is relative. If someone could do 50 reps, would they be working at less than 100% of their maximum?

A person's **Training age** can influence a person's 1RM as well. This age refers to the number of years an athlete or client has been participating in a serious strength training program. Most people you'll be training will probably be a training age of under 2 years. It normally takes approximately 2 years for a person to be considered strong or " lifting really heavy weights."

In order to determine a starting weight or intensity, the standard I hold as excellent when designing a strength phase for a new client's program is based on their body weight. Of course, percentage of body fat could make a big difference.

In my opinion a man is considered in excellent physical strength or "strong*," if his 1RM is:

For a 180 lb man:

$ bench press twice his weight.....360 lbs
$ squat three times weight.....540 lbs
$ military press one and half times his weight.....270 lbs
$ curl his weight.....180 lbs
$ pull –ups……..20 reps
$ dips with double their weight…….10 reps

for a 140 lb woman:

$ bench press one and half times her weight.....210 lbs
$ squat twice her weight.....280 lbs
$ military press her weight.....140 lbs
$ curl 3/4's of her weight.....105 lbs.
$ pull-ups……10 reps
$ dips + ½ of her weight……10 reps

However, because the majority of your clients will be so de-conditioned, it would be best to consider 50% or half of all the poundages from the excellent category above as their 1RM.

For example, if a man was 180 lbs, then, holding him to my excellent standard, I would calculate his 1RM in the bench press to be 360 lbs or twice his weight.

If this man was a beginner, then cut all the percentages by half. The 1RM for a 180-lb man will now change to:

$ bench press his weight.....180 lbs
$ squat 1 ½ times his weight..... 270 lbs
$ military press 3/4's his weight.....135 lbs.
$ curl half his weight.....90

for a 140 lb woman:

$ bench press 3/4's her weight.....105 lbs
$ squat weight.....140 lbs
$ military press ½ her weight.....70 lbs
$ curl 1/4 of her weight .....35 lbs

* Keep in mind this in regard to gym strength.

Training Potential Curve

The average beginning client can often perform a 20RM at 75% of maximum.(1) After one year of training he or she may be down to 10RM for the same percentage and after five years the same person might be only able to perform 4RM. This is because at the beginning of their program they are starting at a lower end of their ***training-potential-curve.*** (2) It is generally accepted that weights lower than 70% of maximum, or repetitions higher than 12, would be too light, to elicit a strength response. However, in the initial stages of a program, beginners can make significant strength gains with as many as 20 reps or 50% of their 1RM because of the reason stated above. With that in mind, you might start a beginner who is a 180lb male at 50% of the weights above, so, for a bench press 180 x 50% = 90 lbs. In general, if you're writing a program to maximize strength, then repetitions of 1- 5RM would be your pick. Reps in the 8-15 range produce greater hypertrophy gains with less effect on maximal strength, and reps between 6-7RM produce equal changes in hypertrophy and strength. (3) These are general guidelines. Remember, novice lifters should emphasize sets of higher repetitions in order to learn correct technique.

Each muscle group or lift responds to a specific average rep range. At 12RM in the bench press a person may be at 70% of maximum, but at 12RM maximum for the leg curl, (see fiber type below) a person might only be working at 57% of maximum. Some athletes can complete as many as 65 repetitions at 70% in lower body exercises with a high-stretch-shortening cycle such

as a leg press. (4) Long term aerobic work can also modify the 1RM. People who compete in events where there is a high cyclical component may perform abnormally high repetitions at a very high percentage of their 1RM. Australian rowers have been able to complete 12 reps at 97 percent of their in maximum in comparison to the average athlete who may be able to complete only 1-2 repetitions at that percentage.

The Number of repetitions is the one acute variable which a person adapts to most quickly. According to strength coach Charles Poliquin, most athletes adapt to a given number of repetitions in just six workouts. Try changing rep ranges every 2- 4 weeks or every 6 workouts. Once your client increases their strength by 10% or four repetitions, you'll need to increase the weight.

Function, or the fiber composition can affect the selection of reps for your client. For example, with the knee flexors, sets of 12 repetitions have little effect on hypertrophy, as opposed to the knee extensors which can hypertrophy with sets of up to 50 repetitions. It appears the knee flexors are used mainly for explosive tasks while the extensors are used in maintaining posture against gravity and for repeated stretch-shortening tasks.(6) Poliquin has found when training the elbow flexors the best strength gains were obtained with at least 2.5 average reps per set with a minimum of 15 reps per workout. (7) Because fiber make-ups can change from person to person, an average trainee might do seven repetitions maximum at 80% of their maximum, while a fast-twitch individual may only complete three repetitions at the same given percentage. The soleus muscle usually contains 88% slow-twitch fibers so a range of 15-25 repetitions may be needed to receive a stimulus for growth. (8)

Keep in mind this whole article is based on the concept of maximal voluntary contraction. Every repetition range means your are working to failure. You or your client is not supposed to be able to complete one more rep. Here are some of the interesting ideas I learned from this book.

$ **Try lowering the reps not the sets every two workouts.** For example, perform lifts of 3-4 sets of 20 lb dumbbells for 6-8 reps, for the next two workouts increase the weight to 22.5 lbs and perform sets of 5-7 repetitions and lastly, 25 lbs for 4-6 repetitions.

$ **Drop Sets**. Start with a particular weight and perform a set to failure. Drop the weight by 5-10%, rest about 10 seconds and lift again to failure. Repeat to failure again. For strength training, don't exceed more than 4 or 5 sets. You may shorten the rest period if needed. Fast twitch athletes may need the longer rest.

$ **The four/five percent solution** requires an increase in the amount of resistance each workout. Select a 3-rep wide bracket to start the cycle. 3-5,4-6,5-7 or 6-8. If muscle mass is the primary goal, the average set should last at least 40 seconds. If strength is the goal the set should not last more than 20 seconds. Because of the amount of sets, only perform 2-3 exercises per body part and work each body part every 5 days.

Day 1: Chest and Back
Day 2: Legs and Abs
Day 3: Rest
Day 4: Shoulders and Arms
Day 5: Repeat

Here's an example of a four/five percent workout for someone who can curl 7 reps @ 100lbs.

Workout 1
4-5 sets x 7 reps @ 100 lbs.
Workout 2
Increase the weight by 4-5 % and do one rep less per set:
4-5 sets x 6 reps @ 105 lbs
Workout 3
Increase the weight by 4-5% and do 1 rep less per set:
4-5 sets x 5 reps @ 110 lbs
Workout 4
Use the weight in workout 2 for the 1- rep target
4-5 sets x 7 reps @ 105 lbs (If these results are achieved your client is now 5% stronger)
Workout 5
Increase the weight by 4-5% and do 1 rep less per set
4-5 sets x 6 reps @ 110 lbs
Workout 6
Increase the weight by 4-5% and do 1 rep less per set
4-5 sets x 5 reps @ 115 lbs.

Your client should now be able to do a 7RM with 110 lbs and is now 10% stronger in just six workouts!

$ **Pyramid System**. According to Tudor Bompa, do not exceed an intensity spread of 20%.

10 reps = 25%
8 reps = 20%
6 reps = 15%
4 reps = 10%
2 reps = 5%

$ The upper body needs more variation than the lower body. If you were planning a training cycle for the bench press you would need more variety than if you were training for the dead lift or squat. Here's an interesting fact. Biomechanists have determined in a squat, you're lifting 75% percent of your body weight plus the load of the barbell. After all, you're legs are lifting the upper body and not lifting the lower legs off the ground. Consider this when adjusting squat poundages of up to 4-5%.

$ Have a beginner complete more repetitions per set.

$ Multiple sets lead to higher and faster rates of strength gains. Usually one to two sets are enough for beginners but after 6-12 sessions a trainer must increase the volume because the muscles will have adapted. Remember, probably the first 30% of strength gains come from an improvement in intermuscular coordination. The person "learns" how to lift and

becomes more efficient at turning on and turning off the systems needed to accomplish the lifts.

$ The fewer reps an athlete performs per set, the more sets needed to achieve the appropriate training response. If a client has not fully recovered from a previous workout, cut back on the number of sets, not the intensity. For example, in a preparatory period, squat poundages are best driven upwards using a minimum of 7-8 sets of 4-5 repetitions. Once the athlete fails to respond to the training volume as a stimulus, intensity becomes more important and 6-10 sets of 1-3 reps produce better results.

$ There is an inverse proportion to sets and exercises. The total number of exercises should be reduced when performing a large amount of sets per exercise.

I hope this helps you and your clients when they are in their strength training period. Good luck!

1. Modern Trends in Strength Training, volume 1, Poliquin, Charles, 2001, pg. 5
2. pg. 11
3. pg. 8
4. pg. 6
5. pg. 7
6. pg 13
7. pg 9
8. pg 12

PERSONAL TRAINER OF THE MONTH
Lawrence Herrera

Lawrence Herrera
Personal Trainer of the Month
By John Platero

Lawrence is a guy who gets things done. He received his first certification from the NCCPT in 2003 and four and half years later he's now an instructor!

He seems to have always been an over achiever. In high school, he played baseball, football and track. In ninth grade he started lifting weights training for football. In college, at the **Naval Academy in Annapolis** he played baseball and rugby and presently competes in Exterra triathlons.

After two years at Annapolis, Lawrence moved to San Diego, changed his major to Exercise Science and attended Grossmont Community College. At **LA Fitness** in San Diego he became certified and began his career as a personal trainer. He eventually ended up at a **24-Hour Fitness** where he worked for two and half years. "I was full time. I trained clients between 25-40 hours a week."

While in Sand Diego, Lawrence obtained the NASM CPT, SFS, IFS and PES certifications.

He then moved to New Mexico and was employed at a small rehab center in Sante Fe called the **New Mexico Sports Fitness and Physical Therapy**. Eventually moving to Albuquerque, Lawrence trained at a large 60,000 sq. ft facility called the **New Mexico Sports and Wellness Center**. However, he wanted to finish his degree and the larger facility was demanding too much of his time. He enrolled in the **University of New Mexico** and now attends classes ten hours per week.

Lawrence leases space in a small private training studio called **Cross Fit** where he trains clients ten hours a week. His company, **LH Functional Fitness,** also provides personal trainers for the **KIVA Squash Club** where he acts as the Conditioning Coordinator.

"I focus on a client's goals. I first assess, then I personalize their program. I focus on functional and integrated movement before isolation. Once the client can move efficiently with compound exercises we progress to isolated movements."

Lawrence trains in the gym two to three days a week. "I prefer to be outside. I'm scheduled to compete in an Exterra Triathlon in May. It's a 1k swim, 10k mountain bike and a 5k trail run."

When I asked Lawrence about the field of personal training he responded, "Educate yourself and come to my class. Once you get certified you'll now have the ability to help people and inspire them to obtain optimal health and fitness."

We couldn’t have said it better. **We’re proud to have Lawrence Herrera as our November, 2007 Personal Trainer of the Month.**