



President's Message

I'm sitting here watching the New Hampshire debate. One candidate stated; 75% of the health care expenses are spent on five chronic illnesses that can be prevented. He suggested we should start focusing on preventative measures to change the financial health care plight. I love it. How about a tax incentive of \$12,000 per household for personal training? That could easily fund 15-20 sessions a month. There is no other health care professional that can do what we do.

Do you ever wonder why there is a "sticking point" when lifting a weight? **Bill DeSimone** wrote a great article on Moment Arms which might help bring some light to why and when that occurs. Try and find the moment arms in the exercises you perform.

Our Personal Trainer of the month is **Revonda Montoya**. This woman has enough passion to train an entire city.

I hope your training business has picked up in these winter months when people need to stay inside to exercise. On the other hand in California, this weekend was almost like summer. Sorry☺.

I've decided to compete in the UCI Master World Cycling Championships in Austria in August and the Senior World Games in St. George, Utah in October. Wish me luck! I've already started my training.

We're working on the new website which will help all of you make more money. Hopefully, in about 90 days it will be ready.

If you would like to write an article, classified ad or have any events coming up or comments on the newsletter, please contact us through the web at info@nccpt.com.

Stay fit!



Mastering the Moment Arm

By Bill De Simone

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I have developed a way to apply Biomechanics to Weight Training that you may find intriguing.

After rupturing my own biceps during a slow curl, I decided to research what the classic sciences had to suggest about exercise, strength training in particular. I went back to kinesiology and medical physiology texts, to see what they had to say about joint and muscle function, and to lever mechanics and biomechanics, to better understand the nature of resistance and its relation to the body.

When I put all this together to understand general concepts, I realized that a major overlooked factor was the resistance lever created by the body. It is the interface between your internal muscle torque, i.e., the torque you generate, and the resistance source, whether that source is free weights, machines, elastic, bodyweight, etc. It is always present, always influences performance, and is always a separate phenomenon from muscle torque.

In the case of machines, the resistance source may have its own internal lever, so there are at least two and maybe three overlapping torque systems during every exercise. These are the muscular torque; the resistance torque created by the body lever and resistance; and the resistance torque provided by the machine.

I have found several advantages to analyzing exercise as a series of overlapping torque systems. It is immensely helpful in clarifying exercise selection and instruction. There is no more assumption attached to exercises; it is very straightforward to determine what an exercise actually does for your muscles. Your effort can go into depleting the muscle's force, not into overcoming a mechanical disadvantage, so joint distress is reduced and overload more efficient. You do not become reliant on a particular brand or vintage machine. You can analyze the mechanics of what you have available, compare it to what you know of your muscle and joint capabilities, and adjust accordingly.

I had to understand some general concepts from the sciences to begin to apply these ideas. To start, muscular torque exists in a very predictable pattern: it increases, then decreases, as you move from fully stretched to fully contracted. This is attributed to both leverage changes and force capabilities. Identifying the exact limb position for peak torque can be problematic, since it can change depending on the experience of the trainee, the speed of the movement, fatigue, and the testing device; but it will always be somewhere in the mid-range of a muscle's possible range of movement. It may be near an endpoint of an exercise movement, but in the mid-range of the muscle's possible movement.

Certain limb positions, and in turn corresponding muscle lengths, reduce the ability to apply muscular force: the positions of active and passive insufficiencies. Active insufficiency is the weakness when the ends of the muscle are close together. Passive insufficiency is when the ends of the opposing muscle are far apart and don't allow the target muscle to apply force. These conditions can exist either separately or simultaneously for opposing muscles. Many common exercises put the muscles in exactly these positions, with certain benefits attributed to the exercises (such as "peak contraction" and "lengthening"). All you are really doing is reducing the weight you work with, because the muscle cannot generate as much force as in its mid-range, and because the internal lever is at a minimum in either of these positions. The sensations you feel with these exercises are either the beginnings of a cramp, or the traction on the joint trying to hold itself together.

Resistance torque is not as predictable as muscular torque. You have to identify an axis and a line of resistance, which gives you a lever, and then note how the lever changes during the exercise. On Nautilus and Hammer, this is fairly obvious, but each free weight or tubing or pulley exercise has to be reviewed separately, taking into account both the changes in lever and in the case of elastics, the resistance. The overlapping nature of the torque patterns is what makes the analysis confusing. When you lock out on a press, the exercise feels easier. Is this because in this position, you have increased muscular torque? Actually, you do not, when compared to other joint angles. Or is it that at lockout, your bones have reduced the resistance lever to zero, so that even though your muscular torque is reduced, you have zero resistance torque?

What really matters, however, is whether the changes in torque are in alignment with each other. It's not only that the direction of resistance opposes the action of the muscle. Where the muscle generates the most torque, the exercise, whether cam-based or conventional, should provide the most resistance torque. Otherwise, your effort is going towards overcoming a mechanical disadvantage, and not towards depleting your capability to produce muscular force. This is a classic concept in kinesiology and appears to be one of the original goals behind the development of both Nautilus and isokinetics.

Now, with these general concepts, I then started from scratch to "design" exercises for each area.

I looked at each muscle and joint system to figure out how to stabilize the particular joint for a particular movement, and what limb positions corresponded approximately to the muscle torque pattern. Then I would take a conventional exercise, and looked at the resistance source and the resistance lever created by the body, to get an approximate resistance torque pattern.

For exercises that appeared to be in alignment, I began to fine-tune the joint stabilization, body position, range of motion, and the equipment placement. For exercises where the patterns did not align, if I could not successfully modify the exercise, I would regard it as secondary or just disregard it. If I were unable to reference a muscle torque pattern, I would go by feel, using very slow reps, trying to sense a decrease in

muscle effort during the motion, assuming that at that range, the torques were out of alignment.

All of this assumes that torque alignment is desirable. According to the texts, it is, but I can see exceptions. My point is not necessarily to label the best and worst exercises or machines, but to understand fully what happens, so I can apply it appropriately.

Since injuring my biceps is what got me started, let me relate some of what I found regarding biceps and how it modified my exercise. The fully stretched position would be with the hand fully pronated, elbow straight, and arm extended behind the body. Or, in gym terms, this is a low incline, dumbbell curl. The fully contracted position would be with the hand fully supinated, elbow bent, and shoulder flexed so that your elbow points overhead, or the "compound" position curl. So the area of peak muscle torque, the mid-range, would be with the hand slightly supinated from neutral, with the upper arm between neutral and flexed at the shoulder, but not to the limit of shoulder flexion. And, the elbow would be bent approximately 90 degrees. Notice that when someone strains with a barbell curl, this is the position the arms maintain, while the torso leans back.

Have you noticed the disparity in the weights you can handle in various curls? Even assuming you perform each without momentum, and that you perform each "fresh", and taking into consideration single v. double arm exercise, you handle different weights in a barbell curls, Scott curls, machine curls, concentration curls, incline curls. Why? Your muscles don't change when you walk across the gym.

Two things do change. The maximum resistance lever created by your body during the exercise aligns at a different point of your muscle torque pattern. The resistance lever in barbell and Scott curls is greatest when the forearms are horizontal, but this occurs at different elbow angles, and therefore, at different capabilities on the muscle torque pattern. You might be able to handle 80 pounds in a barbell curl easily, but that same 80 pounds on a Scott curl feels much harder, because even though the resistance torque is the same, the maximum resistance torque hits the biceps at a weaker point in the torque curve.

You also may change the limb position, putting the biceps at a different length, either closer to the endpoints or the mid-range. In a bent-over concentration curl, you shorten the biceps by starting with the shoulder in flexion, then you flex the elbow, then you supinate. In other words, you position the biceps so that it mechanically can't generate as much force, then try to compel it to do so. That "peaking" sensation is the beginnings of a cramp. The overhead, compound position biceps curl actually, well, compounds the situation, since the shoulder is more flexed, and so closer to a position of active insufficiency.

At the other extreme is the incline dumbbell curl. At the start, with the elbow straight, there is zero torque, since the line of resistance is in line with the axis (both axes, the elbow and the shoulder). Instead, what you have is traction, the weight pulling straight down on the arm, and the "stretch" sensation is the bicep contracting to try to hold the shoulder together; not to flex the elbow. Neither the deltoids nor the biceps are in a good mechanical position for force, since both are being stretched.

In any case, no "sculpting" is actually happening. You are still overcoming resistance torque with muscular torque. The resistance is being applied to a lever, which has to be overcome by a smaller lever at the joint, which is being driven by muscle force.

You are just experiencing different sensations, that have been attributed to different effects, but it is still a mechanical process.

I've developed two modifications to work the arm flexors, one for curls, one for pulldowns, both to minimize shoulder distress and to work the range for peak muscle torque. Curls are done with the torso upright, whether with dumbbells, barbells, or cable. Hands are kept slightly supinated from neutral, as if using an EZ curl bar. Where practical, I start in the position of maximum resistance arm, in this case, with the forearms horizontal, because this is where the exercise would feel hardest. I start the set with short reps, from slightly above to slightly below horizontal. In this range, the change in resistance torque is not that different from the change in muscle torque, so it requires constant effort. If I were to fully straighten the elbow, or to fully flex the elbow and shoulder, both of those positions have zero resistance torque, since the weight is balanced under or over the axis. Since there is still some muscle torque in these positions, the disparity would allow me to reduce my muscular effort, which in the interest of efficient training, I would like to avoid. Towards the end of the set, I lengthen the reps, because even with the reduced resistance torque, the fatigue in the biceps doesn't allow me to reduce my effort during these parts of the rep.

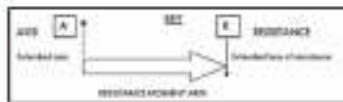
To work biceps with pulldowns, I use a conventional overhead pulley, and I sit away from the pulley, so that my arms are not directly overhead, i.e., the handle is slightly in front of my torso. Two individual grips that allow rotation seem to stress the wrists and forearms the least; if they're not available, I use an EZ curl handle or straight bar. From a side view, as you pull, the cable line to the handle should stay in line with your shoulders; i.e., if you extended the cable line, it would run through the shoulders, not the elbows or upper arms. This keeps the line of force balanced through the shoulders, creating zero torque for the shoulder extensors, but creating a variable lever around the elbow, so that the resistance torque is overcome by the arm flexors. In order to do this, your elbows will first move away (forward) from your torso. Then as you finish, they drop towards your ribs.

Notice two things. The finish position is similar to a Scott curl, except without balancing the weight for a rest at the top. Also, note the shape of the effective lever, which is the perpendicular distance between the extended cable line and the axis (your elbow). It starts small, increases until your elbow is flexed 90 degrees, and then decreases towards the finish, similar to recent Nautilus cams.

With these two applications, I still have at least four options for training biceps: dumbbell, barbell, or cable curls, and biceps pulldowns. I may do the other exercises for "mental" variety more than anything physical, but not under the idea that there would be any change in shape or positional strength of my arms. I would stay primarily with the methods that stress my joints the least, not only for biceps, but for all muscles.

The approach of "mastering the moment arm" can be applied to any sets and reps scheme, whether HIT or volume training, because it operates on a more fundamental level, that of forces and levers. It really helps with experienced trainees, who may have brought on a bit of wear and tear on their joints with training, like myself, and some adult, new exercisers who may not have much margin for error when it comes to their joints.

Moment Arm Exercises



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Owner and operator of the Optimal Exercise personal training studio in Cranbury, New Jersey. Started as a personal trainer in 1983 with Sports Training Institute in New York, and is certified by NSCA and ACE.

His presentation "Bodybuilding or Biomechanics" has been included in NSCA events and Club Industry (2007, Chicago; 2008, New York).

The **Moment Arm Exercise** manual applies the approach described in the article to all major muscle groups. 150 pages, with diagrams and photos; \$29.95 plus S&H.

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Personal Trainer of the Month **Revonda Montoya**

Revonda's passion for personal training and health and fitness exudes as she speaks of her clients, her business and her unquenchable thirst for knowledge. When I learned her history I could see why. Revonda has walked through the shadows and immersed, transformed, like a butterfly.

Revonda grew up in Virginia with one older brother. By age twelve she weighed 210 pounds! "It was our lifestyle. The way we ate. A doctor told my parents I would be fat all my life." Within one year, Revonda lost 120 pounds! This was her visit into the shadows. Now, at 90 pounds, she began to educate herself. "I smartened up and got involved in sports such as volleyball and soccer and stabilized my body weight to a normal range of about 115 pounds."

College, marriage and two children followed; Melanie 14 and Nicholas 16 years old. She continued to work out and began to teach group exercise at church, called "Praise Aerobics." "One day, while working out at a gym a bodybuilder was observing me and took an interest in me." Prior to this meeting, Revonda had mostly participated in group exercise and was mostly interested in burning calories to stay slim. Knowing her background you can see why. "He taught me the beauty of muscle pulling on bone. Once I incorporated weight lifting into my training, my body immediately toned up."

After college, Revonda taught aerobic classes at the YMCA and decided she wanted to train people, however, there wasn't much criteria at the YMCA so she searched and found ACE. She became certified ten years ago and began training people at Fitness Priority in 1998 as well as a cardiac rehabilitation program at the Community College in Hagerstown under the supervision of Dr. McIntosh. "I fell in love with helping special populations."

Over the years Revonda has trained people and taught aerobics up to 50 hours a week as an employee in a variety of clubs including the YMCA and GOLD'S Gym. This led to working as an independent trainer at South Point. "I finally figured out that you are only really independent, when you truly are on your own, in your own situation." Hence, Revonda has opened her own small personal training studio called **Designing Movements LLC** where she trains approximately 16 clients a week. She still continues to teach muscle building, Pilates and yoga group classes at GOLD's.

"I have no favorite type of client. I love them all," she says kindly. Her philosophy is "to meet their needs where they currently are." "I want there to be a lifestyle change for my clients, not just a quick fix. I train them in a progressive and organized fashion."

Revonda stays in shape by running four miles on M-W-F and spins on T-T for 45 minutes. She trains with weights five days a week. On M-W-F she trains opposing larger muscle groups and on T-T she trains smaller opposing muscle group. Each training session is 60-90 minutes.

"Personal training is great because we can make positive changes so people can better themselves and succeed in life. We have experienced everything our clients are about to." In Revonda's case I believe her. I myself have never been overweight nor lost more than half of my entire body weight!

Revonda is continuing her education and will begin to teach the **NCCPT Personal Trainer Certification workshop in Maryland** next month.

Because of her journey, her life experience and her kind, empathetic nature we are proud to have Revonda Montoya as the January, 2008 Personal Trainer of the Month.