The Dose-Response Relationship of Exercise

by M. Doug McGuff, M.D.

Recently I saw an advertisement for Nautilus that said quite simply "Nautilus...Strong Medicine". Later, in Mr. Mentzer's column in the March, 1997 issue of All Natural Muscular Development I read the following quote from Vert Mooney, MD....."Modern medical care should have the same precision and reproducibility in exercise programs that is expected in a dosage of prescribed medicine." Later I read a column by Richard Winnett, PhD. where he was exploring the idea of exercise dosages. These recent experiences have brought me to the realization that exercise is strong medicine and should go through the same process of determining an optimum dose amount and frequency that researchers use when inventing a new drug. Such a process should be able to produce a prescription for exercise that would be roughly appropriate for the vast majority of the population.

Let us explore how we could apply this process to exercise. First we must recognize that the human body is an organism, and this organism is able to make adaptive responses to various stimuli and that once identified, such responses should be reproducible across the vast majority of the population of that given organism. A drug is a stimulus that will act upon an organism, then under the correct circumstances, the organism produces a response. Likewise exercise is a stimulus which acts upon the organism, it is the organism that produces the response under the correct circumstances.

When one is researching a drug, the basic equation is as detailed below.....

**Stimulus** >>>>>>>>>>> **Organism** >>>>>>>>>>> **Response**

With regard to the stimulus, the basic issues to be identified are the concentration of the drug and the dosage of the drug. Analogous issues in exercise would be the intensity of the exercise and amount of exercise performed per session. With regard to response, our researchers would wait to record the desired response and note at what point in time this response occurs. The amount of time it takes the response to occur is what dictates an optimum dosing schedule. The key when designing a therapeutic drug is to optimize the concentration so that minimum dosing is required to produce a maximum response. Likewise the key in bodybuilding should be to optimize intensity so that minimum exercise duration and frequency is required to produce a maximum growth response.

While this may seem complicated, it is actually quite a simple process as long as you control all the known variables and systematically manipulate the unknown variables. I will go through these variables individually and show you how to control/manipulate them. To expedite this process we will also need to rely on the work of other respected peers in the field to establish good starting points so we won't have to do everything by complete trial and error. So let us begin...

Since the desired response is produced by the organism and that response takes time, this is the first variable we should identify because if we are not allowing adequate time for this response while we are testing other variables we will never get a response and will be left wondering what is wrong. So there are several variables we must hold constant.

The first of these variables is Intensity (analogous to concentration). Since our capability with regard to intensity changes on a moment by moment basis, the only accurate recording of intensity we can record is 0% or 100%, anything else would be guesswork. In addition reliable data from others in the field note that this intensity (concentration) is required to produce the desired response from the organism. So we must standardize 100% intensity, that is we will train to failure.

The next variable we must hold constant is the dosage. In drug research one generally starts with the lowest dosage expected to produce some response. This is done to guard against toxicity which could interfere with the organism’s response. In my emperic experience training clients as well the experience of Mr. Mentzer, and my colleagues who run SuperSlow facilities around the country...I feel that the average subject has much less toleration for exercise than previously thought. If exercise tolerance for the human population was charted, it would likely form a "bell graph" distribution. I feel that until recently we have
been operating way too far to the right on the graph (that is recommending WAY too much exercise for the average trainee). This natural mistake has occurred because of selection bias....people tend to become interested in bodybuilding when they show at least some above average potential for it and part of this potential is above-average exercise tolerance. Also people naturally tend to mistake the stimulus (the actual exercise) as the entity that causes growth. As a result, even great minds such as Arthur Jones have decreased volume relative to this grossly inflated baseline rather than what is actually required. For the purposes of our experiment I recommend no more than 5 total exercises (Calf Raise, Leg Press or Squat, Pulldown, Chest Press, and Compound Row) or Mr. Mentzer's consolidation routine. DO NOT vary the workout or your record-keeping will be meaningless. Do not fret over the lack of variety. Variety IS NOT necessary for progress, these movements track muscle and joint function, and if the intensity of your work is adequate this will stimulate all the muscular structures of your body.

The next issues we must tackle are interrelated. We must standardize the way in which we administer the "dose" and we must have an accurate means of recording the response of the organism. The units of a drug dose might be milligrams; the unit of our dose is the repetition. We must standardize our unit so that we maximize the efficiency (intensity) of our dose. Just as we want to eliminate any impurities from our drug, we should eliminate any impurities from our exercise. Such impurities include anything that will allow the muscle to escape from being under continuous load such as heaving, jabbing or throwing the weight. Indeed, we want to eliminate even the smallest amount of momentum so we can know that every second of every repetition represents muscular loading. For measurement purposes our unit must be exactly reproducible. In our "drug" research a milligram is a milligram, is a milligram....all the time, every time. In our research a repetition should be a repetition....all the time, every time. Remember, the law of identity can never be escaped..."A is A". At Ultimate Exercise (my one-on-one HIT training facility) we use SuperSlow repetitions (10 seconds positive and 10 seconds negative). This allows us to insure the purity of the exercise and the precision of our basic unit of record-keeping.

Finally, we need to know what to monitor in order to accurately quantitate our desired response produced by the organism. Ultimately our desired response is bigger muscles and ideally this is what we would like to measure. Unfortunately, this is a fairly gross change and the units of measure (fractions of inches) are too large to allow us to make the fine adjustments of optimizing volume and frequency. Also, emperic evidence shows that muscle growth can be delayed and sporadic. What we need is a reliable marker for muscle growth. Fortunately such a marker has been found. We know that a muscle's strength is directly related to it's cross sectional area. In a given individual, if a muscle becomes stronger, it will also become larger; or if a muscle is noted to have become larger we will find that is stronger. It has also been noted that the strength gain ALWAYS precedes the size gain (this is particularly true in myself). A subject may gain strength for many consecutive workouts without any change in measurements; but then, in delayed fashion, the size gain will suddenly occur. While size gains may be sporadic and unpredictable, they are always preceded by a gain in strength. Such gains in strength can be reliably found in our workout record provided that the routine is standardized and NOT varied, and provided our units of performance recording are strictly standardized.

So now that we have identified all of the salient variables, what is my Heavy Duty/HIT prescription that I feel can be used by almost any subject? Here it is....

Rest completely from exercise for a minimum of 10-14 days.

Select either the 5 exercise generic routine or Mr. Mentzer's consolidation routine.

Perform each exercise in high intensity fashion, go to complete failure and attempt continued movement for 10-15 seconds after failure. Allow little or no rest between exercises.

Perform your repetitions strictly so that the muscle is under continuous load. Standardize your repetitions so that your record-keeping is precise. I strongly recommend a SuperSlow protocol for your reps.

Begin by allowing 4 days of rest between workouts. Keep accurate workout records. If the recovery period is adequate, you should note increasing weight, reps or both on a workout by workout basis. If recovery is truly adequate, I believe you should see an increase on every set of every workout.
If you are not seeing strength gains on every set of every workout, systematically insert an extra day of rest until you do. Do not be intimidated if the rest period gets pushed out to 6, 7, 10 or more days. This is where most trainees break down in the process...but I must say...TRUST ME ON THIS! You have tried so much other cockamamie bullshit, why not muster the courage to try the one thing that will bring the results you so passionately desire?

In conclusion I would like to offer a personal anecdote. I had been training approximately every 4th-5th day and had been making steady but small increases on 1 or 2 exercises every workout. Recently Greg Anderson of Ideal Exercise and Terry Carter who works with me at Ultimate Exercise insisted that I go to once a week workouts of 4 exercises each. Now, I am making big jumps in weight and reps on all of my exercises at every workout. Yesterday, I was performing compound row with a new weight and after 4 SuperSlow style reps I concluded that the weight felt too light and that I must have mistakenly pinned the stack at too light a weight. I briefly unloaded and consulted my workout card and confirmed I had indeed selected the correct weight...8 lbs more that last time. I promptly started over and completed 11 SuperSlow repetitions with a resistance that was 8 lbs more than a weight that limited me to 6 reps previously.

Please give this a try, I promise the only thing you will regret is the time you have wasted by training more frequently.

In my next article I would like to discuss the concept of the "narrow therapeutic window" as it relates to exercise and how as one becomes stronger the space between an effective exercise dose and a toxic exercise dose becomes more and more narrow.

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