

# Strength Building 101

By Gary Reinl

"If you have an order for therapy that includes the restoration of muscular strength ... consider the following."

## Physiological law of adaptation

The process of restoring muscular strength begins with a stimulus.

### The Rules

It is generally accepted that a maximum stimulus is achieved by performing one to three sets of eight to twelve repetitions with an amount of resistance that is equal to 75% of the amount of resistance that the patient can correctly lift and lower once ... but not twice. In that regard, it is important to remember that the patient must perform every repetition correctly and more importantly, continue to the point of volitional fatigue.



Also, variable resistance is required to maintain the 75% rule during some exercise movements. A Leg Press is a good example. In this

particular exercise, the amount of resistance needed often varies by as much as 140% - if 100 lbs. of resistance is needed in the weakest position, approximately 240 lbs. of resistance is needed in the strongest position. Thus, if the resistance remains at the level appropriate for the weakest position, it is less than optimal in all others.

Further, if a patient lifts and lowers the resistance through a partial range-of-motion and/or the resistance is provided through a partial range-of-motion, the benefit is usually limited to the involved range -- a partial range stimulus usually produces a partial range strength increase.

To continue providing a maximum stimulus, use the double progression method (increase the number of repetitions to twelve and then increase the resistance by approximately five percent or one resistance level) until the desired level of strength is achieved. It is noteworthy to mention that the viability of the double progression method significantly increases if the patient can replicate the training protocol ... session to session, set to set and repetition to repetition.

## Physiological law of recovery and growth

The process of recovery and growth usually takes between 48 to 96 hours.



### The Rules

It is generally accepted that a maximum benefit is achieved at the end of the recovery and growth process. Thus, any effort to restimulate prior to the completion of this process is counter productive. In fact, too much stimulation will cause a decrease in strength.

## Documentation

Keep accurate detailed records.

### Program Record


## Summary

- Restoration of muscular strength begins with a stimulus.
- One to three sets.
- Eight to twelve repetitions.
- Resistance level equals approximately 75% of a one repetition maximum.
- Correctly perform every repetition.
- Continue to the point of volitional fatigue.
- A partial range stimulus usually produces a partial range strength increase.
- Variable resistance is sometimes required.
- Double progression system.
- Replication is a key success factor.
- 48 to 96 hours between sessions.
- Maximum benefit is achieved at the end of the recovery & growth process.
- Too much stimulation will cause a decrease in strength.
- Document all relevant information.

## How to create a treatment plan to restore muscular strength

**1) Selection:** All plans should directly reflect the individual's needs and abilities. Create an individualized plan to progressively restore specific strength. Do not use a standardized plan and/or rate of progression. Begin with the exercises most needed and gradually introduce total plan.



**2) Orientation:** Regardless of the ultimate goal, the length of the orientation period must coincide with the individual's willingness to participate. Some individuals will virtually bypass the orientation period while others may require exaggerated extensions. Failure to accurately direct the orientation period could lead to overall plan failure.

The purpose of the orientation period is to permit the individual to fully understand the mechanics of the plan and gain related confidence and interest.

**3) Intensity:** The amount of resistance, number of sets per exercise and number of repetitions per set (intensity) must not exceed the individual's needs, abilities and/or willingness to participate. To optimally manage this vital issue, the therapist must provide constant supervision. Intensity is an individual issue. What is optimal for one patient is often excessive for another and inadequate for a third. If a patient feels that the intensity is wrong, evaluate immediately and provide appropriate guidance.

### 4) Duration of each session:

Due to the individual nature of each plan and to the varying needs, abilities and willingness to participate of each patient, total elapsed time will vary from patient to patient and from session to session. However, and regardless of all else, always try to limit the



total time to the minimum amount needed to produce maximum results.

**5) Frequency:** The patient's ability to recover and grow controls the ideal amount of time between each session. However, it is important to understand that a patient's ability to recover and grow is not a static formula. Factors such as diet, rest, medications, psychological considerations, etc. can cause substantial movement in the individual's recovery/growth pattern.



Also, the intensity and duration of the previous session can significantly influence this pattern. In the end remember, if the frequency is too often or too sparse a strength loss will occur...keep accurate records and amend recommendations accordingly.

**6) Duration of each plan:** Once pre-incidence status is attained, the restorative process is usually complete.

## Machine Operating Guidelines

**Note:** At all times, ensure sound biomechanical patterns of movement and sound ergonomic postural support.

**1) Demonstrate and explain optimal machine entry, use and exit:** Fully disclose to the patient the need for sound biomechanical patterns of movement and sound ergonomic postural support. Include all applicable information regarding alignment, range-of-motion, form, speed-of-movement and amount of resistance.

**2) Determine approximate machine alignment setting(s):** Use your skill, knowledge and professional expertise to make an educated guess regarding the patient's approximate machine alignment setting(s). Set machine accordingly.

**3) Supervise and instruct regarding machine entry:** Make certain that the patient enters the machine in a safe manner. Note: It is possible that an individual's weakness and/or dysfunction will cause an unplanned

pattern of movement during the entry process. Hands-on assistance is often required.

**4) Determine specific machine alignment setting(s):** Make all related adjustments and test alignment. Record data. Note: When positioning the patient, if possible and medically indicated, manually correct poor posture before testing alignment. Example: An individual may sit slumped, round-shouldered and leaning to the right due to poor posture and/or weakness.

**5) Determine recommended range-of-motion:** a) Remove pin from weight stack. b): Test the patient's passive-assisted pain-free range-of-motion. If the range is abnormal, record related information and, if applicable, create a plan to correct. c): Test the patient's unassisted pain-free range-of-motion (pin is still removed from weight stack). If the patient is unable to replicate their passive-assisted pain-free range-of-motion, record related information and, if applicable, create a plan to correct.

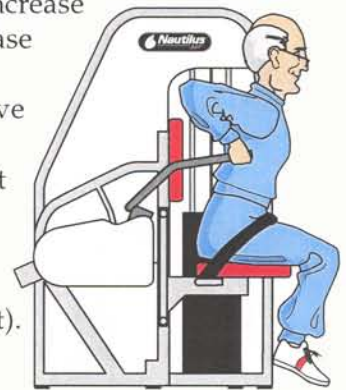


**6) Supervise and instruct regarding form:** Function dictates form. If the form looks unnatural, unbalanced or anything other than a sound biomechanical pattern of movement and/or if sound ergonomic postural support is compromised...stop. At all times try to facilitate form that is consistent with the function of the involved body parts. Points to consider: Dominant side lead, substitution muscles (static contraction/dynamic movement), body torque and excessive hand gripping.

**7) Supervise and instruct regarding speed-of-movement:** The goal is to safely lift and lower the resistance within a planned range-of-motion while maintaining optimal form.

Explosive movement can cause unplanned range-of-motion and/or dangerous acceleration and/or deceleration impact forces. Throwing the weight up or dropping the weight down is wrong. Causing the weight to float up or fall down reduces the benefit and creates risk. It is easy to move too fast. It is almost impossible to move too slowly. Note: A common mistake is the two second up and four second down rule. If you lift and lower the resistance at an optimal speed, the distance traveled will always determine the elapsed time.

**8) Determine recommended level of resistance:** a) Perform a manual test. Select a trial starting weight. Instruct patient to perform a repetition. If optimal, instruct the patient to continue until correct form is compromised or 15 repetitions are completed. Based on this test and other related information, select a starting level of resistance. Record data. b) Increasing resistance – If the patient is able to do the maximum number of prescribed repetitions (and a strength increase is desired), increase the resistance by approximately five percent or one resistance level at the next session (see applicable weight stack progression chart). Record data. c) Decreasing resistance – If the patient is unable to do the minimum number of prescribed repetitions, decrease the resistance by approximately five percent or one resistance level at the next session (see applicable weight stack progression chart). Record data.



**9) Exit:** Make certain that the patient exits the machine in a safe manner. Note: It is possible that an individual's weakness (or level of fatigue) and/or dysfunction will cause an unplanned pattern of movement during the exit process. Hands-on assistance is often required.



# Restoration of Muscular Strength; A Comparison of Treatment Options

Restoration of Muscular Strength Treatment Options are designed to help the therapist provide the stimulus needed to begin the process of restoring muscular strength. They are not designed for any other purpose. Thus, any meaningful comparison must focus on this issue and only this issue.

The chart below lists the operational considerations related to providing a maximum stimulus and graphically displays a measuring system used to compare the compatibility of those considerations with various treatment options.



**Restoration of Muscular Strength Treatment Option Comparison Chart**

Operational Consideration	Treatment Options		
	Machine Based	Manual/ Calisthenics	Balls, Sticks, Cuff Weights, Rubber Bands, Etc.
Easy to provide a resistance level equal to approximately 75% of a one repetition maximum	YES	NO	SOMETIMES
Easy to correctly perform every repetition	YES	MAYBE	MAYBE
Easy to reach the point of volitional fatigue by doing 8 to 12 repetitions	YES	NO	SOMETIMES
Easy to perform the exercise through the desired range-of-motion	YES	SOMETIMES	MAYBE
Easy to provide appropriate variable resistance	YES	NO	NO
Easy to increase the amount of resistance by approximately 5%	YES	NO	NO
Easy to replicate training protocol ... session to session, set to set and repetition to repetition	YES	NO	NO
Easy to accurately document all relevant information - range-of-motion, postural support, resistance level, positional settings, progress, etc.	YES	NO	NO