

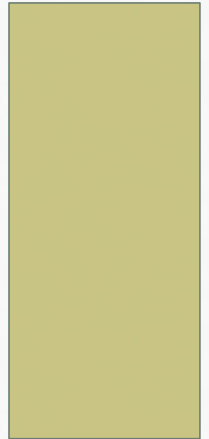
RESISTANCE EXERCISE TO PREVENT AND MANAGE SARCOPENIA AND DYNAPENIA AND HOW TO INCORPORATE OSTEOPATHIC MANIPULATIVE THERAPY INTO THE REGIMEN

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SARCOPENIA VS DYNAPENIA

- For well over twenty centuries the muscle wasting (sarcopenia) and weakness (dynapenia) that occurs with old age has been a predominant concern of mankind.

THE ANCIENTS

- As eloquently reviewed by Narici and Maffulli, the Classic Greeks (4th and 5th centuries BC)
 - detested the degrading effects of aging on their bodies and considered it:
 - chronic
 - Incurable
 - and progressive disease.

THE ENLIGHTENED

- However, by the 1st century BC and the 1st century AD
 - the perspective on physical frailty and aging started to change

THE ELDERS

- In fact, in his 'Essay on Old Age' in 44 BC Cicero argues that:
 - 'it is our duty... to resist old age, to compensate for its defects, to fight against it as we would fight a disease; to adopt a regimen of health; to practice moderate exercise; and to take just enough food and drink to restore our strength'.

CICERO

- Cicero's suggestion to use exercise to combat muscle wasting and weakness was logical, it did not truly gain steam in the scientific and medical communities until the latter part of the 20th century.

TREATMENT

- Exercise has long been suggested as a treatment to combat sarcopenia and dynapenia
 - it exerts effects on both the nervous and muscular systems that are critical to positive physiological and functional adaptations (e.g., enhanced muscle strength).

EXERCISE

- For more than two decades scientists have recognized the profound role that progressive resistance exercise training can have on increasing muscle strength, muscle size and functional capacity in older adults.

LITERATURE

- A series of landmark studies published in the early 1990's by Fiatarone and colleagues in the Journal of the American Medical Association 1990 and the New England Journal of Medicine 1994
- highlighted the profound role that progressive resistance exercise training (RET) can have on increasing muscle strength, muscle size and functional capacity in older adults..

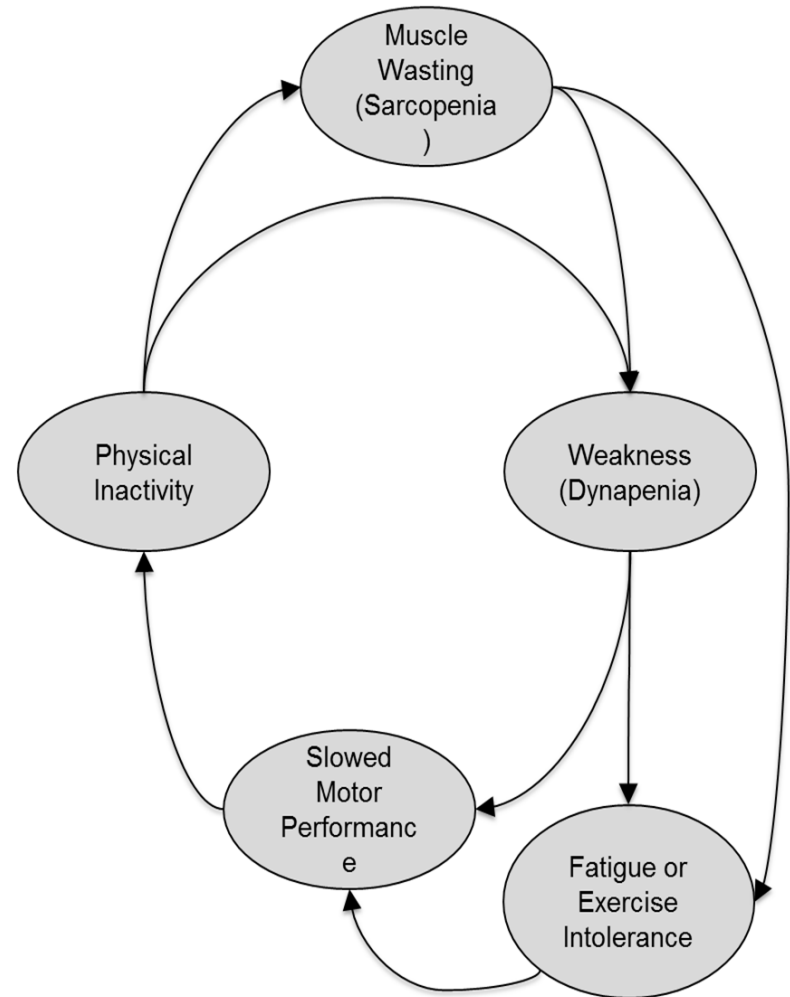
PROGRESSIVE RESISTANCE EXERCISE TRAINING (RET)

- Progressive RET involves
 - increasing the number of repetitions
 - at a constant load
 - until exceeding an established repetition range (e.g., 12 repetitions).
 - Subsequently, the load is increased and the exercise is performed at the new load until again exceeding the repetition range.

EARLY STUDIES

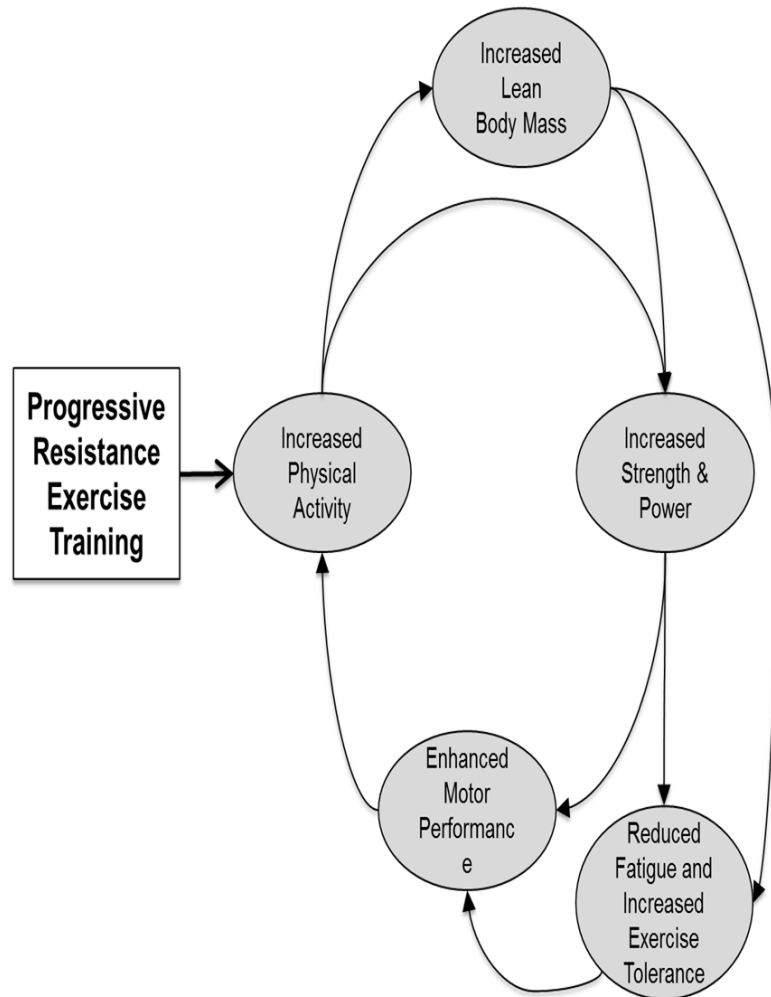
- The first of these studies demonstrated that institutionalized, nonagenarians (i.e., individuals from 90 to 99 years old)
 - were able to increase
 - muscle strength, on average, an astounding 174%
 - mid-thigh muscle area 9.0%
 - gait speed 48% with 8-weeks of high-intensity progressive RET (1990)

**Conceptual
interactions between
physical activity,
sarcopenia,
dynapenia,
fatigability, exercise
tolerance, and
physical function**



Progressive resistance exercise training can modulate these various phenotypic factors.

Note that other influences, such as nutritional, cognitive, and psychological factors, are not shown for clarity.



FIBER TYPE

- By the start of the 21st century we knew that muscle fiber types of older adults were able to: (Hikida)
 - hypertrophy (~30% increase in size with 16 weeks of high-intensity RET)
 - transition their fiber type (from type IIX fibers to IIA)
 - had the capacity to incorporate new nuclei into the fibers

ADAPTATIONS

- These adaptations are comparable to what is observed in younger individuals:
 - suggesting that the muscle of older adults is **NOT** limited in its ability to adapt.

RESULTS

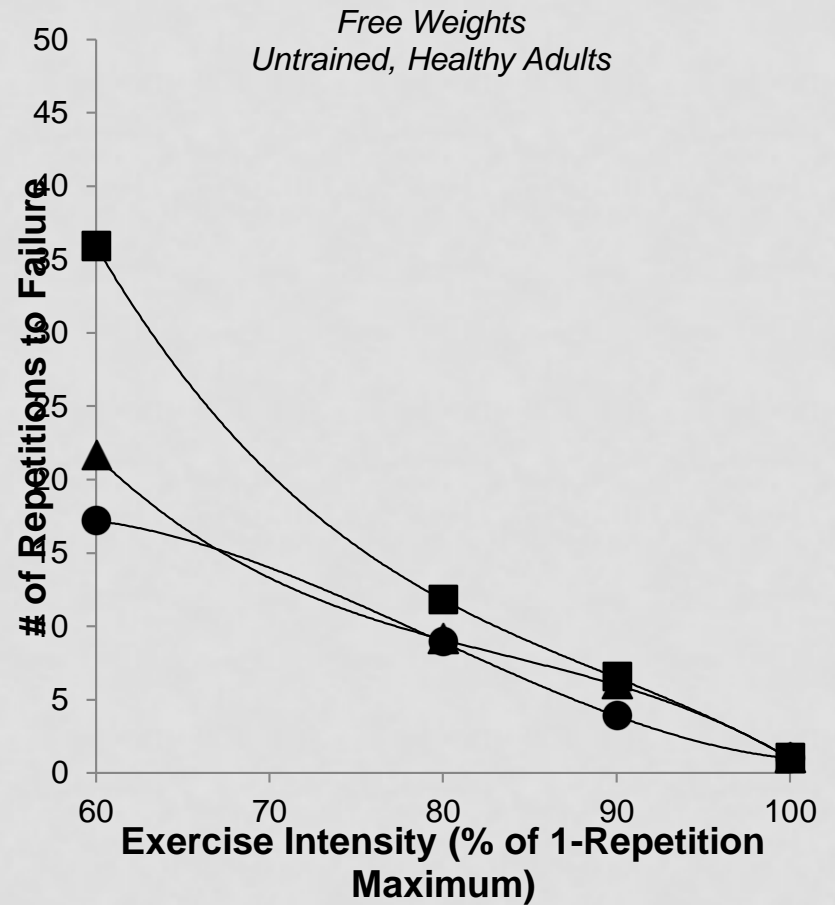
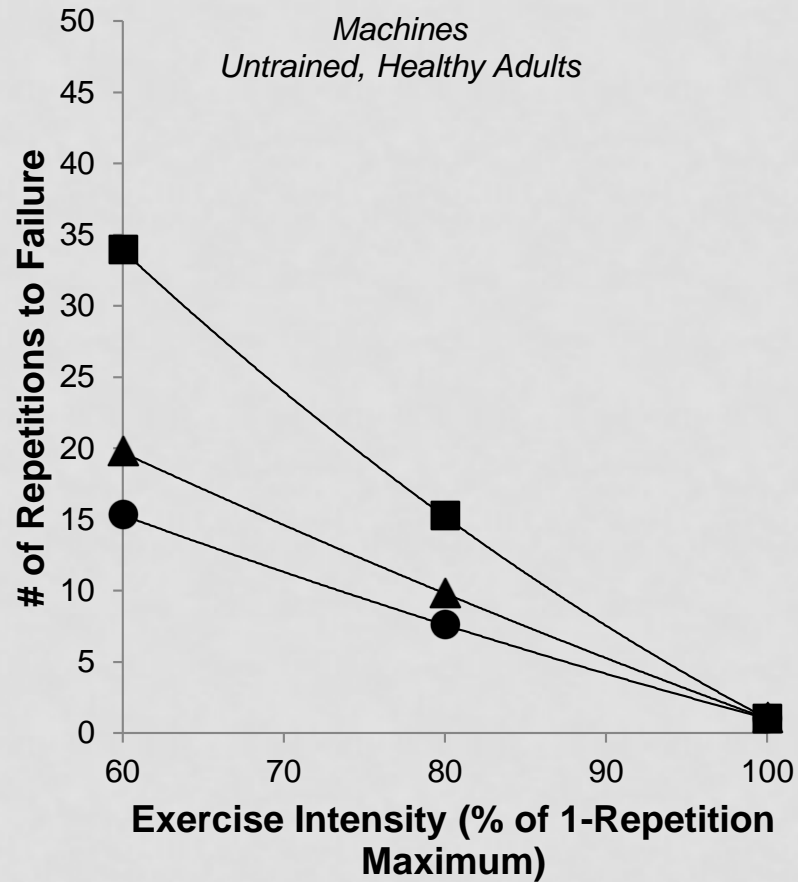
- Some two decades later, there is now evidence indicating that high-intensity RET, when coupled with other targeted multidisciplinary interventions, results in:
 - lower mortality
 - nursing home admissions
 - disability compared with usual care after hip fracture.

OMNI STUDY

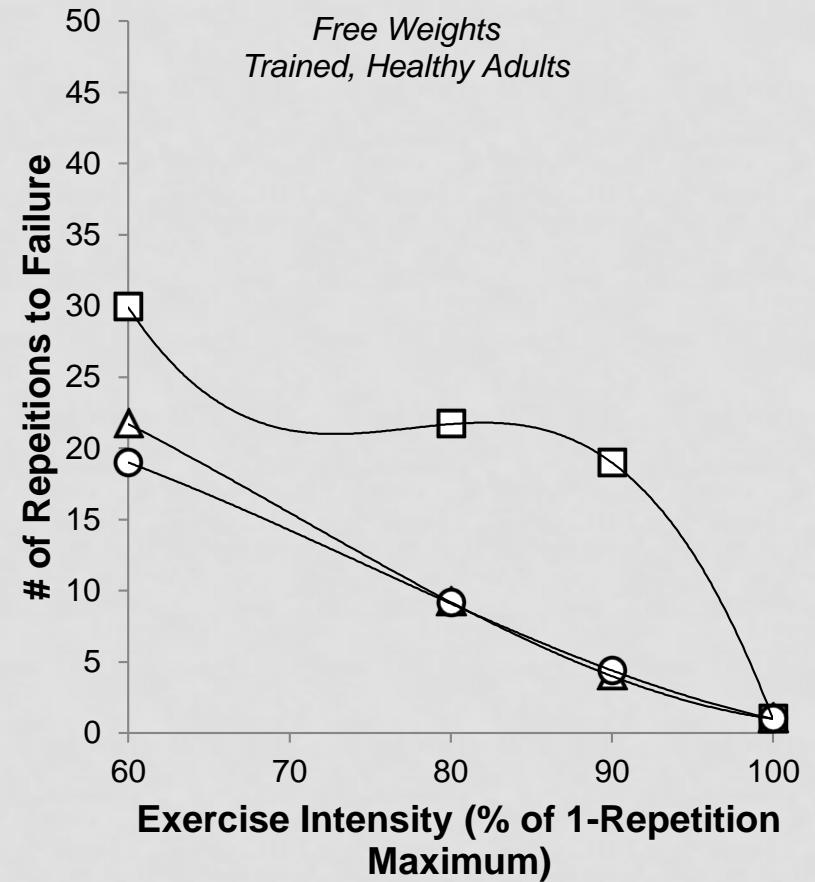
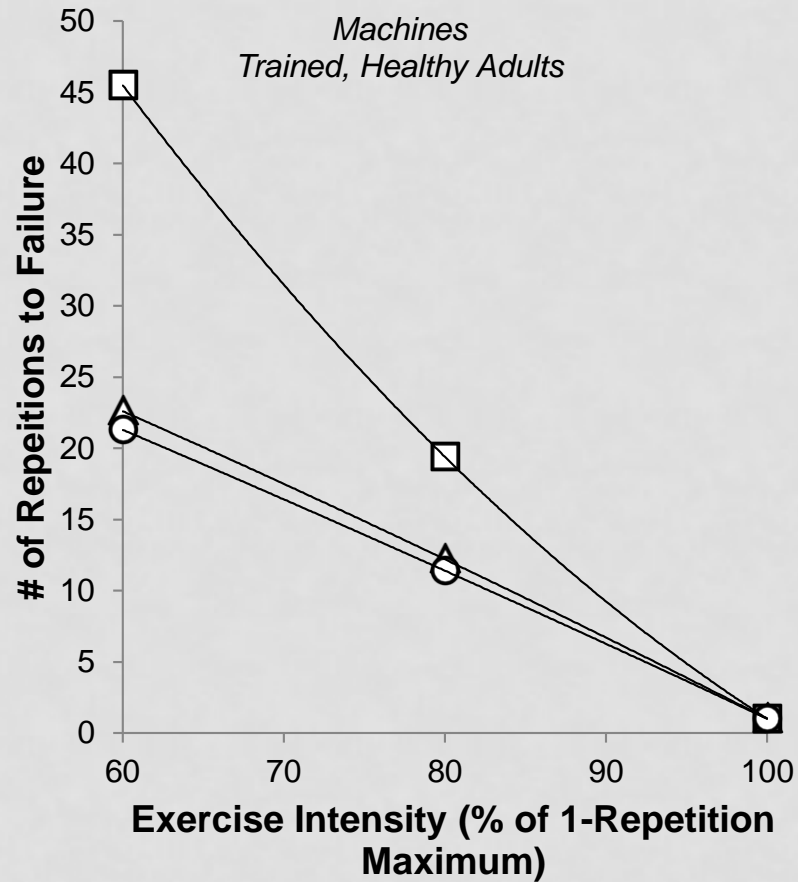
FREE WEIGHTS VS MACHINE

- Relationship between:
 - the number of repetitions
 - untrained (3A) vs trained (3B)
 - four different resistance exercise intensities:
 - (60, 80 and 90% of 1-RM) for the squat (square)
 - bench press (triangle)
 - arm curl (circle).

UNTRAINED

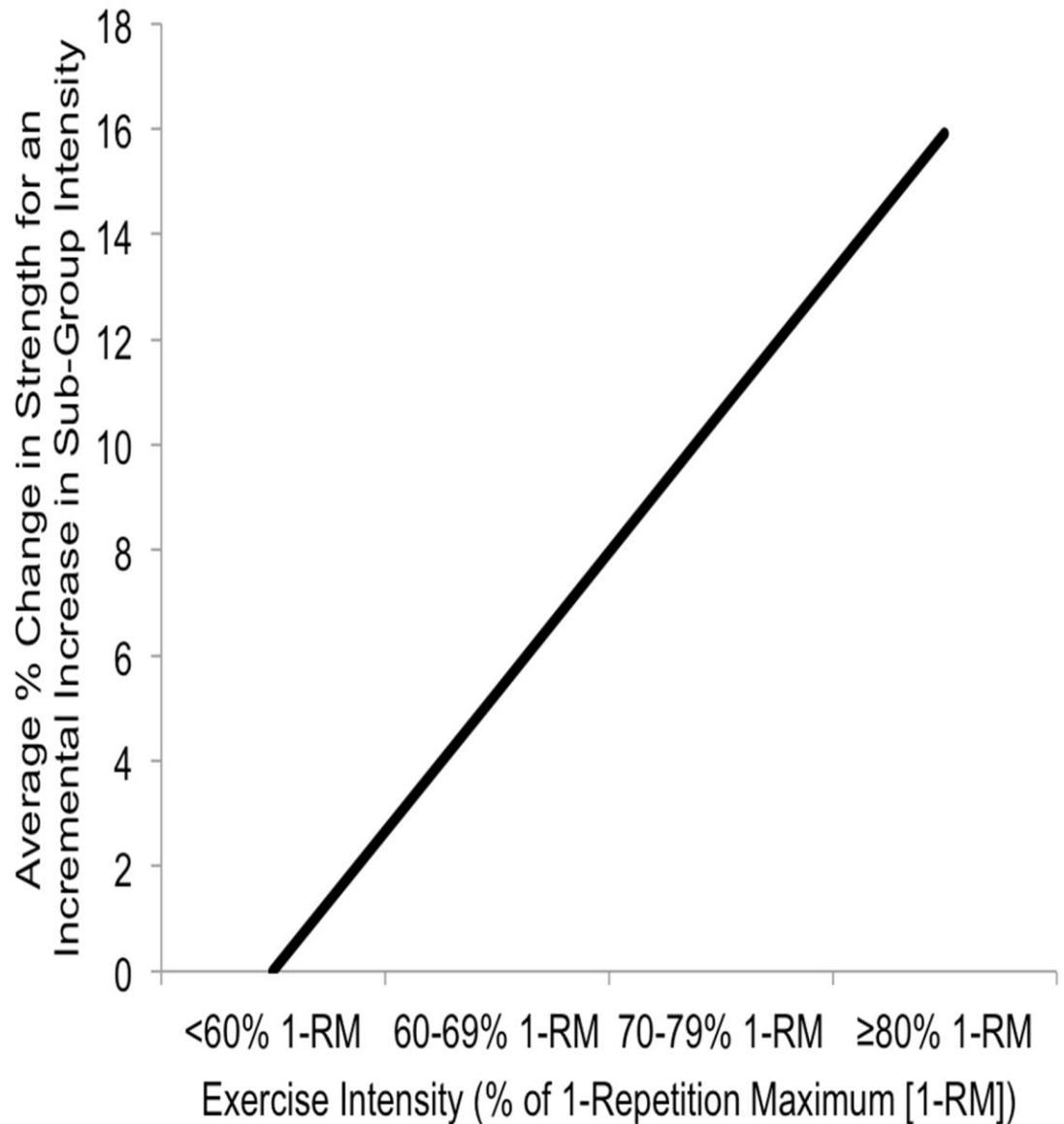


TRAINED



**Higher intensity
resistance
exercise training
is associated
with greater
improvements in
muscle strength**

VOLUME also



PROGRESSIVE RET PROGRAM

- Older adult
- without any contraindications
- Modifications
 - Musculoskeletal
 - Neurological
 - mobility limitations

RET PROGRAM

- Program is designed on the assumption that access to typical machine and free weight resistance exercise equipment is available
- It could be modified as needed based on equipment availability.
- Additionally, progression could be varied (sped up or slowed down) depending on individual adaptation.

BEGINNER: PHASE I

Example beginner progressive resistance exercise training program (weeks 1-8). It is suggested that the exercise is performed to, or near, task failure in the range of repetitions provided.

Beginner I

**50-60% of 1-RM; 2x/week
1-2 Weeks; Familiarization Phase**

Body Part	Exercise	Sets x Reps
Chest	Chest Press (Machine: seated or lying)	1 x 15-20
Back	Seated Cable Row	1 x 15-20
	Seated Cable Pull Down	1 x 15-20
Arms	Biceps Curl (Seated Machine)	1 x 15-20
	Triceps Extension (Seated Machine)	1 x 15-20
Shoulders	Overhead Press (Seated Machine)	1 x 15-20
Upper Legs	Leg Extensions (Seated Machine)	1 x 15-20
	Leg Curl (Seated Machine)	1 x 15-20
Lower Legs	Calf Raise (Seated Machine)	1 x 15-20
	Calf Raise (Standing)	1 x 15-20
	Rest Between Sets: 2 minutes (as needed)	Total Sets: 10

BEGINNER PHASE II

60-69% of 1-RM; 2x/week 3-8 Weeks

Body Part	Exercise	Sets x Reps
Chest	Chest Press (Machine: seated or lying)	1 x 12-15
	Wall Push-Ups	1 x 12-15
Back	Seated Cable Row	1 x 12-15
	Seated Cable Pull Down	1 x 12-15
Arms	Biceps Curl (Seated Machine)	1 x 12-15
	Triceps Extension (Seated Machine)	1 x 12-15
Shoulders	Overhead Press (Seated Machine)	1 x 12-15
Upper Legs	Leg Extensions (Seated Machine)	1 x 12-15
	Leg Curl (Seated Machine)	1 x 12-15
Lower Legs	Calf Raise (Seated Machine)	1 x 12-15
	Calf Raise (Standing)	1 x 12-15
	Rest Between Sets: 90 seconds	Total Sets: 11

Intermediate: Phase I

**60-69% of 1-RM; 2x/week
9-16 Weeks**

Body Part	Exercise	Sets x Reps
Chest	Chest Press (Machine: seated or lying)	2 x 12-15
	Wall Push-Ups	2 x 12-15
	Chest Flyes (Machine)	2 x 12-15
Back	Seated Cable Row	2 x 12-15
	Seated Cable Pull Down	2 x 12-15
Arms	Biceps Curl (Seated Machine)	2 x 12-15
	Triceps Extension (Seated Machine)	2 x 12-15
Shoulders	Overhead Press (Seated Machine)	2 x 12-15
	Lateral Raises (Seated Machine)	2 x 12-15
Upper Legs	Leg Press (Machine)	2 x 12-15
	Leg Extensions (Seated Machine)	2 x 12-15
	Leg Curl (Seated Machine)	2 x 12-15
Lower Legs	Calf Raise (Seated Machine)	2 x 12-15
	Calf Raise (Standing)	2 x 12-15
	Rest Between Sets: 90 seconds	Total Sets: 28

Intermediate: Phase II

70-79% of 1-RM; 3x/week
17-24 Weeks

Body Part	Exercise	Sets x Reps
Chest	Chest Press (Barbell)	2 x 12-15
	Chest Flyes (Lying with dumbbells)	2 x 12-15
	Push-Ups (Knees down)	2 x 12-15
Back	Chest Supported Rows (Machine)	2 x 12-15
	Pull Ups (Machine with body weight assist)	2 x 12-15
Arms	Biceps Curl (Seated Dumbbell)	2 x 12-15
	Triceps Extension (Cable Press Down)	2 x 12-15
	Triceps Kick Backs (Dumbbells)	2 x 12-15
Shoulders	Overhead Press (Seated Machine)	2 x 12-15
	Lateral Raises (Seated Machine)	2 x 12-15
	Upright Rows (Barbell or Dumbbells)	2 x 12-15
Upper Legs	Leg Press (Machine)	2 x 12-15
	Leg Extensions (Seated Machine)	2 x 12-15
	Lunges (No Weight)	2 x 12-15
	Leg Curl (Seated Machine)	2 x 12-15
Lower Legs	Calf Raise (Seated Machine)	2 x 12-15
	Calf Raise (Standing)	2 x 12-15
	Rest Between Sets: 90 seconds	Total Sets: 34

Advanced: Phase I

>80% of 1-RM; 3x/week
Weeks

25-32

Body Part	Exercise	Sets x Reps
Chest	Chest Press (Barbell)	2 x 8-12
	Chest Flyes (Lying with dumbbells)	2 x 8-12
	Incline Chest Press (Machine)	2 x 8-12
	Push-Ups (Knees Down)	2 x 8-12
Back	Chest Supported Rows (Machine)	2 x 8-12
	Pull Ups (Machine with body weight assist)	2 x 8-12
	Shoulder Shrugs (Machine)	2 x 8-12
Arms	Biceps Curl (Seated Dumbbell)	2 x 8-12
	Hammer Curls (Seated Dumbbell)	2 x 8-12
	Triceps Extension (Cable Press Down)	2 x 8-12
	Triceps Kick Backs (Dumbbells)	2 x 8-12
Shoulders	Overhead Press (Seated Machine)	2 x 8-12
	Lateral Raises (Seated Machine)	2 x 8-12
	Rear Deltoid Flyes (Machine or Dumbbells)	2 x 8-12
	Upright Rows (Barbell or Dumbbells)	2 x 8-12
Upper Legs	Leg Press (Machine)	2 x 8-12
	Leg Extensions (Seated Machine)	2 x 8-12
	Lunges (No Weight)	2 x 8-12
	Leg Curl (Seated Machine)	2 x 8-12
Lower Legs	Calf Raise (Seated Machine)	2 x 8-12
	Calf Raise (Standing)	2 x 8-12
	Rest Between Sets: 60-90 seconds	Total Sets: 42

Advanced phase II RET (32+ weeks).

Note that this phase goes to four times per week with a 'split routine'.

Body Part	Exercise	Sets x Reps
	MONDAY & THURSDAY	
Chest	Chest Press (Barbell or Dumbbell)	3 x 6-10
	Incline or Decline Chest Press (Barbell or Dumbbell)	3 x 6-10
	Chest Flyes (Lying with dumbbells)	3 x 6-10
	Push-Ups	3 x 6-10
Back	Chest Supported Rows (Barbell or Dumbbell)	3 x 6-10
	Pull Ups (With or without assist)	3 x 6-10
	Shoulder Shrugs (Barbell or Dumbbell)	3 x 6-10
Upper Legs	Squat (Machine)	3 x 6-10
	Leg Extensions (Seated Machine)	3 x 6-10
	Leg Curl (Seated Machine)	3 x 6-10
	Lunges (Dumbbell)	3 x 6-10
	TUESDAY & FRIDAY	
Arms	Biceps Curl (Standing Barbell)	3 x 6-10
	Biceps Curl (Seated Dumbbell)	3 x 6-10
	Hammer or Preacher Curls (Seated Dumbbell)	3 x 6-10
	Triceps Extension (Lying with Barbell or Dumbbell)	3 x 6-10
	Triceps Kick Backs (Dumbbells)	3 x 6-10
Shoulders	Overhead Press (Barbell or Dumbbell)	3 x 6-10
	Lateral Raises (Dumbbell or Cable)	3 x 6-10
	Rear Deltoid Flyes (Machine or Dumbbells)	3 x 6-10
	Upright Rows (Barbell or Dumbbells)	3 x 6-10
Lower Legs	Calf Raise (Seated Machine)	3 x 6-10
	Calf Raise (Standing)	3 x 6-10
	Rest Between Sets: 60 seconds	Total Sets: 33 sets/day

FUTURE IS NOW

- Promyogenic Therapies May Provide Benefit
 - SARMS, myostatin pathway inhibitors
 - Intended to increase mass MAY ACTUALLY lead to improved strength and functional performance.

BEGINNINGS OF OSTEOPATHY

- Founded in 1874 in Kirksville, Missouri
 - AT Still - a medical doctor who recognized that:
 - the medical practices of the day often caused more harm than good.
 - He focused on developing a system of medical care that would promote the body's innate ability to heal itself and called this system of medicine osteopathy, now known as osteopathic medicine.

NEURO-REFLEXIVE

POST ISOMETRIC CONTRACTION RELAXATION

SIDE EFFECTS

- Tx by Resistance: Can cause opposite effects
 - If too much force used, can trigger protective reflex from Muscle Spindles
 - “No pain, No gain” mentality is harmful
- The primary side-effect or complication of Tx is **post-treatment soreness**
 - Generalized soreness (most common)
 - Usually “first TX is the worst”



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