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FITNESS • NUTRITION • BUSINESS

# LIMITLESS

Complex Training Made Simple

PRESENTED BY  
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## Economics

Limited resources  
Unlimited demand

24 hours / day




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## Who is Stronger?



4x Mr. Olympia



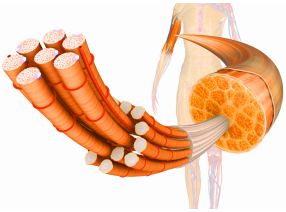
First to clean & jerk 500 lbs.  
80 world records

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## Structure of Muscle



**Non-contractile component**  
➢ Elastic fascia

**Contractile element**  
➢ Actin – myosin

Fascia/CT – 10X nerve afferents than muscle!

Mechanotransduction


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## Strength - Multiple Systems

Neural tissues: sensory input - motor output  
Muscle structures: generate force  
Fascial structures: transmit force  
Osseous structures: levers for movement





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## Tissues

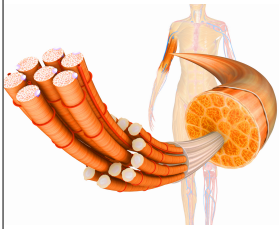



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## Plyometrics



Minimal time between lengthening & shortening  
 Neural & elastic properties - rapid force production  
 Increase firing rate of motor units  
 Contractile element - tension on elastic component  
 Store ~ release of mechanical energy



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## Plyometrics

Plyometrics = Power & rate of force production  
 Warm-up (low intensity)  
 Agility and coordination  
 Power and Speed

### Skill development **NOT** Conditioning

Precautionary Guidelines (NSCA):

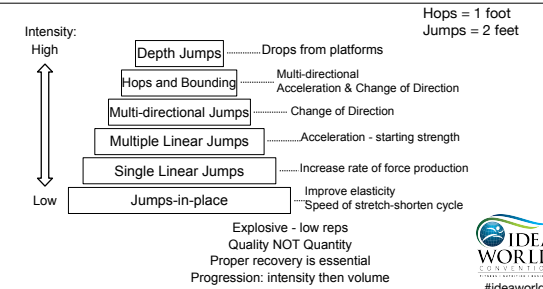
1. Squat 1½ times body weight
2. Complete 5 squat repetitions at 60 % of their own body weight in 5 sec.

**Non-fatigued state to reduce the risk of injury**



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## Progressions



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## Progressing Intensity

Exercise	Weeks	Reps	Sets	Rest Interval
Box Jumps Squat Jumps	1-3	2-8	2-6	30 sec. - 2 min.
Long Jumps Lateral Jumps	4-6	2-8	2-6	30 sec. - 2 min.
Multi-directional Jumps	7-9	2-8	2-6	30 sec. - 2 min.
Bounding Depth Jumps	10-12	2-8	2-6	45 sec. - 3 min.



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## Workout

Warm-up:  
 Multi-planar  
 Facilitation - motor units  
 Prepare tissues

Workout:  
 Squats - Squat jumps  
 Plank - Explosive push-ups  
 Rows - Slams

Cool-down:  
 Static stretching  
 Percussion gun (flush tissues)  
 Compression clothing - venous return



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## Complex Workout

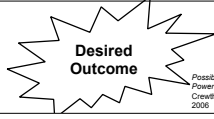
Exercise	Intensity (RM)	Sets	Reps	Rest Interval
Heavy goblet squat & Box jumps	6RM	3	4-6 Each	90 sec.
Resisted push-ups & Explosive chest passes	Bodyweight & band	3	Fatigue	
Pull-ups & Med-ball slams	Bodyweight	3	Fatigue	4-6
	Med ball ~5% BW			
RFE Split squats & Lunge jumps	6RM	3	6	4-6
Shoulder press & Med ball push presses	6RM	3	6	
	Med ball ~5% BW			



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## Strength Training

<b>Response:</b> Mechanical / Metabolic - Hormones
Protein Repair Satellite cells
Acute adaptation Increase muscle protein
Chronic adaptation Increase MF X-section



Possible Stimuli for Strength and Power Adaptation  
Crewther, Keogh, Cronin and Cook  
2006



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## Muscle Growth

### Mechanical

- Structural damage to muscle fiber
- Protein degradation

### Metabolic

- Energy pathways: ATP-PC/Glycolysis/Aerobic
- Fatigue - metabolic waste

Repair:  
Anabolic steroids  
Protein re-synthesis



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## Energy Supply

Energy Source	Glycolysis (Anaerobic)	Oxidation (Aerobic)
1 molecule glucose (blood)	2 ATP	38 ATP
1 molecule glycogen (muscle)	3 ATP	39 ATP
1 molecule fat (3 in a triglyceride)	NA	129 ATP (1 triglyceride = 387 ATP)

All 3 energy pathways work at same time - specific to muscles involved  
Limiting factor - ATP produced by each pathway  
Fatigue:  
Loss of ATP & build-up of H<sup>+</sup> (hydrogen) - acidosis  
Sodium bicarbonate - buffers H<sup>+</sup> - delays fatigue



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## Strength Defined

“Strength is the ability to exert force”  
Essentials of Strength & Conditioning, 4th Ed.

Haff & Triplett, editors, 2016

“Ability to exert maximum maximum external force”  
Science and Practice of Strength Training  
Zatsiorsky & Kraemer, 2006



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## Strength Defined

### Maximal Effort $F = Ma$

Using maximum resistance  
Intramuscular

### Repeated Effort $F = ma$

Using a non-max load to failure

### Dynamic Effort $F = ma$

Using a non-max load w/the highest attainable velocity  
Rate coding



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## Components of Strength

### Intramuscular Coordination

Activation of individual fibers  
“Hidden potential”—recruit fast motor units

### Motor Unit Recruitment

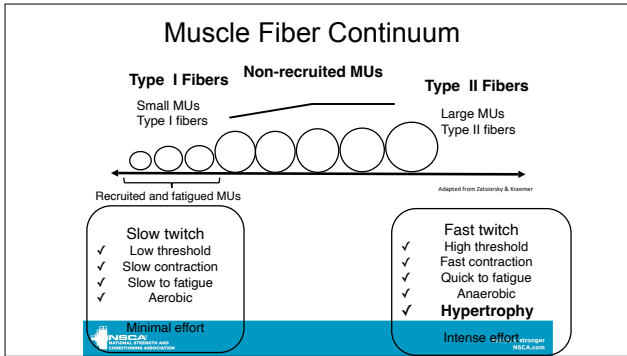
Size principle—small units first, demands for higher F met by larger MUs

### Rate Coding

Discharge frequency of motor neurons  
Increase in firing rate increases force and power production



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### Complex Training

Maximal Effort  $F = Ma$   
+  
Dynamic Effort  $F = mA$

Motor unit recruitment (Strength)  
+  
Rate coding (Speed of contraction)

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### Organizing the Sets

- 1st set: Strength ~ 2-6 reps (fatigue)
- 2nd set: Power (low-intensity weight) 2-6 reps
- Both: MAX effort - accelerate through ROM

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### Muscle Timing: Contract - Relax

#### Timing: Contraction & Relaxation of Muscle

- ✓ "Turning off" muscle may be more important than 'turning on'
- ✓ A muscle that cannot relax quickly will slow down the athlete

**'Superstiffness' - Stuart McGill**

- ✓ Muscles + fascia = mechanical springs (conserve ATP)
- ✓ If spring is too compliant, limits elastic energy storage
- ✓ A pre-contraction level - muscle stiffness for optimal storage and recovery of elastic energy

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### 3 Day 'Split'

Day	Stimulus
1	Force Production (strength or power) <b>High Stress</b>
2	Core Training – Unloaded Bodyweight movement, yoga, Pilates <b>Low-Moderate Stress</b>
3	Energy Pathway: Interval Steady state <b>Moderate-High Stress</b>
4	Off Low Intensity – Active Recovery

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### Weekly Schedule

Day	Workout
Mon.	Complex Workout
Tues.	Yoga
Wed.	Steady-State cardio
Thurs.*	Complex Workout
Fri.*	Yoga
Sat.*	HIIT Group workout
Sun.	Low intensity SS or REST

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## Yearly Schedule

Winter	Spring	Summer	Fall
Base strength 6 weeks	Base strength 6 weeks	Endurance strength 6 weeks	Base strength 6 weeks
Hypertrophy 6 weeks	Complex training 6 weeks	Hypertrophy 6 weeks	Complex Training 6 weeks
Force production Increase volume	Force production Enhance definition	Active recovery Increase volume	Force production Winter sports prep



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## Thank You!

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