Muscular Hypertrophy

What does science say?

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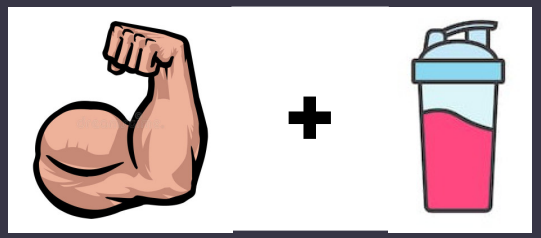
What is “hypertrophy”?

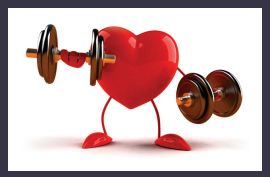
- **Hypertrophy** is the enlargement of organ/tissues from the increase in cellular size.
  - *Muscular* hypertrophy: increase in muscle size due to increase in the muscle fiber SIZE.
  - *Adipose/Fat* hypertrophy: increase in the fat cells SIZE.
- This is NOT to be confused with increase in the quantity of cells or *hyperplasia*.
- Today we will only being going over training-induced hypertrophy along with proper nutritional strategies to optimize.



Hypertrophy + Cardiovascular Training

- Long duration, low-intensity cardio is detrimental for muscle growth.
- Short duration, high-intensity cardio can be a beneficial option.
  - Helps enhance your body's ability to fuel your muscles with more energy.

- "But I enjoy doing cardio, how can I incorporate it with resistance training (RT)?"
  1. Keep the RT and cardio sessions separate to maximize performance in both.
  2. If strength is your goal, omit or minimize and select low impact modes (e.g., swimming, cycling, rowing).
  3. Perform opposite muscle groups of cardio and resistance training (lower-body RT, upper-body cardio).



Hypertrophy + Resistance Training

- Resistance training is the primary form of exercise that is used to stimulate muscle hypertrophy or increase muscle size.

- Common training variables manipulated to elicit a hypertrophic response:
  - Training intensity & repetitions
  - Training volume
  - Training frequency
  - Exercise selection
  - Rest intervals
  - Muscle failure
  - Repetition speed

Old School "Bodybuilder" Rational
• Body part split workout • Moderate weight (75-85% 1RM) • Low to moderate repetitions (6-12) • 60-90 seconds of rest between sets • Stare in mirror and flex when resting

Hypertrophy + Resistance Training

- **Old School "Bodybuilder" Rational**
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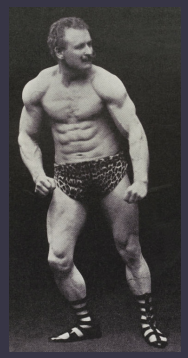
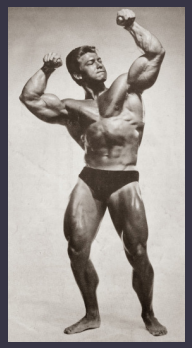


Eugen Sandow 1890s-1900s



Larry Scott 1960s

Arnold Schwarzenegger 1970s-1980s

Lee Haney 1980s-1990s

Dorian Yates 1990s

Ronnie Coleman 1990s-2000s

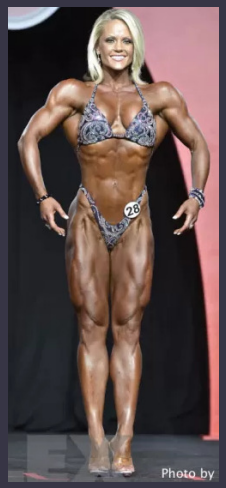
Phil Heath 2010s-present

Can’t forget about hard-working ladies

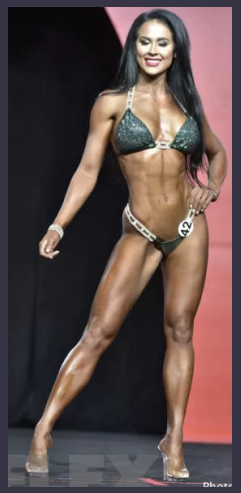
Dana Linn Bailey
2x Physique Olympia

Oksana Grishina
4x Fitness Olympia

Erin Stern
2x Figure Olympia



Nicole Wilkins
4x Figure Olympia



Ashley Kaltwasser
2x Bikini Olympia

USA Olympic gymnasts
(Strong Females!)

Hypertrophy + Intensity & Repetitions

- Study 1 (8 weeks, volume equated):
  - Bodybuilding group: 3 sets at 10RM, 90 sec rest
  - Powerlifting group: 7 sets at 3RM, 3 min rest
  - Results: 1. increase in muscle size (no differences between groups), 2. powerlifting had superior strength gains.
- Study 2 (8 weeks, volume equated):
  - Low-load group: 3 sets 25-35 reps
  - High-load group: 3 sets 8-12 reps
  - Results: 1. increase in muscle size (no differences between groups), 2. greater strength gains from high load, 3. improved muscular endurance in low load
- **Work in all ranges of repetition schemes dependent to selected exercise.**
- **Good rule of thumb: free-weight compounds movements (lower reps), isolation and machine movements (higher reps).**

Schoenfeld et al. *J Strength Cond Res* 2014, 28(10): 2909-2918.
Schoenfed et al. *J Strength Cond Res* 2015, 29(10): 2954-2963
https://www.strongerbyscience.com/low-load-training/

Hypertrophy + Volume

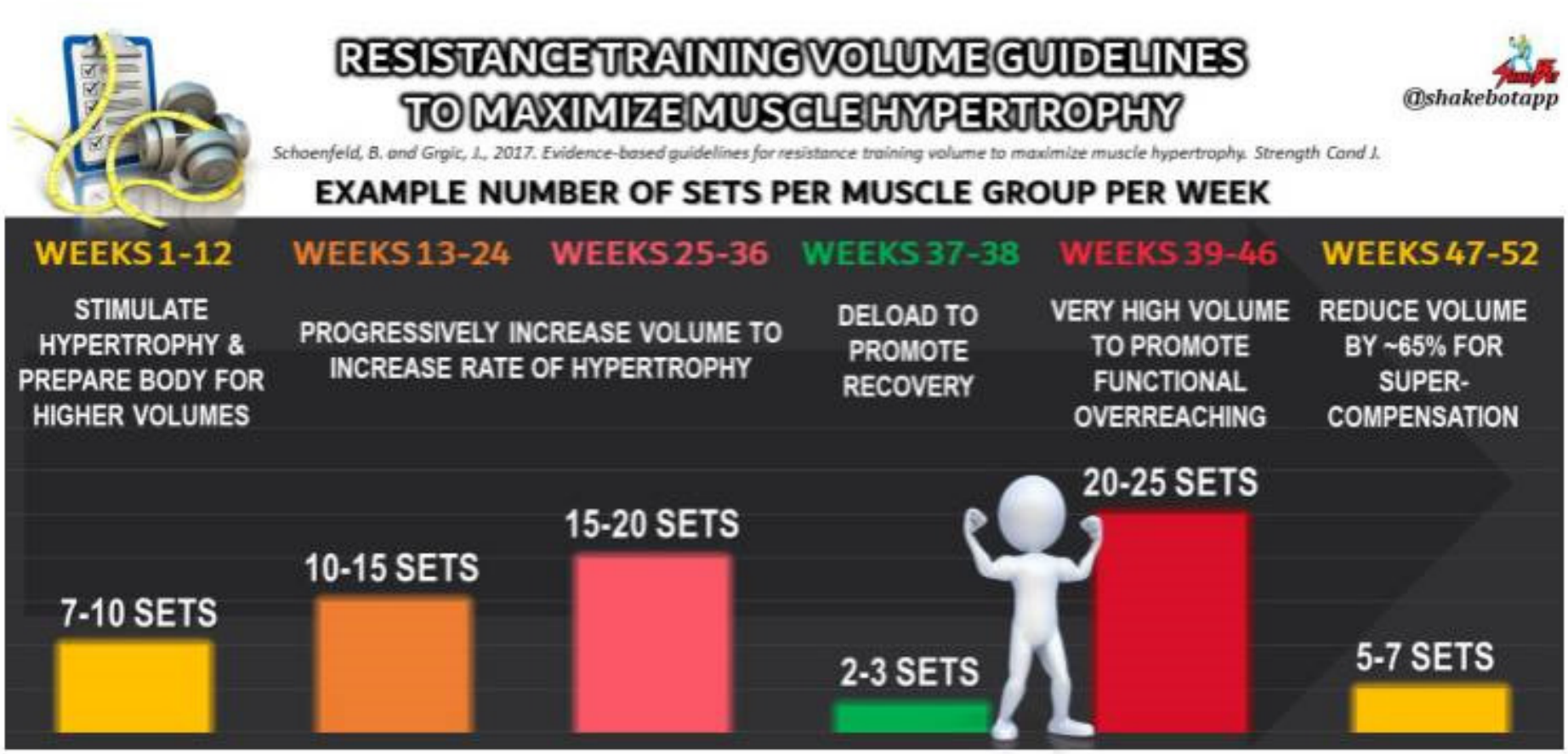
- There is a dose-relationship for training volume and hypertrophy.
- External load being used must be considered into volume.
  - Higher loads + low reps require greater number of sets for muscle growth (e.g., $\geq$ 4).
  - Lighter loads + high reps (to failure) require fewer sets for muscle growth (e.g., $\leq$ 4).

- **Strictly maximize muscle hypertrophy?**
  - Include both loading schemes into training regimen.

- **Strictly maximize strength gains?**
  - Stick primarily to higher loads in order to produce force better.

Schoenfeld BJ and Grgic J. "Evidenced-based guidelines for resistance training volume to maximize muscle hypertrophy." *Strength Cond J,* 2018.

NOTE: this is simply an example. There are numerous ways to manipulate variables to achieve hypertrophic responses.



Progressively increasing from lower (~10 sets per muscle/week) to higher (~20 sets per muscle/week) training volumes over a period of several months may help to promote a state of functional overreaching, which would, in turn, result in a supercompensation of muscle proteins while reducing the potential for overtraining

Hypertrophy + Frequency

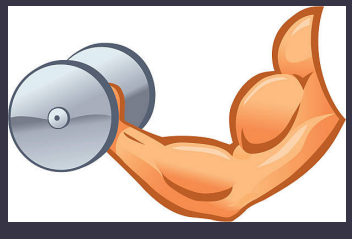
- Q: How many times per week should you be training muscle groups?
- A: When comparing one, two and three time(s) per week, training a muscle group two times per week is superior to once per week- when total volume was equated.
- A: However, it is unknown if training a muscle three times per week is better than two times per week.

- **To maximize muscle growth, train each muscle group at least 2x/week.**

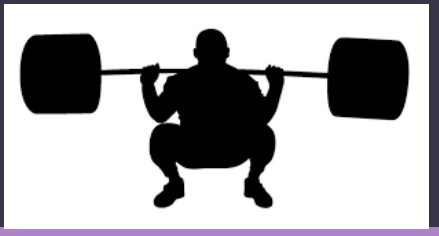
Schoenfeld et al. Effects of resistance training frequency on measures of muscle hypertrophy: A systematic review and meta-analysis. *J Strength Cond Res*, 2016.

Hypertrophy + Exercise Selection

- Specificity of training is key.
  - Problem: "I want bigger biceps." Solution: "Create enough volume by performing biceps-targeted exercises.
- Muscles work in groups, cannot target specific muscle
  - Example: cannot select exercises to work the outside of the quadriceps (*vastus lateralis*) since the quadriceps muscle are united.



- Untrained/Newbie Lifter:
  - Use both, won't make a difference in terms of muscular hypertrophy.
- Trained/Experienced Lifter:
  - Incorporate both multi-joint and single-joint exercises



https://www.strengthandconditioningresearch.com/hypertrophy/#8

Hypertrophy + Muscle Failure

- Newbie lifters:
  - It doesn't matter.
- Experienced lifters:
  - Problem: if training to failure happens all the time, training volume will decrease. *Volume is a primary driver of hypertrophy*.
- So…what should we do?
  - Be cautious to training to failure on compound exercises due to the taxing on the neuromuscular system. Opt for more single-joint or smaller movement exercises.
  - Can train to failure on final set rather than every set.

https://www.bodybuilding.com/content/ask-the-muscle-doc-is-training-to-failure-necessary.html

Hypertrophy + Repetition Speed

- Another term: *time under tension* (increasing stress on the muscle- *good for hypertrophy*)
- Slow bar speed: good for muscle hypertrophy
- Fast bar speed: great for strength and power

- Untrained/Newbie Lifter:
  - Doesn't matter- little to no difference.

- Trained/Experienced Lifter:
  - Slowing down during eccentric phase may lead to greater muscle hypertrophy

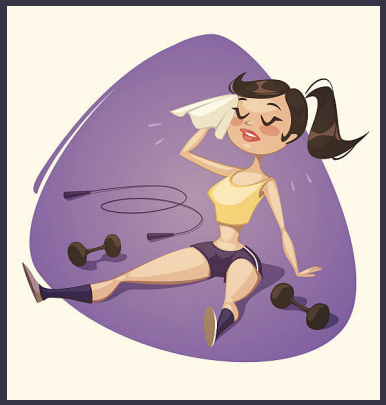
https://www.strengthandconditioningresearch.com/hypertrophy/#8

Hypertrophy + Rest Periods

- Old-school bodybuilding suggested 90 seconds of rest between sets.
- Heavier loads will require greater rest periods (> 2 min). Lighter loads can recover faster (< 2 min).

- Untrained/Newbie lifter:
  - Doesn't matter

- Trained/Experienced lifter:
  - Longer rests may be beneficial in order to allow greater volume loads.



Hypertrophy + Nutrition (ISSN)

- For building and maintaining muscle:
  - 1.4-2.0 grams/kg/day
  - 3.0g/kg/day for on body composition effects in resistance-trained individuals.
  - Older individuals (> 65 yr) require higher protein consumption levels.
- Ideally, consume high-quality protein every 3 - 4 hours.
  - 0.4 g/kg/meal to reach the minimum of 1.6 g/kg/day
  - 0.55 g/kg/meal for upper daily intake of 2.2 g/kg/day
- Strive for 700-3000 mg of leucine (*essential amino acid*) daily.
- Whole food consumption is optimal, and supplementation can be practical.
- Nutrient timing: wider range than thought (immediate to up to 2 hours post exercise).
  - The post-workout "anabolic window" is dependent upon the consumption of the pre-workout meal.

ISSN Position Stand: protein and exercise (2017)
Nabuco et al. **Nutrients** 2018, 10(5), 563.
ISSN doi: https://doi.org/10.1186/s12970-018-0215-1
Moore et al. **J Gerontol A Biol Sci Med Sci** 2015, 70(1): 57-62.