How, when, and why to implement popular training methods for sport performance

Dr. Anna Swisher
Eleiko Education

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Overview

What is it? Does it work? Who benefits? When should I use it?

- Olympic lifting complexes
- Sets to failure
- Occlusion training
- Eccentric overloaded lifts

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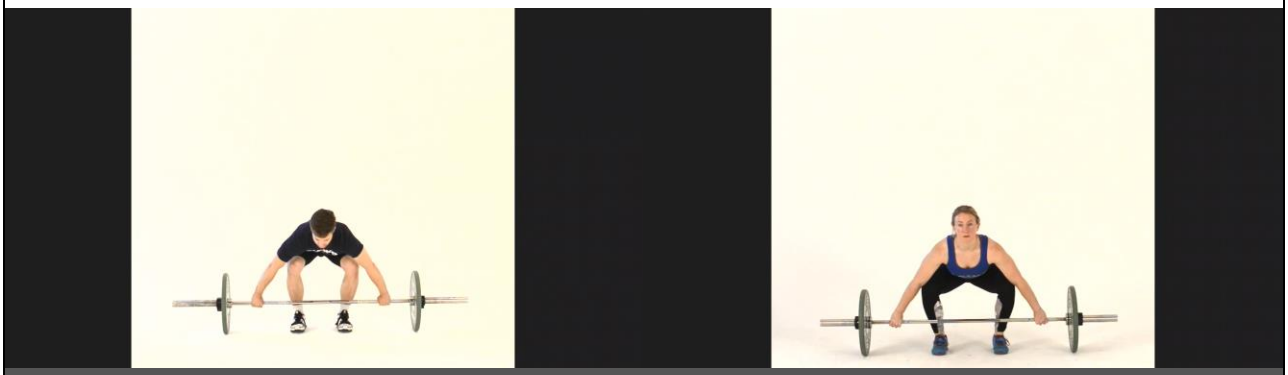
Olympic lifting complex

- Combination of oly lifts and derivatives combined in one set



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Olympic lifting complexes

1) Increase work capacity; Prepare the body for more dynamic, heavy loading
   EX: 3x (6 high pull + 6 muscle snatch + 6 overhead squat + 6 RDL)
2) Strengthen technique
   EX: 3x (2 power snatch + 2 OHSQ) or 3x (1 power clean + 2 FSQ)
3) Break up monotony of training
4) Improve weaker positions (i.e., at knee)
   EX: 3x (snatch pause at knee + power snatch pause at knee)

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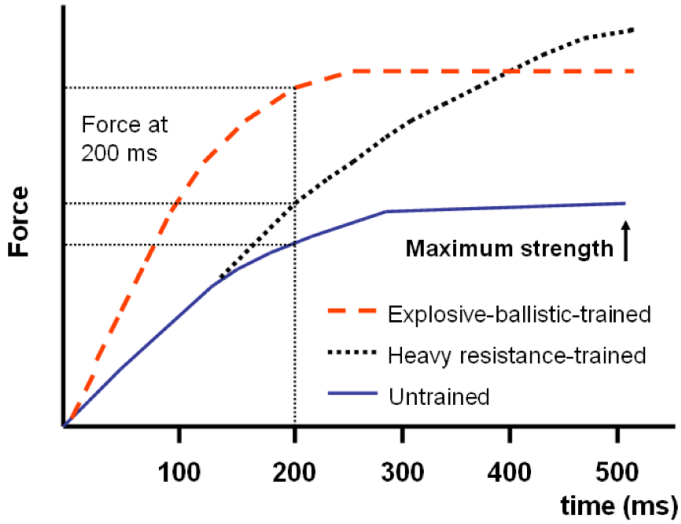
Why olympic lifts should be in your workouts



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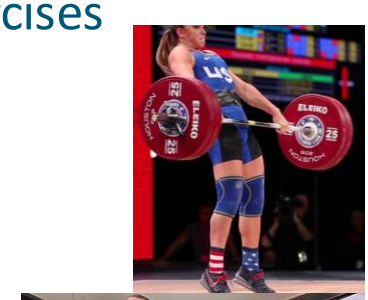
Power output of various exercises

(Power = force x velocity)

Lift (max effort)	Time to complete	Bar velocity	Power
Bench	~1-5 sec	~0.6 m/s	~300 W
Deadlift	~1-10 sec	~0.5 m/s	~1300 W
Back squat	~1-5 sec	~0.5 m/s	~1300 W
2nd pull snatch or clean	**~ 100-200 ms**	**~1.6 m/s**	**~4000 W**



Garhammer, 1980; Garhammer, 1981; Garhammer, 1984; Garhammer, 1993; Stone et al., 2007

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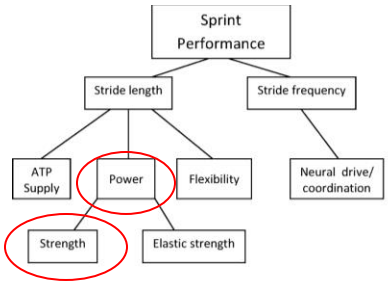
Strength before power and speed

- Strength is the physical quality that underlies power, speed, and rate of force development (RFD) (Stone et al., 2007; Comfort et al., 2012)
  - Faster sprinters have better lower body power and RFD



Adapted from Bishop and Girard, 2013; Stone et al., 2007

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Benefits of olympic lifts for sport

1. Improve coordination and ROM
2. Improve body composition (complexes)
3. Sprint faster and jump higher
4. Get powerful (ballistic)
5. Improve dynamic stability
6. Protect against injury
7. Enhance core strength
8. Elevate mental strength

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Who benefits from olympic complexes

- Athletes in GPP
  - Reinforce technique and work capacity
- Beginner lifters and youth athletes
  - Lots of reps with light weights
  - Learn proper movement patterns
- Intermediate and advanced athletes and lifters
  - Strengthen technique
  - Improve weaker portions of lifts
  - Fun, change of pace

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What causes muscle hypertrophy?

- How do we optimally stimulate a muscle to hypertrophy (myofibrillar) ?
  - Key to assessing training methods

❖Tension, damage, metabolic stress (H+)
❖Myostatin, anabolic steroids, hormones

Stone et al., 2007; Schoenfeld 2010, 2013

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What kind of hypertrophy? Training goal?

- Can increase size without strength/power (non-functional)
- Can hypertrophy aspect of a muscle that is not relevant to performance
  - Curls with various hand orientations
  - Added mass takes more effort/force to move
- **Athletes develop movements not muscles**
  - Goal is for new muscle to add to strength and power production capacity in SPORT

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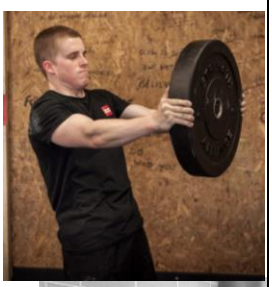
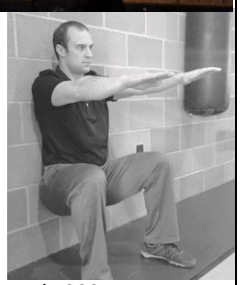
Multiple pathways to muscle growth

What is optimal for sport?

- Careful when training focus is TUT with lower loads
  - What causes high tension?
- Tension causes molecular and cellular responses
  - Increased satellite cell incorporation
  - Results in a cascade leading to muscle protein synthesis
- Isometrics
  - Do planks get you HUGE?





Stone et al., 2007

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Training to technical failure

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Potential rationale for lifting to failure

1. If smaller MUs are fatigued at end of a set, then larger MUs must help
2. Increase in H+ with failure is a stimulus for hypertrophy
3. Potential for a greater training stimulus

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What is problematic about training to failure

1. Increased time to recover (Morán-Navarro et al., 2017)
   - Training vs. exercising
2. Much harder to manage volume of training
   - Difficult to follow progressive overload
   - Overtraining and injury risk higher
3. Negative hormonal alterations (T:C and IGF-1) impede muscle growth (Izquierdo et al., 2006)

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Lifting to failure

- Training to failure is *not necessary* to induce hypertrophy or activate higher threshold MUs (Frobrose et al., 1993, Stone et al., 1996)
  - Better stimulated by higher volume loads for athletes
  - Ballistic exercise also ⇑ recruitment of higher threshold MUs
- Lacking evidence that in **trained individuals**, it is better than simply training hard (Izquierdo et al., 2006; Stone et al., 2007, Peterson et al., 2005; Schoenfeld 2013)

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Who benefits from training to technical failure?

- General population with no training
  - No large-muscle mass or technical lifts (curls….)
  - Central fatigue and time for recovery non-issue
  - Lower overall work; less impact on remainder of workout

Who should avoid training to technical failure most of the time?

- Athletes

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Occluded strength training

- Why do it?
- Benefits?
- Mechanisms?

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Occluded strength training

(AKA Kaatsu or blood flow restriction training)

- What is it?
  - Using elastic bands to occlude venous blood flow; slower tempo to extend eccentric
  - Can be done for arm and leg work; most common for squats
- Likely mechanisms
  - Increase in concentration of metabolites and delay in transport
    - Stimulus for hypertrophy

Pearson and Hussain, 2015; Abe et al, 2012, Pope et al., 2013

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Occluded strength training

PRO	CON
Increased metabolic stress (novel stimulus)	Body adapts quickly (within weeks)
Highly fatiguing (3-8 sets of 10-20 reps @ ~30RM (<40% 1RM)	Low loading must be used (lower tension created)
Potential for high levels of damage	Tough to get pressure levels correct with wraps (venous return only impacted)

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Occluded strength training

- Loading is a key factor
  - Squat with high load + longer eccentric = more damage and metabolites but lower overall volume
  - Squat with low load = minimal damage, more volume, more metabolic stress; won't effectively stimulate hypertrophy (Scott et al., 2016)
    - Why not just do more heavy squats?

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Bottom line: Occluded strength training for athletes

- Occlusion training is less effective than conventional training over a period of months and years
  - Athletes should do heavier training, which is a better stimulus for hypertrophy
  - Eccentric overloaded squats better for similar fatigue after-effects
- Is there any application in sport for it?....

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Occluded strength training

- Types of athletes who benefit?
  - Trained athletes with minor injuries who must maintain strength and/or mass
- When to use it?
  - SP or COMP phases when time to rehab or rebuild is limited
- What lifts and how to use?
  - Depends on sport
  - Occluded squats used with success on injured athletes
    - Lower loads may make squats tolerable (depending on injury) and can help maintain muscle mass short-term (weeks)
    - Keep bands tight between sets

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Eccentric overloaded lifts

- What is it?
- Why do it?
- Benefits?

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Eccentric overloaded lifts

- What is it?
  - Additional weight on eccentric that is removed for concentric
  - Typically done with weight releaser hooks, manual removal of weights, or specialized machine modulating resistance

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Why do it?

- Highly effective variation as a hypertrophy stimulus
  - Higher tension from higher loading
  - Greater damage from greater loading

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Eccentric overloaded lifts

- Types of athletes who benefit most?
  - Age 18 or older with training age of >2 years
  - Compete in sport that needs high levels of absolute strength
- When to use it?
  - GPP or off-season when focus is hypertrophy and sport training volume is low
- What lifts to use?
  - Most effective for squats, bench, deadlifts

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Summary

Foundational information

❖ Knowledge

Proper application

❖ Wisdom

- Don't forget context of training plan and needs of *your* athletes
- Science enables coaches to better practice the art of coaching

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(No one gets anywhere alone)

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Questions?

Please feel free to contact me

anna.swisher@eleiko.com

IG: coachswisher

WEB: eleiko.com

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