

# Assessing Upper-, Lower- and Total-body Power: A Practical Approach



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SCCC WRITTEN EXAMINATION COMMITTEE MEMBER

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# Thank you

- Chuck & Becky
- CSCCa Conference Committee
- My Mentors
- Colleagues
- Friends
- Family



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# Disclaimer

- If you have a large budget and access to the \$\$\$ equipment
- Support/trained staff to analyze & report



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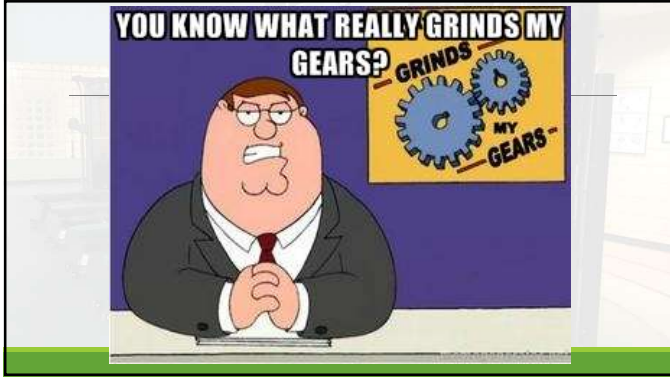
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### Testing Logistics

- Trained staff + Number
- Equipment accessibility
- Testing efficiency
- Time to process + analysis
- Time to develop report
- Testing provides direction if data is meaningful and applicable



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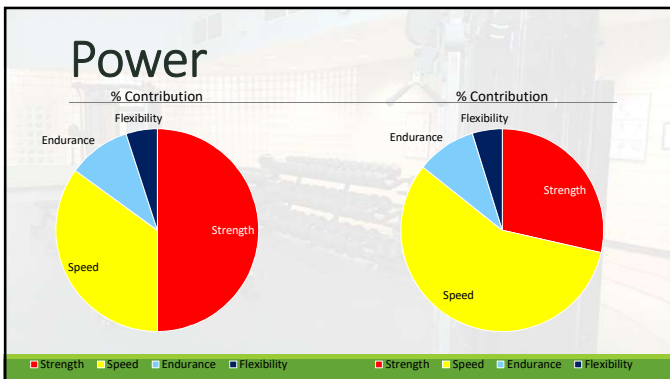
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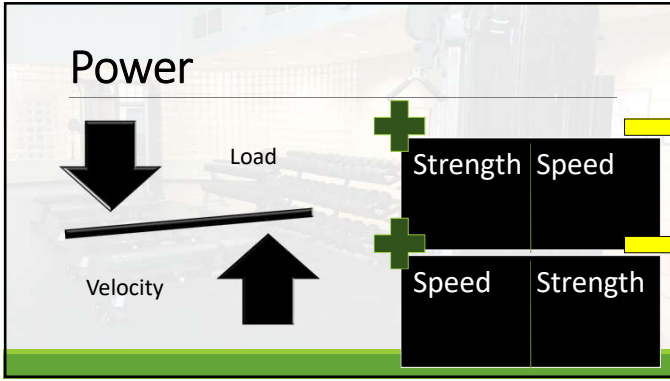
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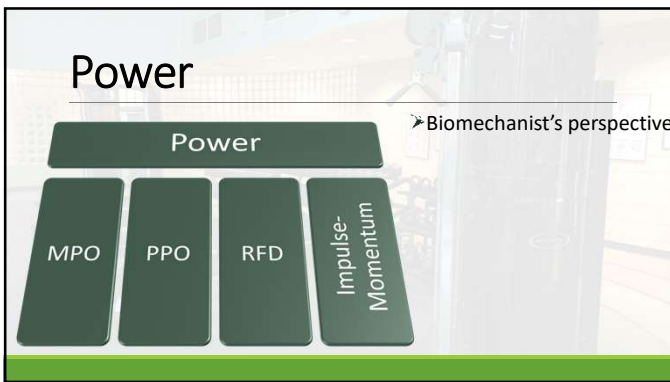
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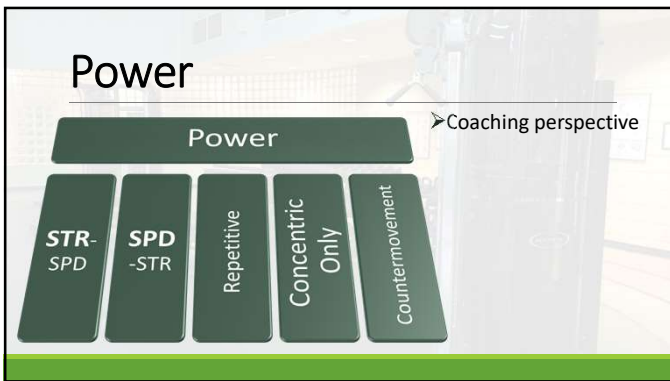
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## Power

Tendo™ units, Gymaware™

Logistically Challenging

- Force plates\*
- Motion analysis
- Cycling power tests
- Isokinetic machines

Practical

- Jump variations
- Weightlifting movements
- Throws

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## Upper-body Power

### Bench Barbell Throw

Gymaware™ or Tendo™

Timing switches

Relatively cost effective

- Timers can be built in

(Load x Distance)/Time

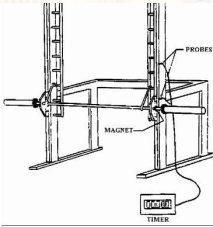



Figure 1. Smith machine with timer circuit.



Shim, Ai, Bailey, M., and Westings, S.H. Development of a field test for upper-body power. J Strength Cond Res. 15(2):192-197. 2001.

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## Upper-body Power

- Chest Throws
- Overhead Throws
- MB Puts – seated
- Minimize or Restrict LB
- Seated absent back support
- Seated on floor & wall
- 45° inclined bench



Cormin, J.B., and G.J. Owen. Upper-body strength and power assessment in women using a chest pass. J Strength Cond Res. 18(3):403-404.

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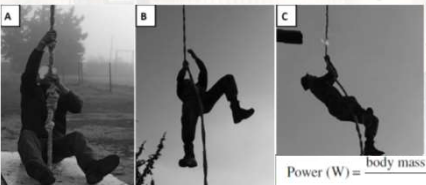
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### Upper-body Power



- Stopwatch
- Scale
- Sport? = Wrestling

$$\text{Power (W)} = \frac{\text{body mass (kg)} \times 9.81 \times \text{rope distance (m)}}{\text{ET (s)}}$$

5-m rope-climbing test demonstrated reliability and strongly correlated with other tests

Dhabhi et al., (2015) Five-Meter Rope Climbing: A Commando-Specific Power Test of the Upper Limbs. *International Journal of Sports Physiology and Performance* 10: 509-515.

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### Upper-body Power

#### "Explosive" Push-up



- Just Jump Mat
- Measure displacement
- Static start
- Countermovement
- Drop (from knees)

Hershaw, T.J., Stephenson, M.L., Sha, Z., and Dai, B. (2018) Effect of external loading on force and power production during plyometric push-ups. *J Strength Cond Res* 32(4): 1099-1108.  
 Moore, L.A., Reinold, M., Riemann, B., and Davies, G. (2012) Kinematic Analysis of Four Plyometric Push-Up Variations. *International J Emer Sci* 5(4) : 384-394.  
 Vossen, J.F., J.F. Kramer, D.O. Burke, and O.P. Vossen. (2000) Comparison of dynamic push-up training and plyometric push-up training on upper-body power and strength. *J Strength Cond Res* 14(2): 248-253.

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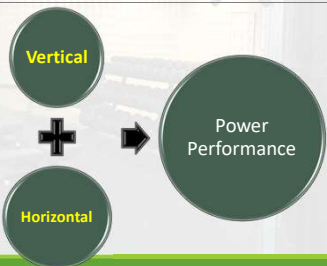
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### Lower-Body Power



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  graph LR
    V((Vertical)) --- Plus{+}
    H((Horizontal)) --- Plus
    Plus --> PP((Power Performance))
  
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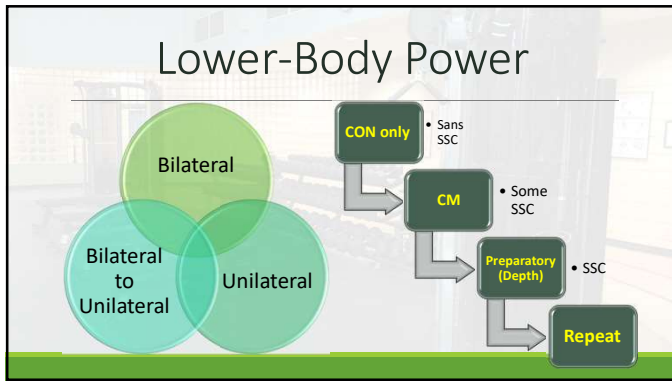
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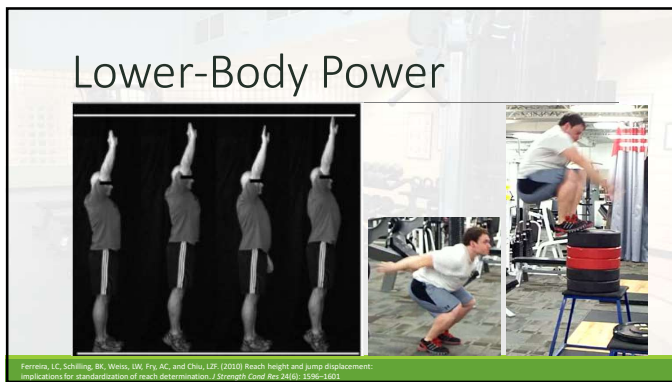
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# Lower-Body Power

CMJ<sub>vert</sub> and Horiz.SJ relate with T-test, 20 yds accel, & 40 yds sprint (r = .70 to 0.9) and strong relationship to 30 m sprints

Sayers equation IF you want to calculate power

Just Jump Mat™, Vertec™, or simply chalk mark on wall

Horizontal tape measure toes to heel landing (sand pit best)

Starting position/action = Static, CM, Approach, Repeat (3x)

Darmento, A, Galpin, AJ, and Brown, LE. (2012) Vertical jump and power. *Strength Cond J*, 34(6): 34-43.  
Peterson, M.D., B.A. Alvar, and M.S. Rhea, (2006) The contribution of maximal force production to explosive movement among young collegiate athletes. *J. Strength Cond. Res.* 20(4): 867-873.  
Dobbs, CW, Gill, ND, Smart, DJ, and McGuigan, MR. (2015) Relationship between vertical and horizontal jump variables and muscular performance in athletes. *J. Strength Cond Res* 29(3): 661-671.

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# Lower-Body Power

- Assessing lower-body power loaded
- Depth of squat (Self or Set)
- Load 10-40% 1RM of HFLV



Stone, M.H., H.S. O'Bryant, L. McCoy, R. Caglianese, M. Lehmkuhl, and B. Schilling. (2003) Power and maximum strength relationships during performance of dynamic and static weighted jumps. *J. Strength Cond Res.* 17(2): 140-147.

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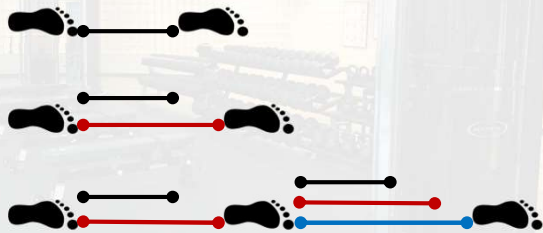
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# Lower-Body Power



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### Total-body Power



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### Total-body Power

Clean or Snatch Variations

- Hang above-knee
- Hang mid-thigh
- Power
- Full



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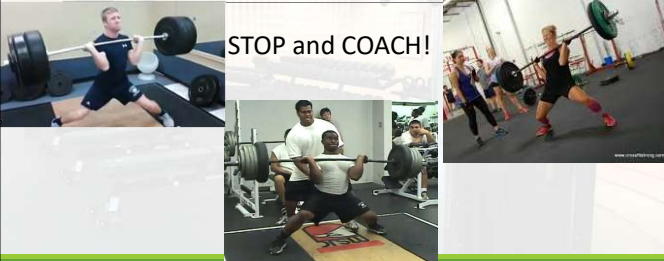
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Now for something completely different. If you see technique like this...

**STOP and COACH!**



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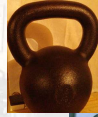
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# Total-body Power

What about the KB Swing?

- Use a reasonable load (e.g. 16 kg)
- KB must reach shoulder level
- Time frame 10 – 15 s
- Number of reps completed
- Same rep with > load?



Brown, J.C. (2004) Kettlebell Training for Sport. <http://www.kettlebelltrainingforsport.com>  
 Campbell, B., and Otto III, W.H. (2013) Should Kettlebells be Used in Strength and Conditioning? *Strength Cond J.* 35(3): 27-29.  
 Latta, J.P. and Lander, M.B. (2012) Kettlebell swing training improves maximal and explosive strength. *J Strength Cond Res* 26(6): 2228–2233.

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# Total-body Power

- Push Press
- Squat Jerk
- Split Jerk



**Peak Power**  
 Push Press = 3640.1 ±573.8 W  
 Jump Squat = 3885.2 ±302.3 W

**Mean Power**  
 Push Press = 2313.6 ±332.5 W  
 Jump Squat = 2096.0 ±201.8 W

**Peak Impulse**  
 Push Press = 247.8 ±34.6 N·s  
 Jump Squat = 278.7 ±22.8 N·s

Latta, J.P., Mundy, P.D., and Comfort, P. Power and impulse applied during push press exercise. *J Strength Cond Res* 28(9): 2552–2559.

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# Total-body Power

- Backward MB throw
- Over-shoulder MB throw
- Over-head MB throw
- Approach over-head MB throw
- Rotational MB throw – Static start
- Rotational MB throw – CM



Stockbrugger, B.A., and R.G. Haennel. (2003) Contributing factors to performance of a medicine ball explosive power test: A comparison between jump and nonjump athletes. *J Strength Cond Res* 17(5):260-274.  
 Stockbrugger, B.A., and R.G. Haennel. (2001) Validity and reliability of a medicine ball explosive power test. *J Strength Cond Res* 15(4):431–438.

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## Total-body Power

Talukdar, K, Cronin, J, Zois, J, and Sharp, AP. (2015) The role of rotational mobility and power on throwing velocity. J Strength Cond Res 29(4): 905-911

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## Application

Hang or Block Start Position  
SN and CL

- Minimal Time to Develop Force from a Static Start Standing
- Peak Power with Minimal Joint Angle Displacement
- American FB: WR & DB
- Football (Soccer)
- Basketball
- Volleyball
- High Jumper
- T&F Throwers

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## Application

Split Jerk or Split Snatch

- Hurdler
- Triple Jumper
- Javelin Thrower
- Hockey
- Football (Soccer)

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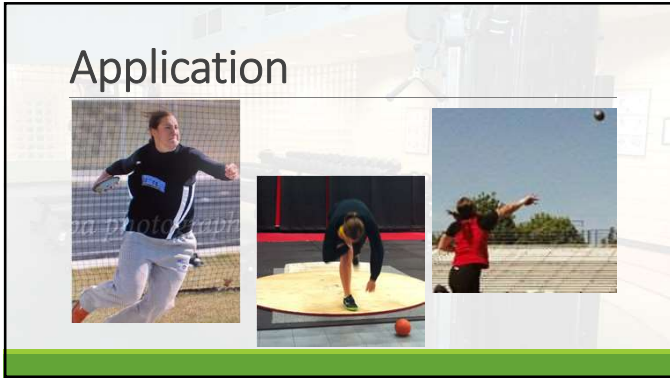
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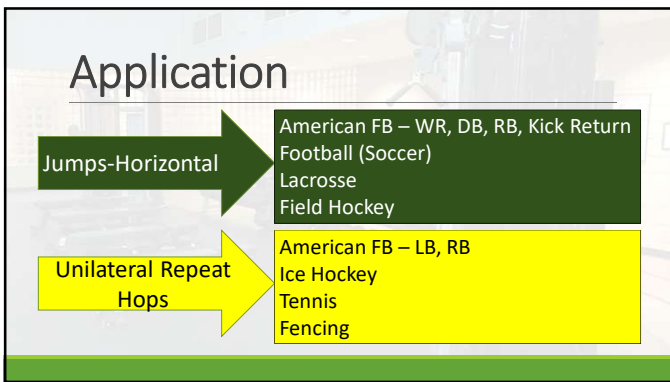
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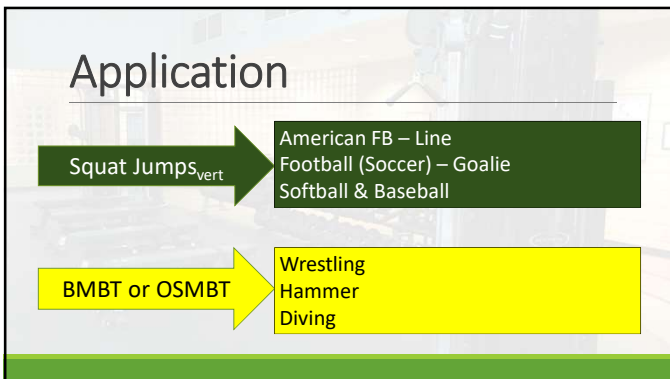
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## Application




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## Concluding Thoughts



- Testing for adaptations vs monitoring
- Test only what is needed
- Determine when testing will occur
- Static, Countermovement, Approach
- Determine the logistics and implement
- USE the information

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## Thank you for your time & attention



**Send questions, complaints, or hate mail to:**  
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