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Modern aspects of training: Actual data from during the strength training of rowers

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Athlete Performance Support – Strength and Conditioning

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Weight training kinetics and kinematics

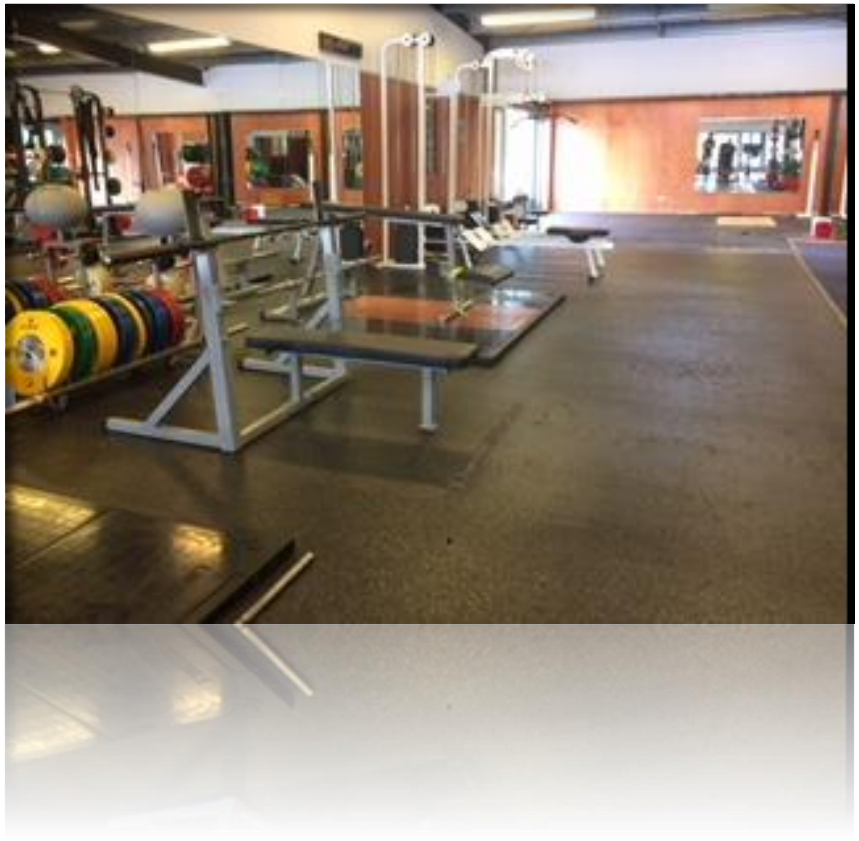
SET DATA:

- Repetition-**Length**
- Repetition-**Rating**
- Repetition-**Power**

SESSION DATA:

- Total Work (J)
- Work Rate (W)
- Fatigue (decay in length, rating or power)
- Rating Perceived Exertion (RPE)

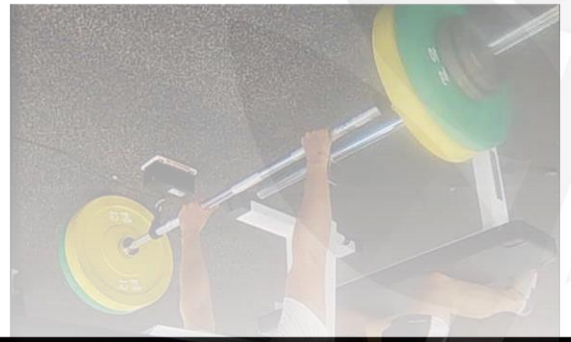
What if we make training the measure?



- Stop creating tests, and…
- Start refining weight training metrics (data) to reduce measurement error so that you can:
  - Define overload
  - Determine change (progress)
  - Compare strategies

Linear encoders

- Measure range of **motion** (m), thus actual **work** (J) performed
- Quantify repetition **power** (W) and velocity (m/s)
- Thus, provide ‘insight’ into ‘effort’ or ‘intent’, in real-time against known maximums or past training efforts



Measurement variations ('real' change)

Large differences in **repetition**:

- Power – 20-25%
- Decay-rate ('pacing') – 50%
- Ratings (reps each minute)

Smaller differences (**set**) average:

- Work (J) – <10%
- Length (cm) - <10%
- Power (W) - <12%
- RM Load (kg) – 1.7%

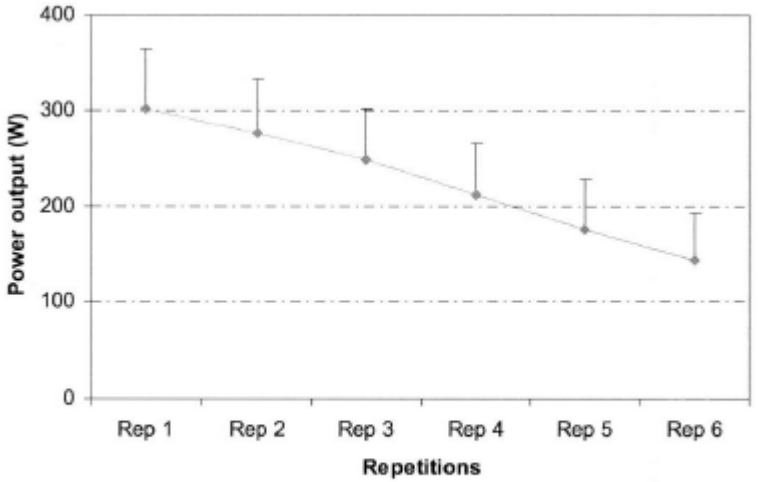


FIGURE 2. Mean power output (*SD*) associated with 6RM training. All power outputs are significantly different from each other.

Lawton et. al (2006), JSCR 20(1), p172.

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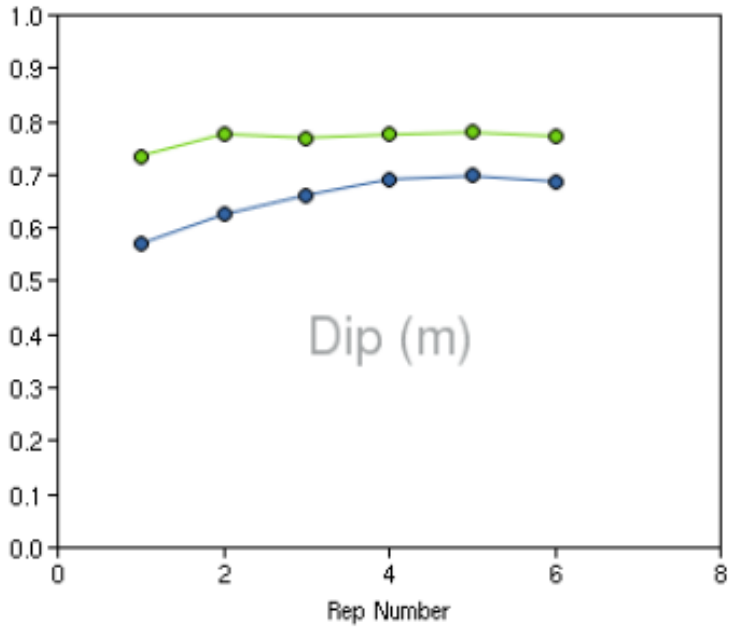
1. Feedback: Technique

‘Repetition-length’

1. Feedback… ‘repetition-length’



Strategy: create feedback

Data: Repetition ‘DIP’ on iPad

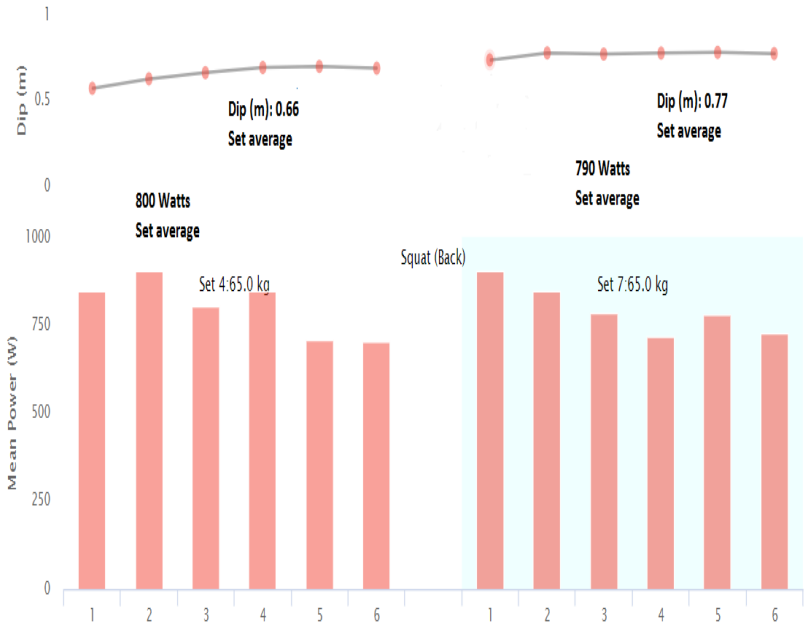
Instruction: ‘increase that number (dip)’

- Blue line – set 4
- Green line – set 7

Process: Let the rower do the learning (reflection over 9 sets)

No feedback from S&C coach (unless Squat action changed e.g. forward lean)

Outcomes…



+11cm ↑ in average **dip** (+17%)

↔ same average speed (0.56 m/s)

10 Watt ↓ in average power (-1.2%)

↑ physiological work (+13%)

i.e. concentric contraction duration ↑ from 8.06s to 9.08s total

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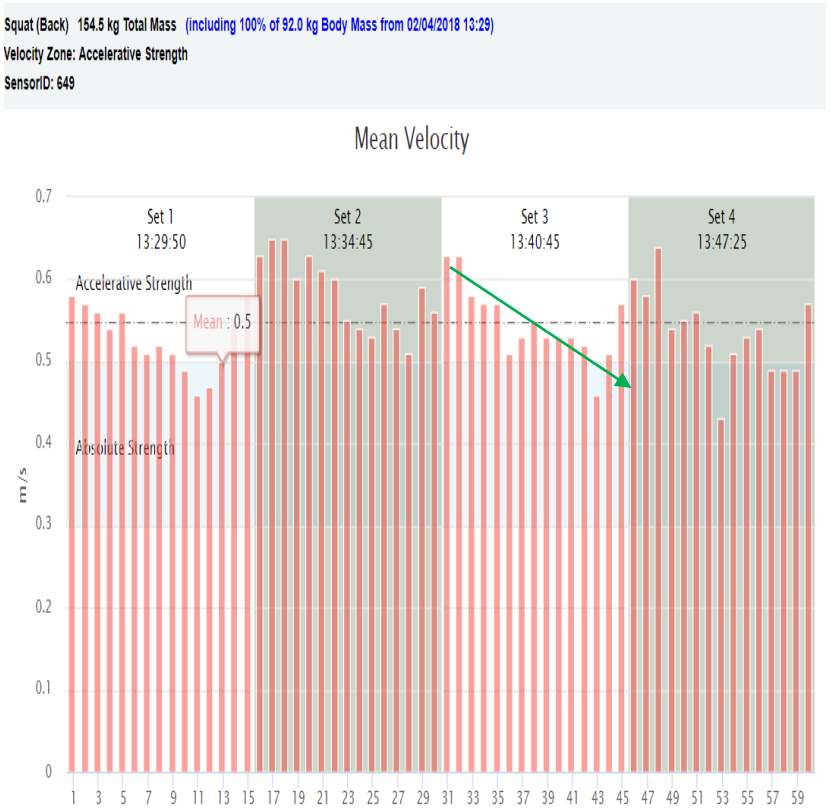
2. Volume : Intent

‘Pacing’ and ‘Repetition-rating’

2. ‘Pacing’ and ‘repetition-rating’ (4x15, @70% 6RM)

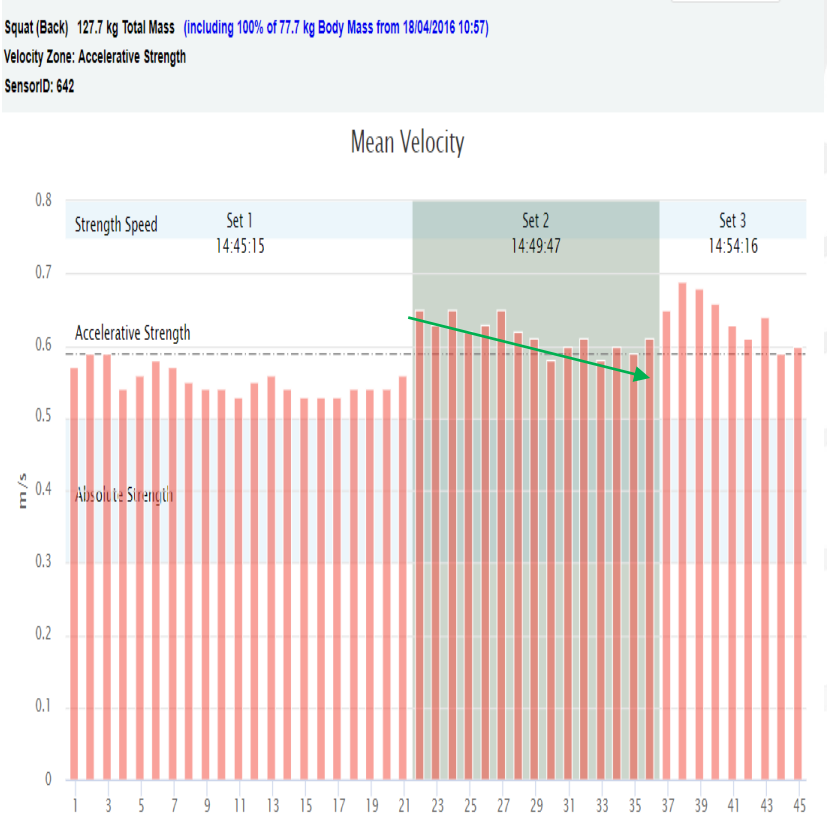


Athlete A: 63kg, 90kg 6RM

Athlete B: 80kg, 115kg 6RM

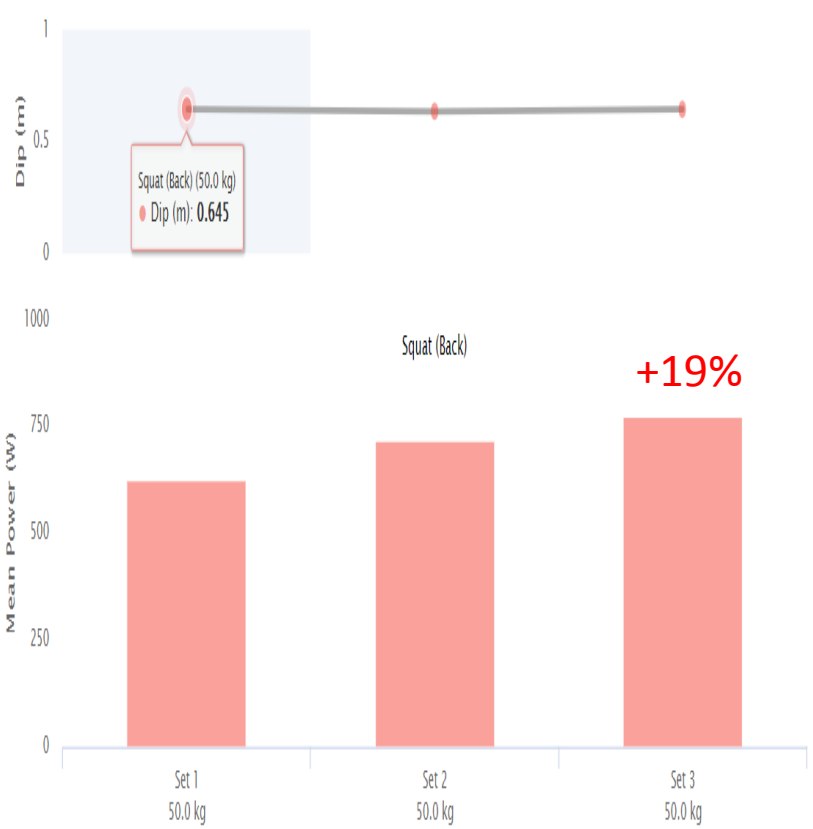
Strategy… Clustering (21, 15 and 9, @70% 6RM)

Athlete C: 50kg, 75kg 6RM

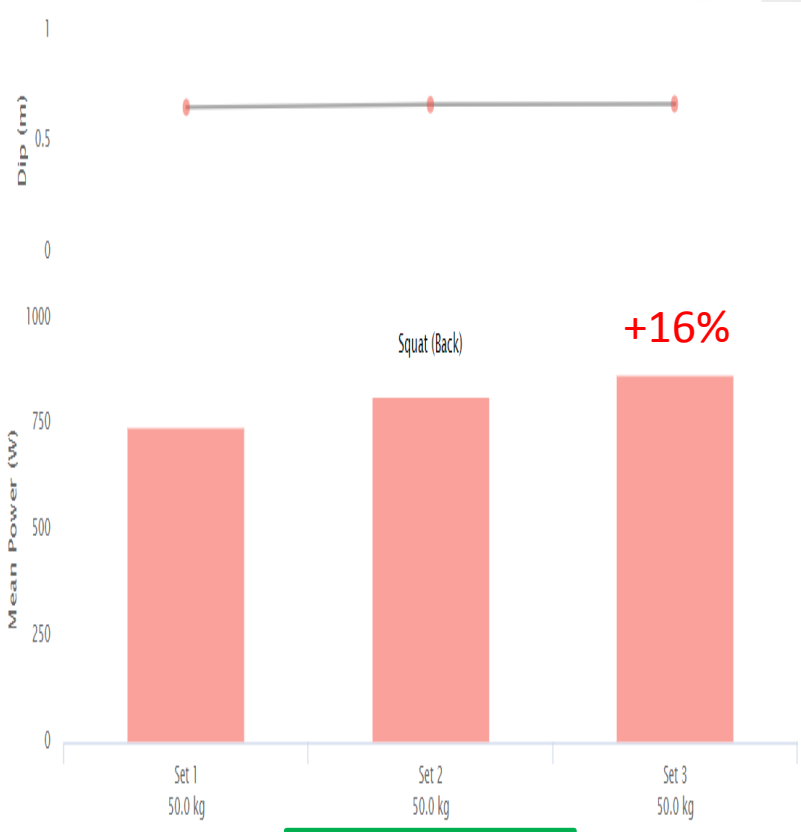


Athlete D: 50kg, 75kg 6RM

Outcome… more power, more length



Athlete C: 640W, 0.64m



Athlete D: 750W (+17%), 0.66m

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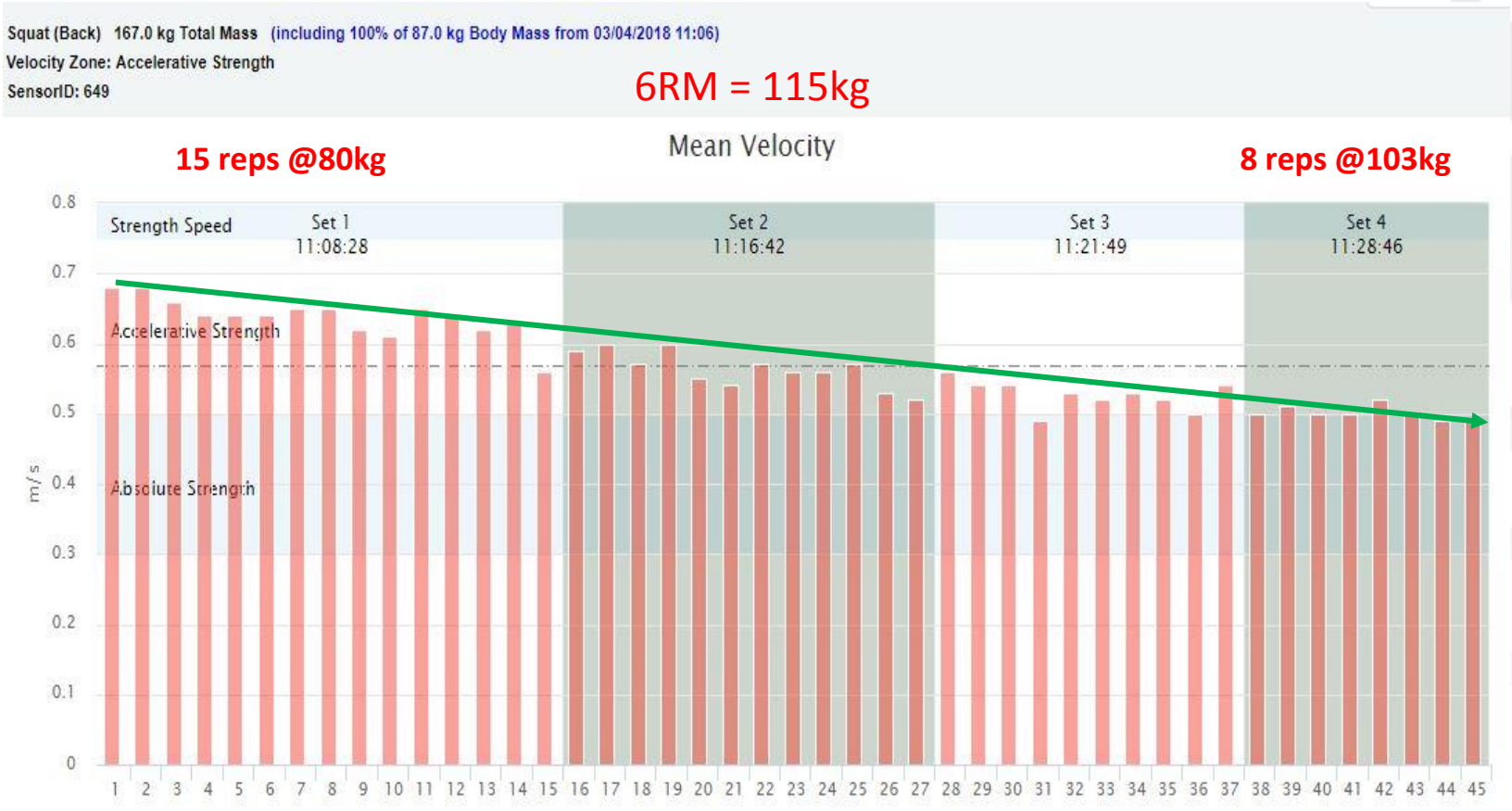
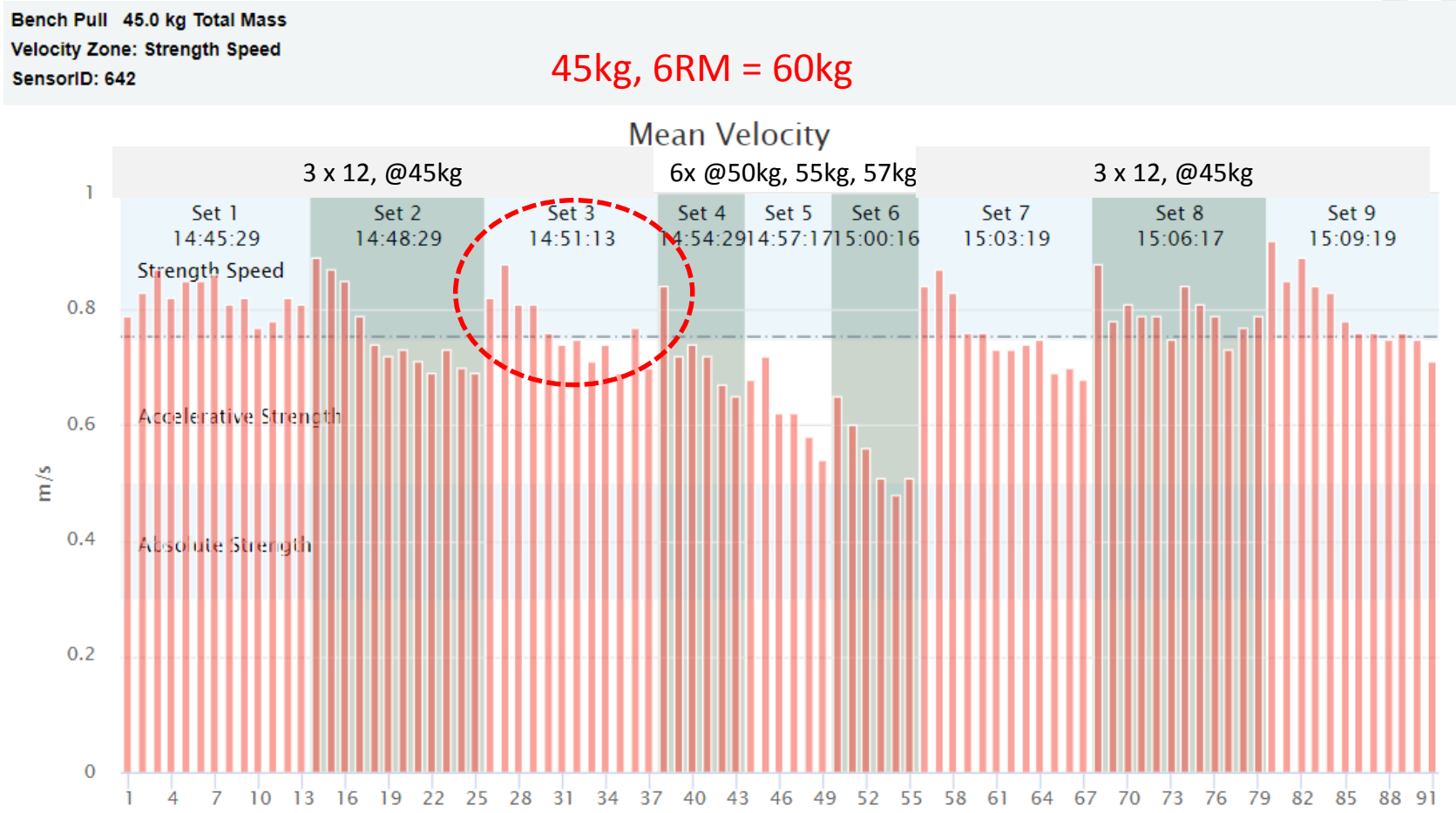
3. Prescription: Adaptation

‘Repetition-power: refining load assignment’

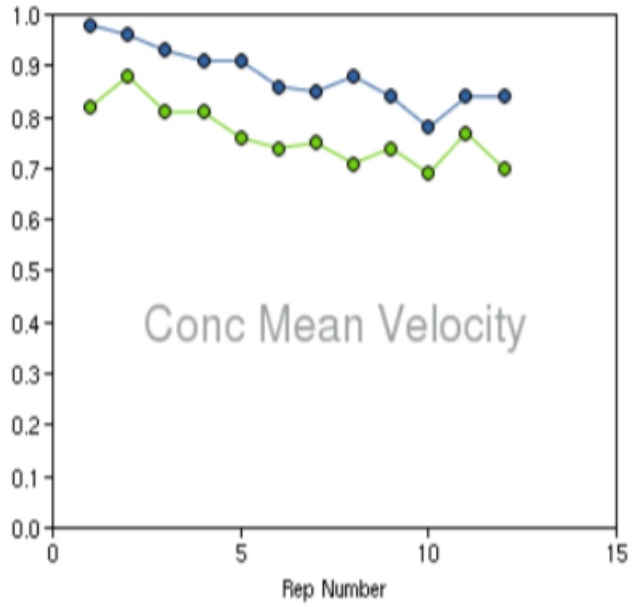
Increase weight… or do more repetitions?

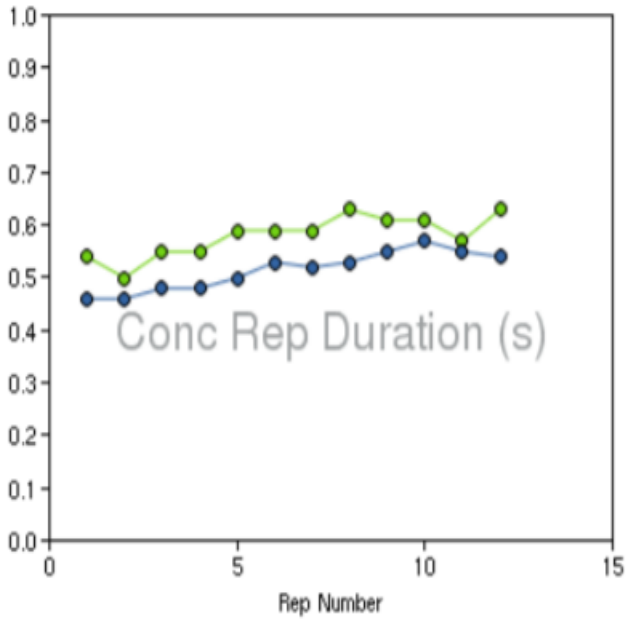


3a. Reducing load… power endurance (45kg)



Outcome… 40kg ☑ compared to 45kg

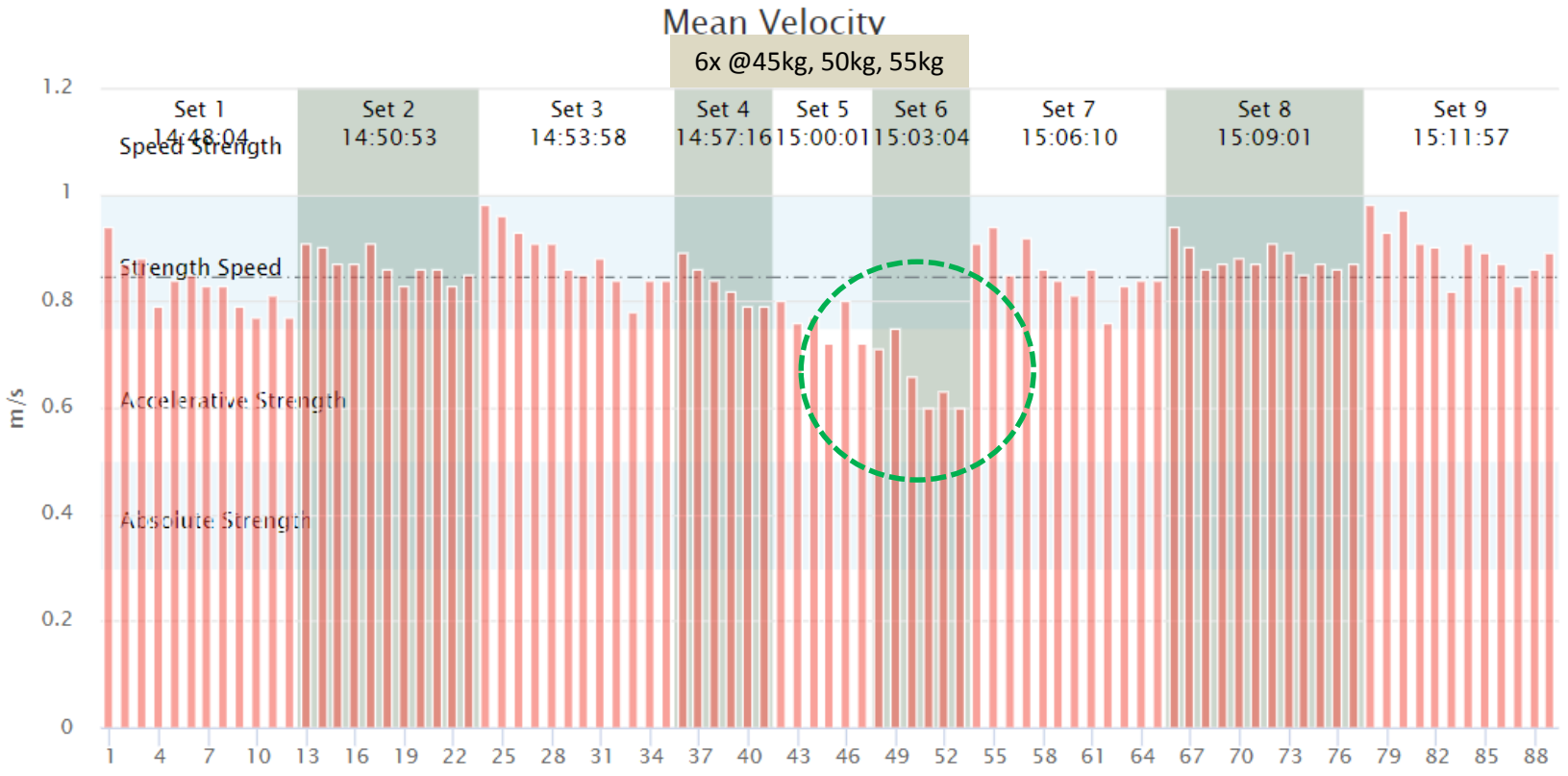




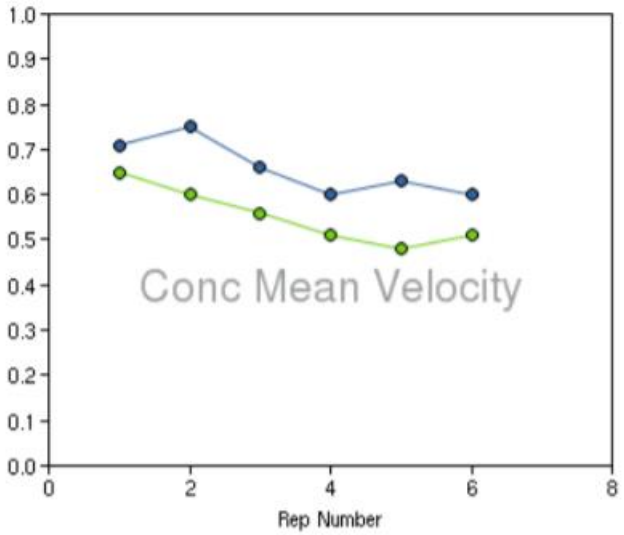
3b. Increasing load… Max Strength Zones

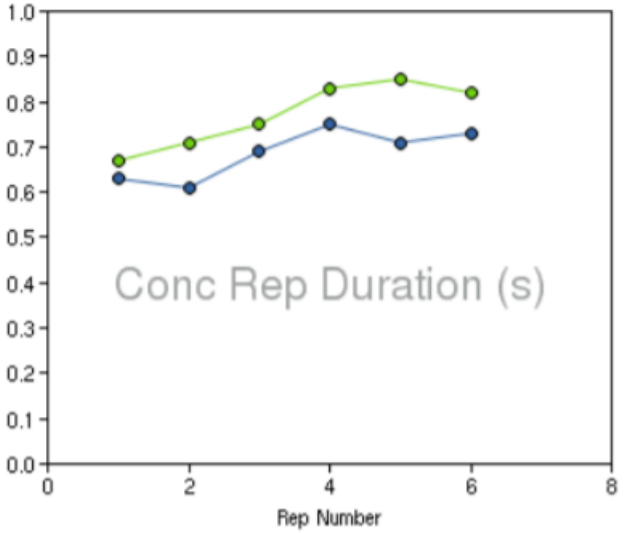
Bench Pull 40.0 kg Total Mass
Velocity Zone: Strength Speed
SensorID: 679

55kg, 6RM = 60kg

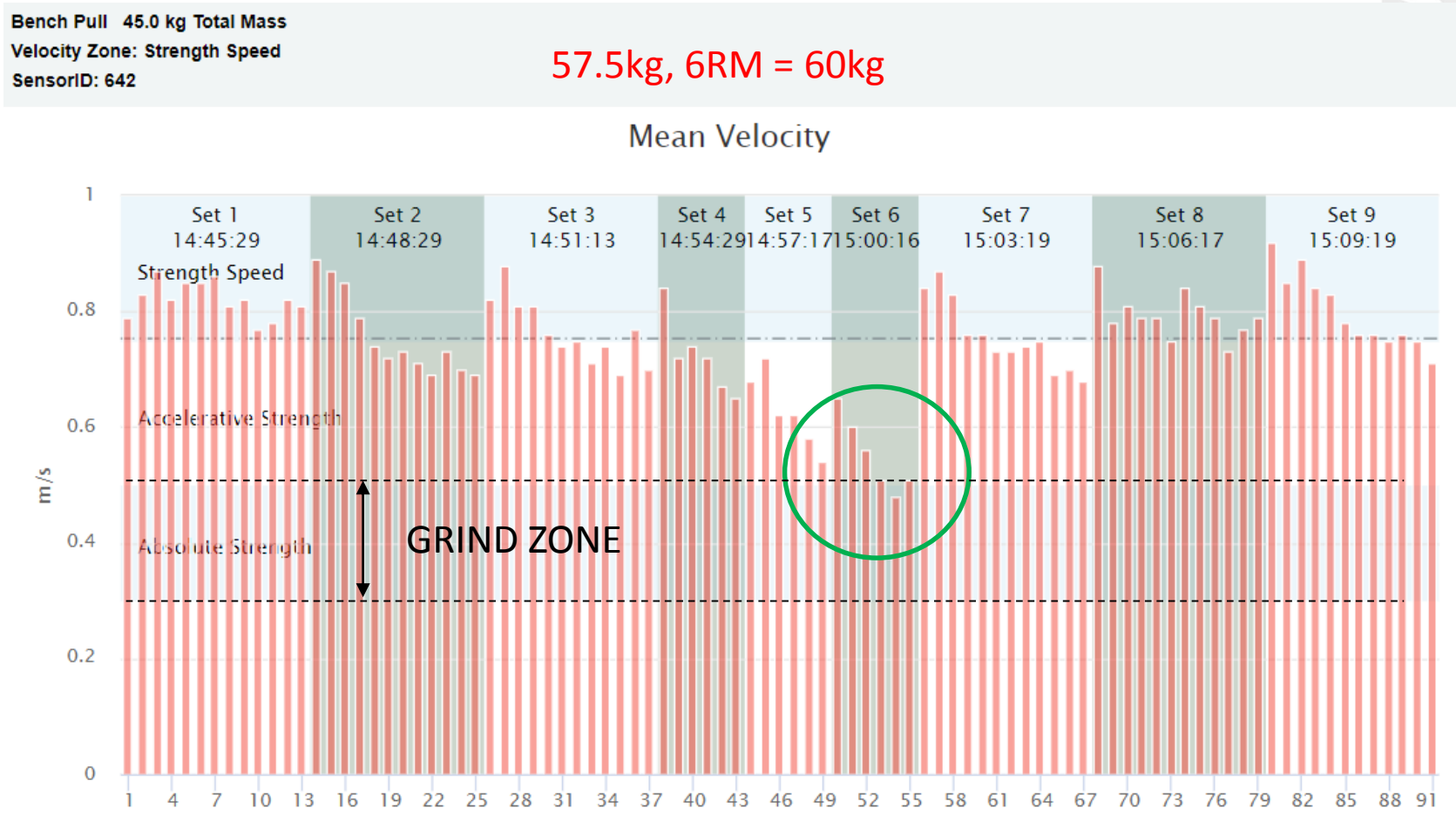


Outcome… 55kg compared to 57.5kg ☑





Outcome… Closer to the ‘grind’ or RM



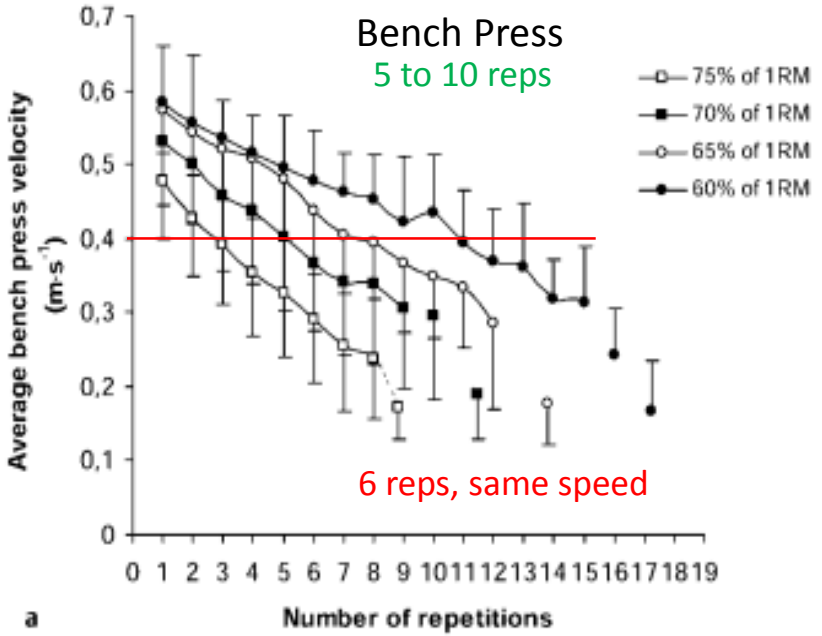
Strategy 3c… Blended ‘repetition failure’

Reference: Turner (2017)
https://www.strengthofscience.com/articles/velocity-based-training-maximal-strength/

Polarising training methods…

- When to switch load?
- @60% 1RM :
  - After 10 reps, (above red line)…
  - Last 6 reps at same speed i.e. 6RM!

- POLARISING: Avoid fast-speed training turning into slow-speed exercise through excessive volume.



Izquierdo, M et. al (2006), IJSM 27, pp718-724

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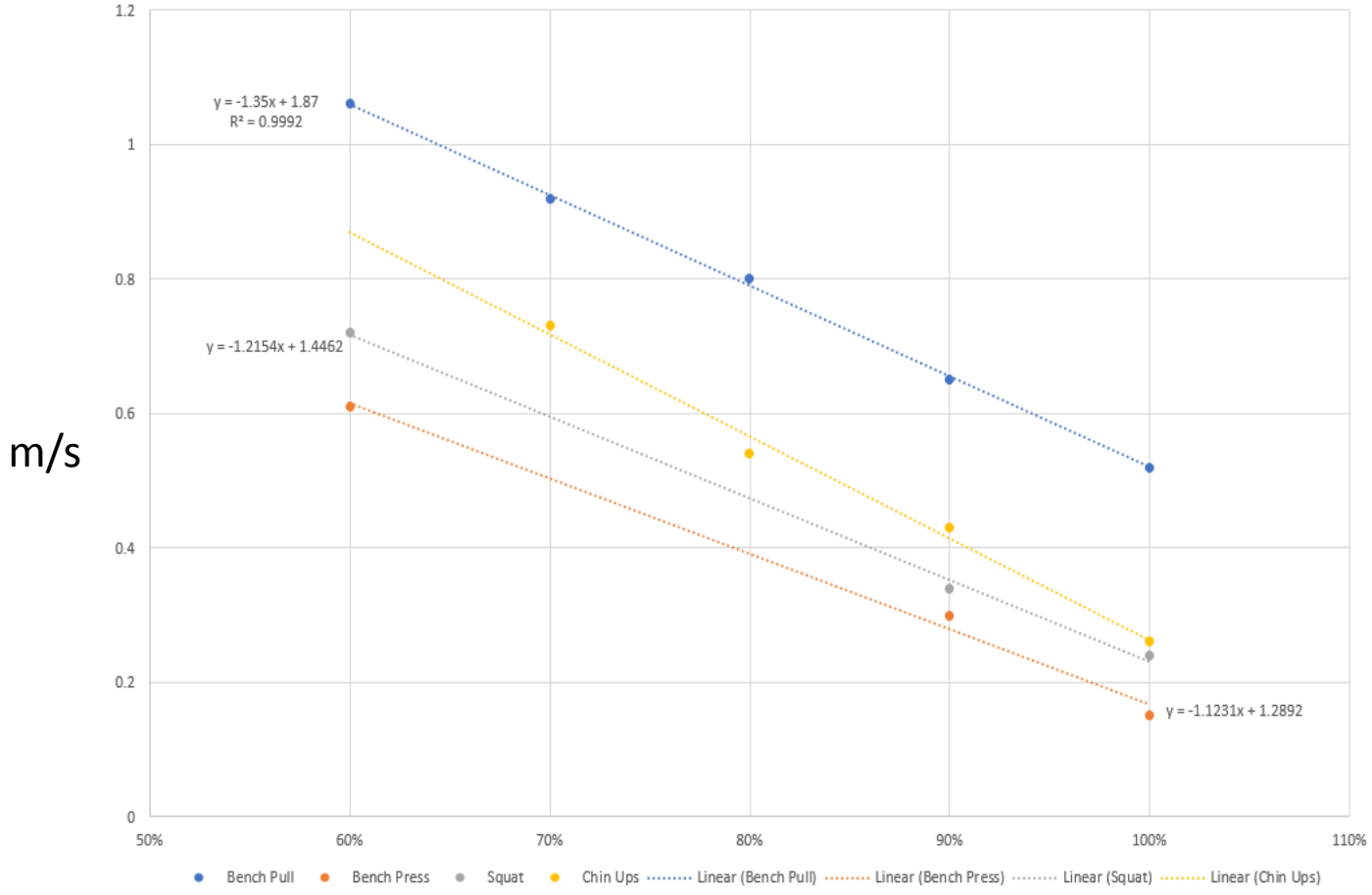
What if repetition-speed is used to assign training loads?

i.e. weights and repetitions?

‘Velocity-Based Training (VBT)’

Linear relationships (>60% to 1RM)…



Two-speed model for load selection

Speed ± 25%	6RM ± 2.0%	1RM ± 2.0%	Reps (range)
FAST >0.5 m/s	70%	60%	7, (10-5)
SLOW <0.4 m/s	>6RM	>85%	2, (1-3)

Model: Bench Press

NB: Each ↑ 0.05 m/s = ~4% ↑1RM

Take home messages… Linear Encoders

1. **Feedback**: Technique

Athlete attention on key metrics e.g. repetition-length

2. **Volume**: Intent

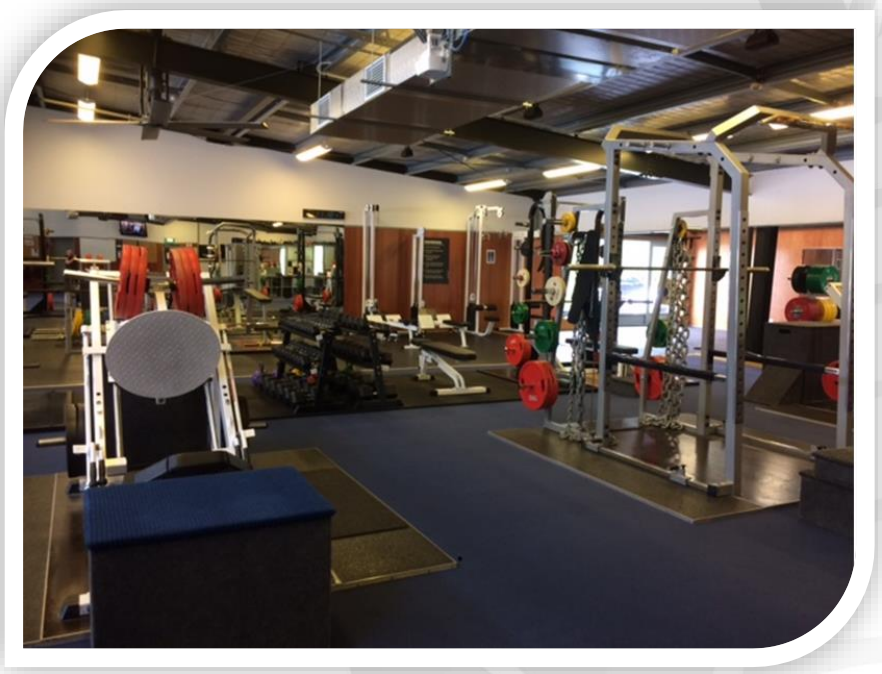
Change repetition-rating strategies to increase average power (W) by 'clustering' reps differently

3. **Prescription**: Adaptations

Assign overload to ensure polarised strength-training, such as

- Faster velocity (e.g. >1.0 m/s)*
- Greater load (e.g. <0.7 m/s)
- More repetitions…

**Prone Bench Pulls (Rows)*



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THANK YOU

Programming ideas…