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Msc. Strength and conditioning

Msc. Performance analysis of sports

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MONITORING TOOLS FOR

Performance assessment

Is a critical component of athlete preparation.

When implemented correctly, assessment of an athlete's physical capacities can provide important information such as identification of strengths and weaknesses, response to training programmes, return to play and ongoing monitoring.

PRINCIPLES OF TESTING

VALIDITY

RELIABILITY

STANDARDIZATION

PRACTICALITY

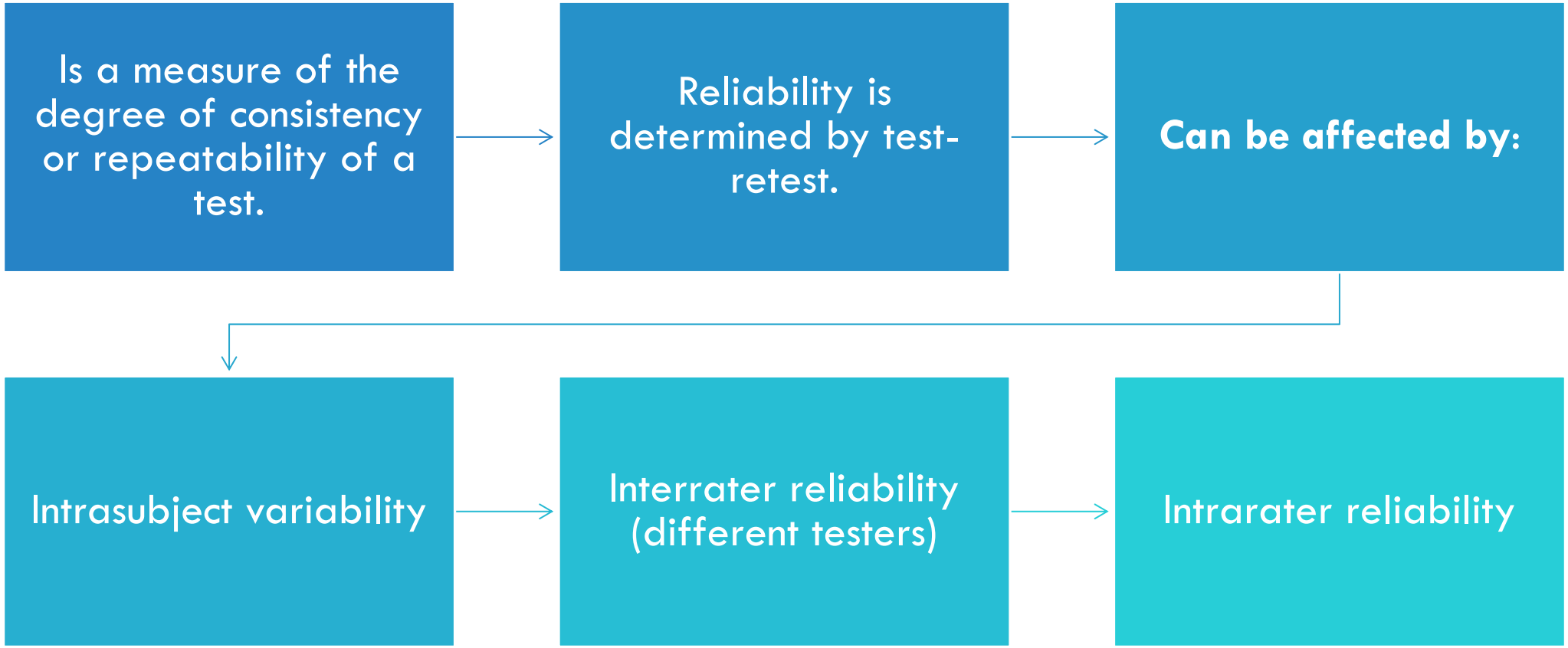
EVALUATION OF TEST QUALITY: VALIDITY

CONSTRUCT VALIDITY (THE TEST ACTUALLY MEASURES WHAT IT WAS DESIGNED TO MEASURE)

FACE VALIDITY (IS THE APPEARANCE TO THE ATHLETE AND OTHER CASUAL OBSERVERS. MIGHT INFLUENCE HOW THE ATHLETE RESPONDS TO THE TEST)

CONTENT VALIDITY (THE TEST COVERS ALL RELEVANT COMPONENT ABILITIES OF THE SPORT IN A PROPORTIONATE MANNER)

EVALUATION OF TEST QUALITY: RELIABILITY



STANDARDIZATION

A standardized test is designed so that the questions which are asked, the conditions in which the test is taken, the way in which the test is marked and the interpretations of the test results are the same for all subjects who perform the test.

PRACTICALITY

The test is simple to design, easy to administer and easy to score.

The layout should be easy to follow and understand.

It stays within appropriate time constraints

It is relatively easy to administer

Its correct evaluation procedure is specific and time-efficient

FROM PREMIUM TO PRACTICAL

Expensive

- Force plates / Optojump
- 3D motion capture systems
- Isokinetic dynamometers
- GPS
- Metabolimeters

WHY TESTING?

Athletic talent **identification**

Identification of physical abilities in need of improvement

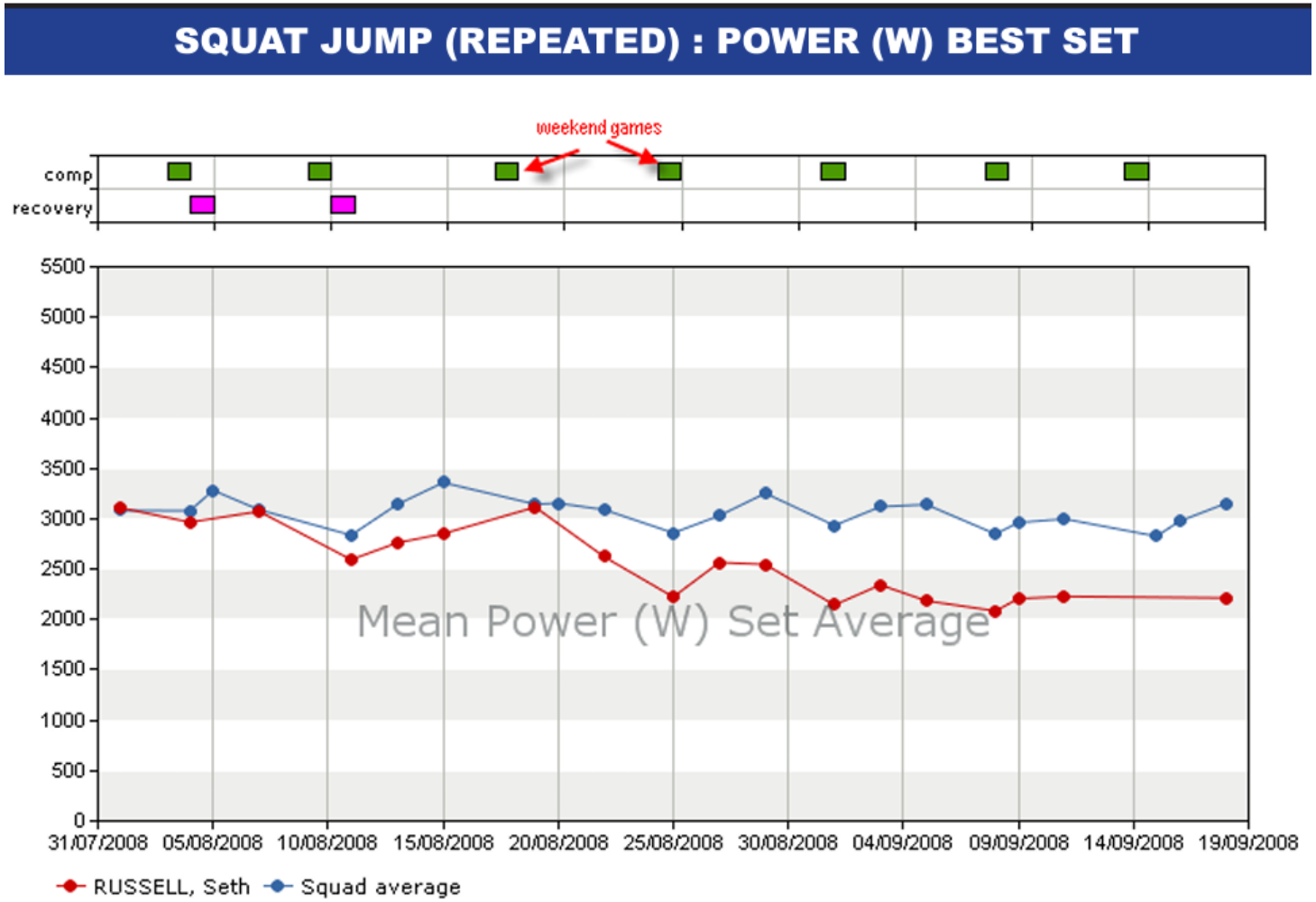
Monitoring / adjusting the training load

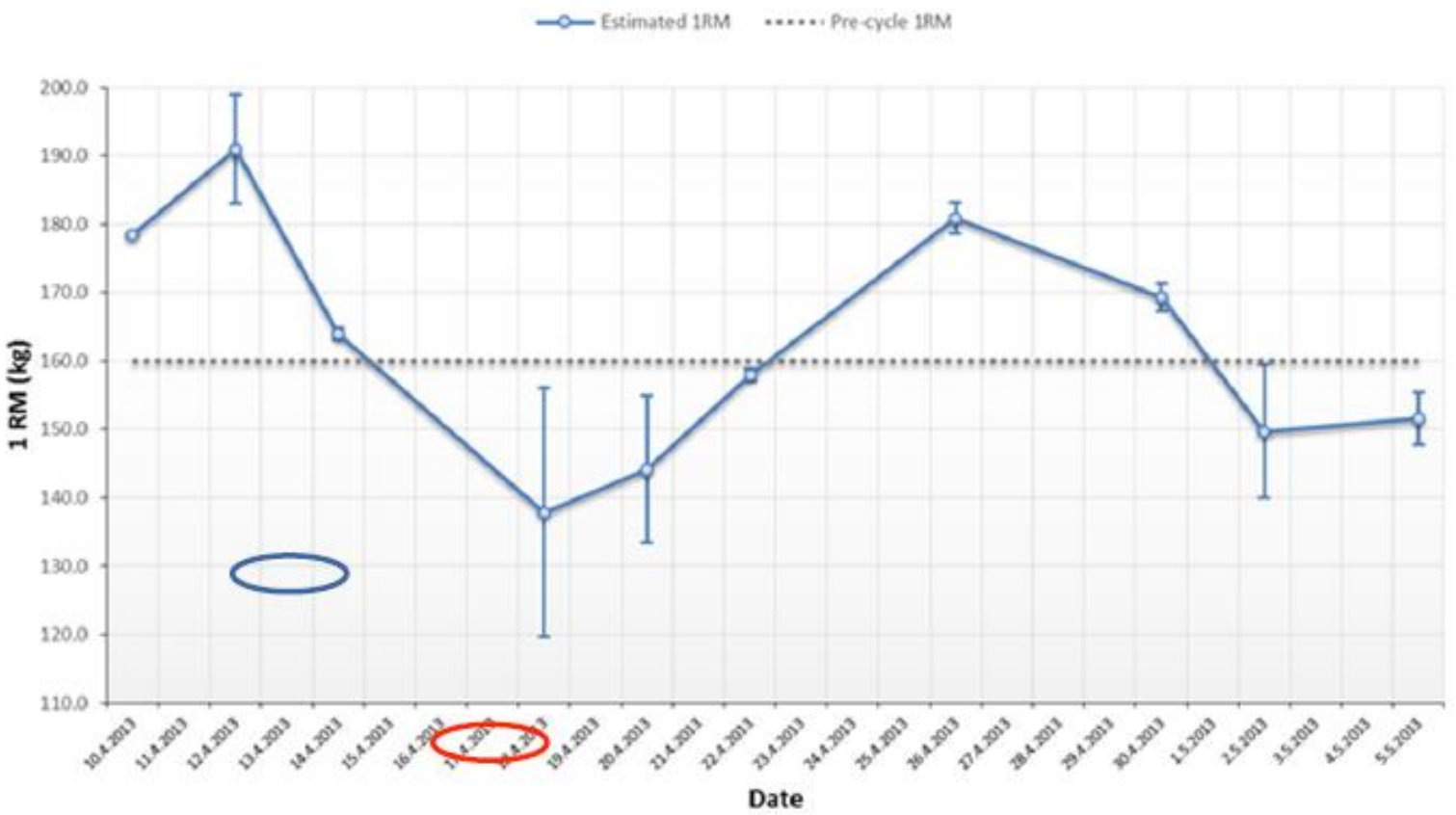
Readiness to train

Monitoring the stages of injury recovery

Motivation (?)

TESTING/MONITORING READINESS





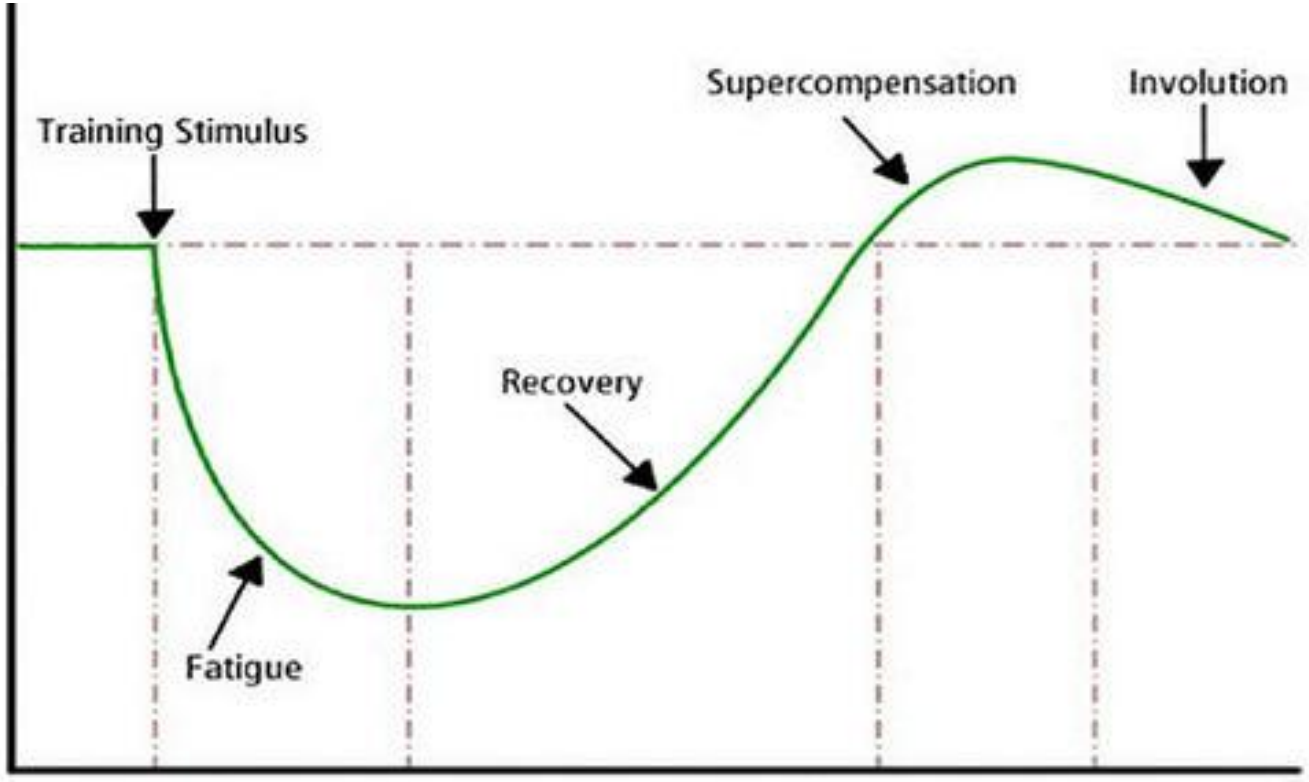
DAILY CHANGES OF 1RM

WHAT TO TEST? HOW OFTEN?

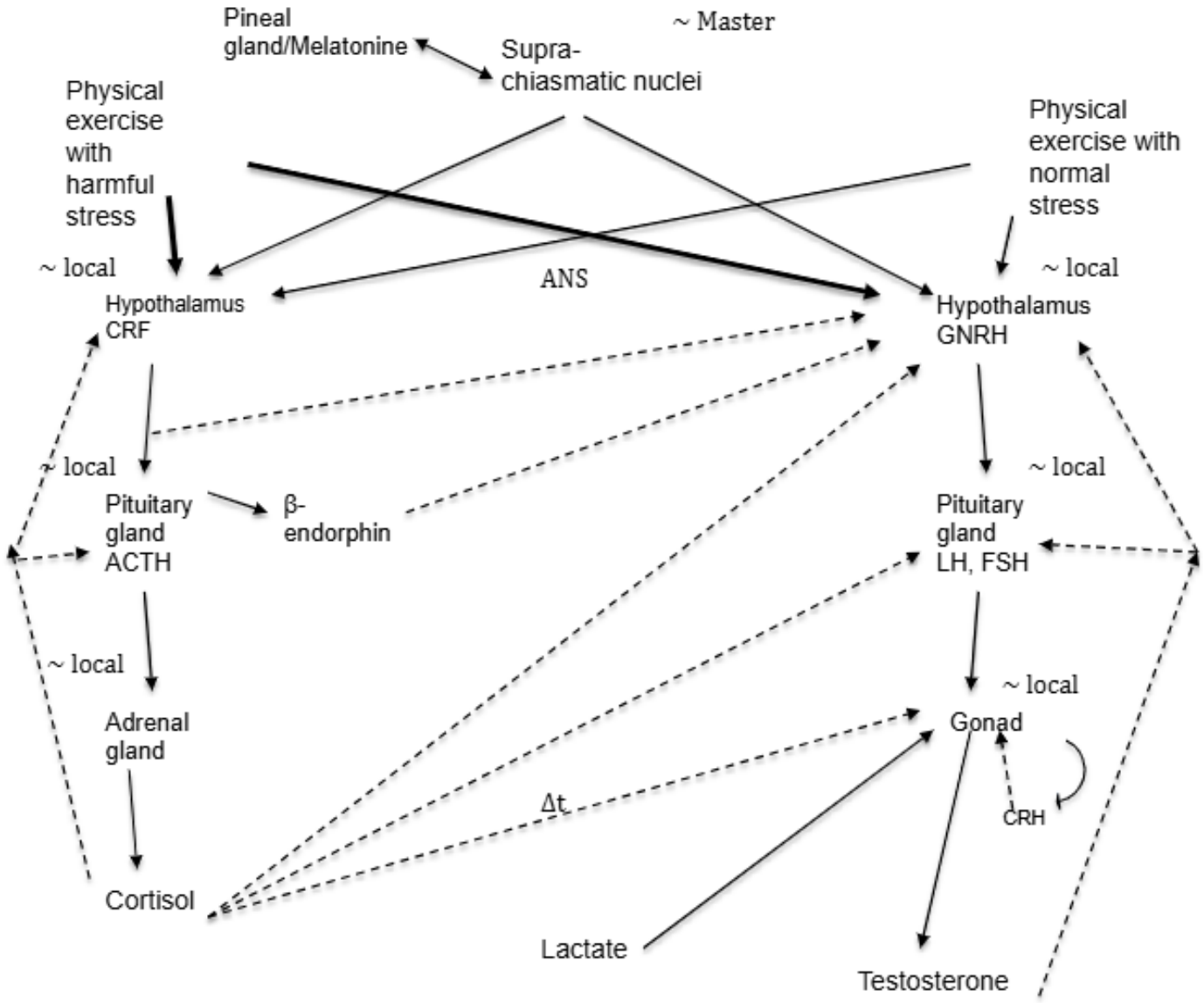
Fatigue can be multifactorial:

- Neuromuscular
- Metabolic
- Cardiovascular
- Endocrine Tf/C
- Emotional
- Psychological

FITNESS-FATIGUE



T(FREE)/C RATIO



ENDOCRINE TF/C

Neuromuscular and Endocrine Responses of Elite Players During an Australian Rules Football Season

in International Journal of Sports Physiology and Performance

Click name to view affiliation

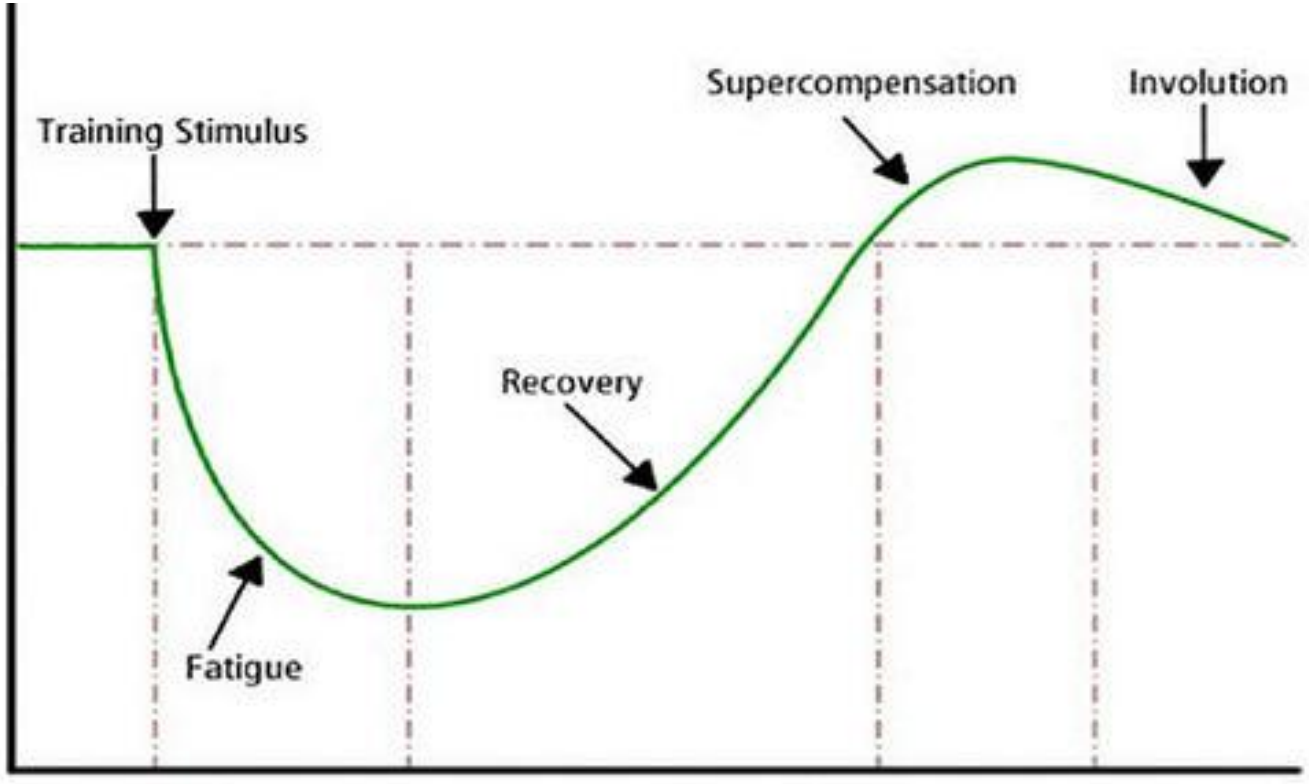
Stuart J. Cormack, Robert U. Newton, Michael R. McGuigan, and Prue Cormie

Behaviour of saliva cortisol [C], testosterone [T] and the T/C ratio during a rugby match and during the post-competition recovery days

Original Article | Published: 29 May 2003

Volume 90, pages 23–28, (2003) Cite this article

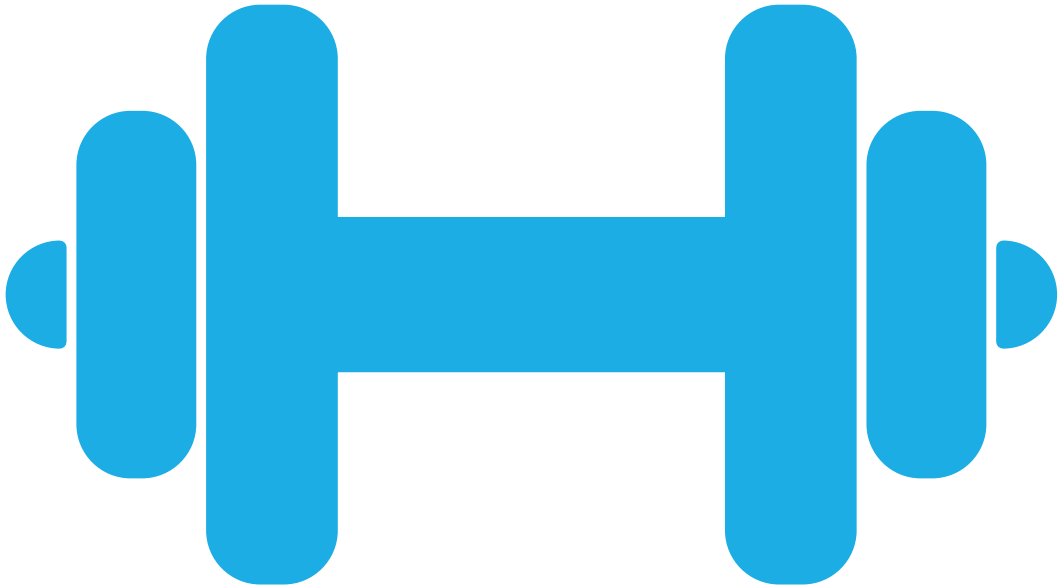
FITNESS-FATIGUE



TESTING ORDER

Tests should be sequenced correctly so a test will not affect performance on a subsequent test in the test battery:

1. Anthropometric measurements
2. Power
3. Speed
4. Strength
5. Muscle endurance
6. Aerobic activities



WHY TESTING?

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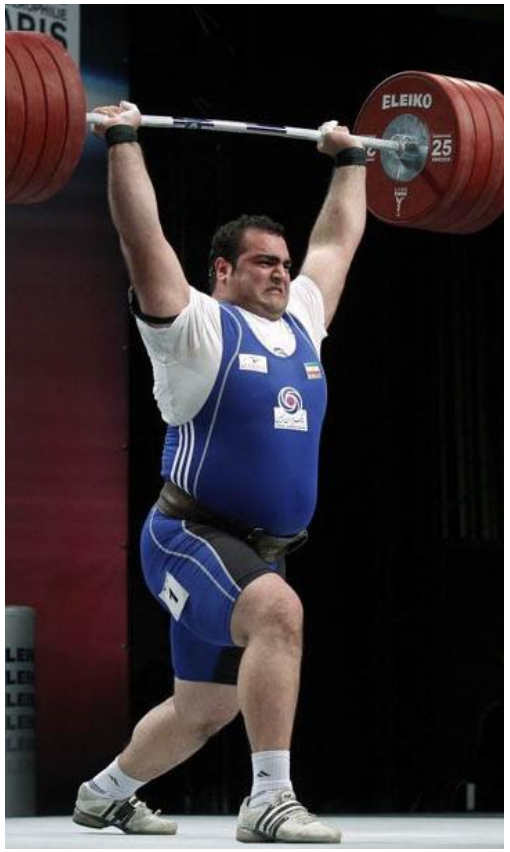
Motivation (?)

WHAT IS POWER?

Power is the product of force and velocity.

By breaking apart the components, you can tell where they are sufficient and deficient



F-V PROFILE IS THE VISUALIZATION OF HOW AN ATHLETE USES BOTH FORCE, VELOCITY, AND POWER

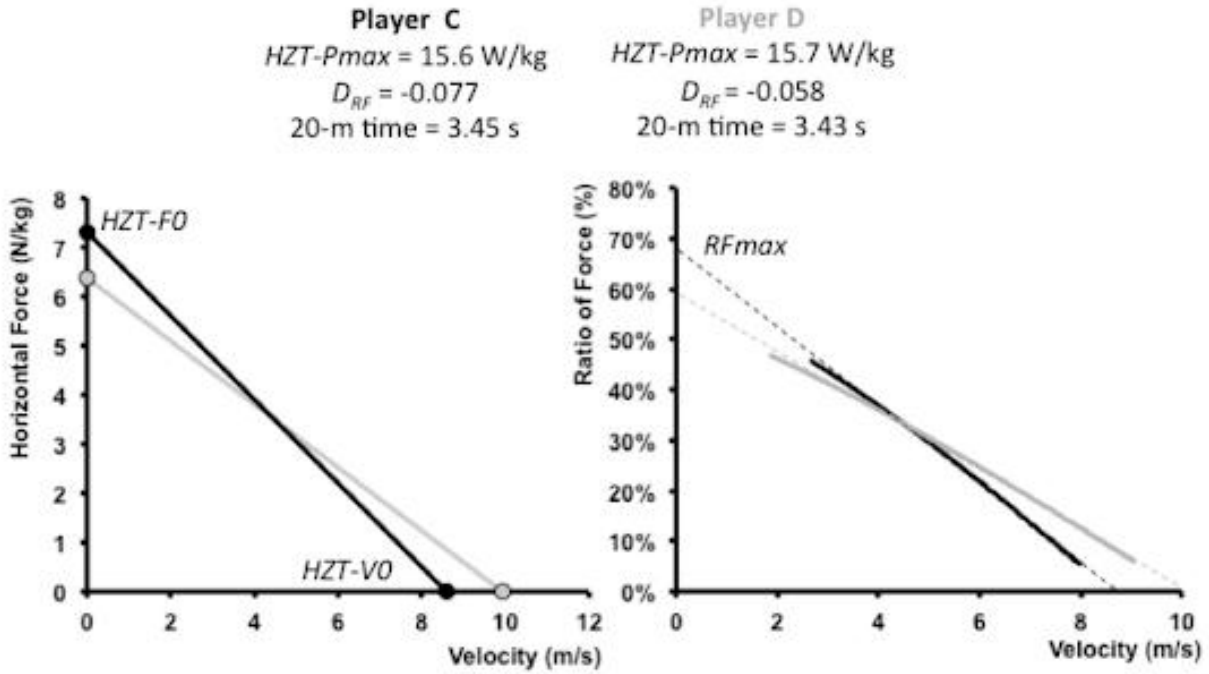
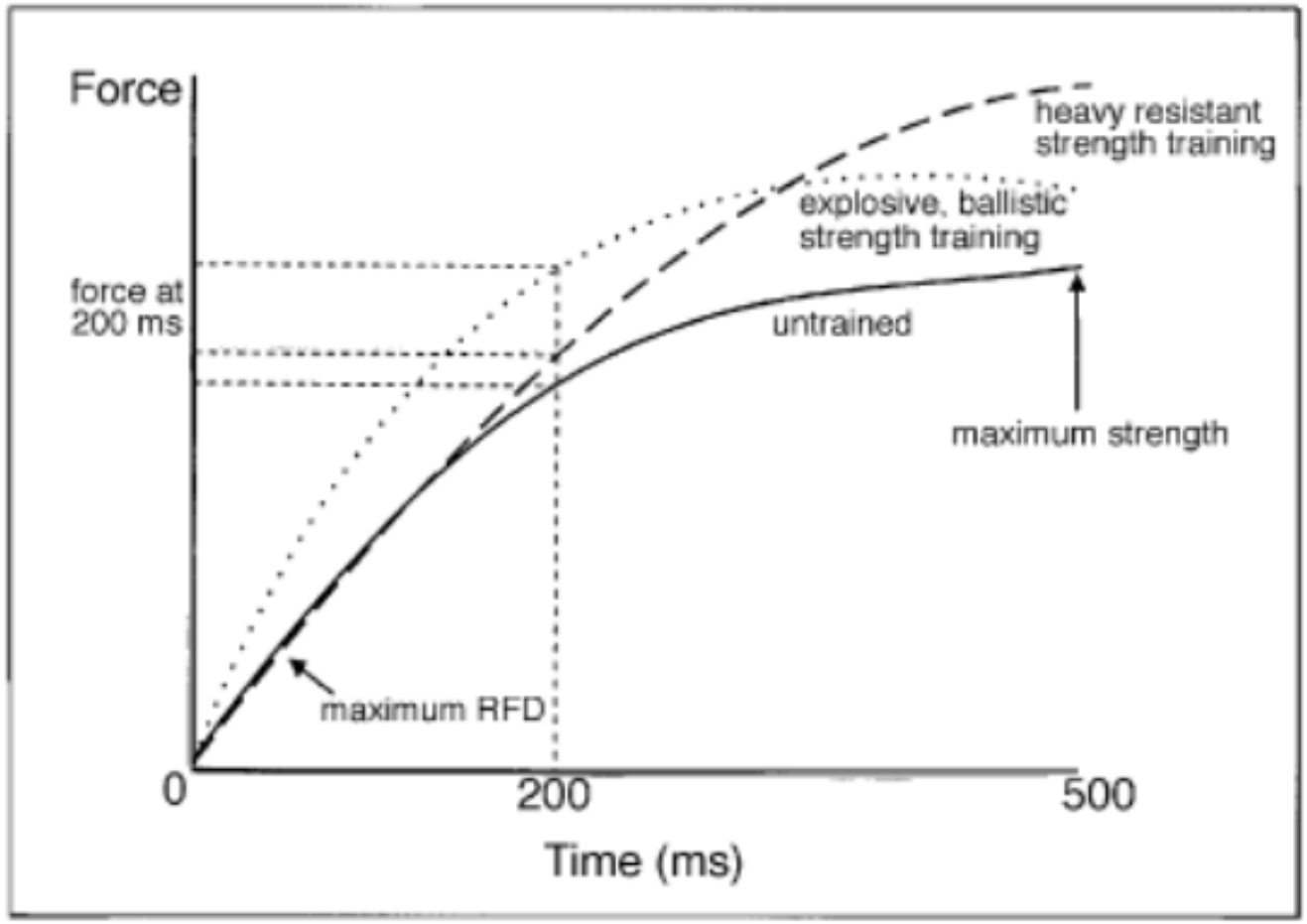


Figure 3. *Horizontal force-velocity profiles of two elite rugby union players (body mass for C: 108.8 kg and D: 86.1 kg) obtained from maximal 30-m sprints. Both players reached their maximal running speed before the 30-m mark.*

Step	Description	Formula/Measurement
1. Data Collection	Perform vertical jumps with different loads	- Bodyweight, 20%, 40%, 60% of body mass added. Up to 100% for Bosco index (SJ LD/SJ UL)x100
2. Measurements	For each jump, measure:	- Jump height (h) - Body mass (m) + additional load - Push-off distance (hPO)
3. Calculate Velocity	Calculate mean velocity for each jump	v = sqrt(2 * g * h) where g = 9.81 m/s^2
4. Calculate Force	Calculate mean force for each jump	F = m * (g + h/hPO)
5. Plot Data	Create a graph	Plot F vs v for all jumps
6. Linear Regression	Fit a linear regression to the data points	F = F0 - a*v F0 = y-intercept (max force at v=0) a = slope of the line
7. Calculate V0	Theoretical max velocity at zero force	V0 = F0/a
8. Calculate Pmax	Theoretical maximum power	Pmax = (F0 * V0) / 4

IMPORTANCE OF VELOCITY



METHODS OF CALCULATION

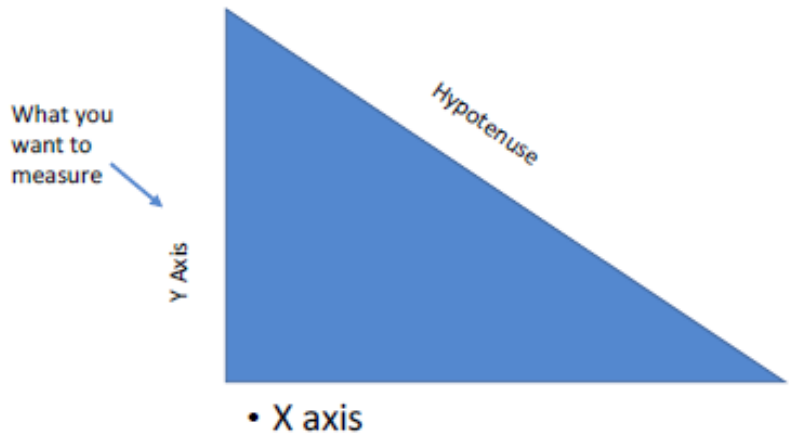
- LPT
  - Essentially, a stopwatch and a measuring tape
- Accelerometer
  - Accel/Gyro/magnetometer
    - Use algorithms to detect start/stop
    - Use algorithms to detect bar path
    - Some measurement issues
- Camera based
  - Use a reference measurement for distance
  - Use a frame rate for time
  - Start and stop of the bar are issues for the algorithm.
- Laser based
  - Uses laser to determine position, which determines distance

DIFFERENT USE

- Autoregulation
- Training load monitoring
- Readiness
- Testing
- F-V

LPT Warning

Any deviation away from completely vertical measures the hypotenuse unless there is X-axis correction



- X axis

ADVANTAGES OF VBT
#1- INTENT

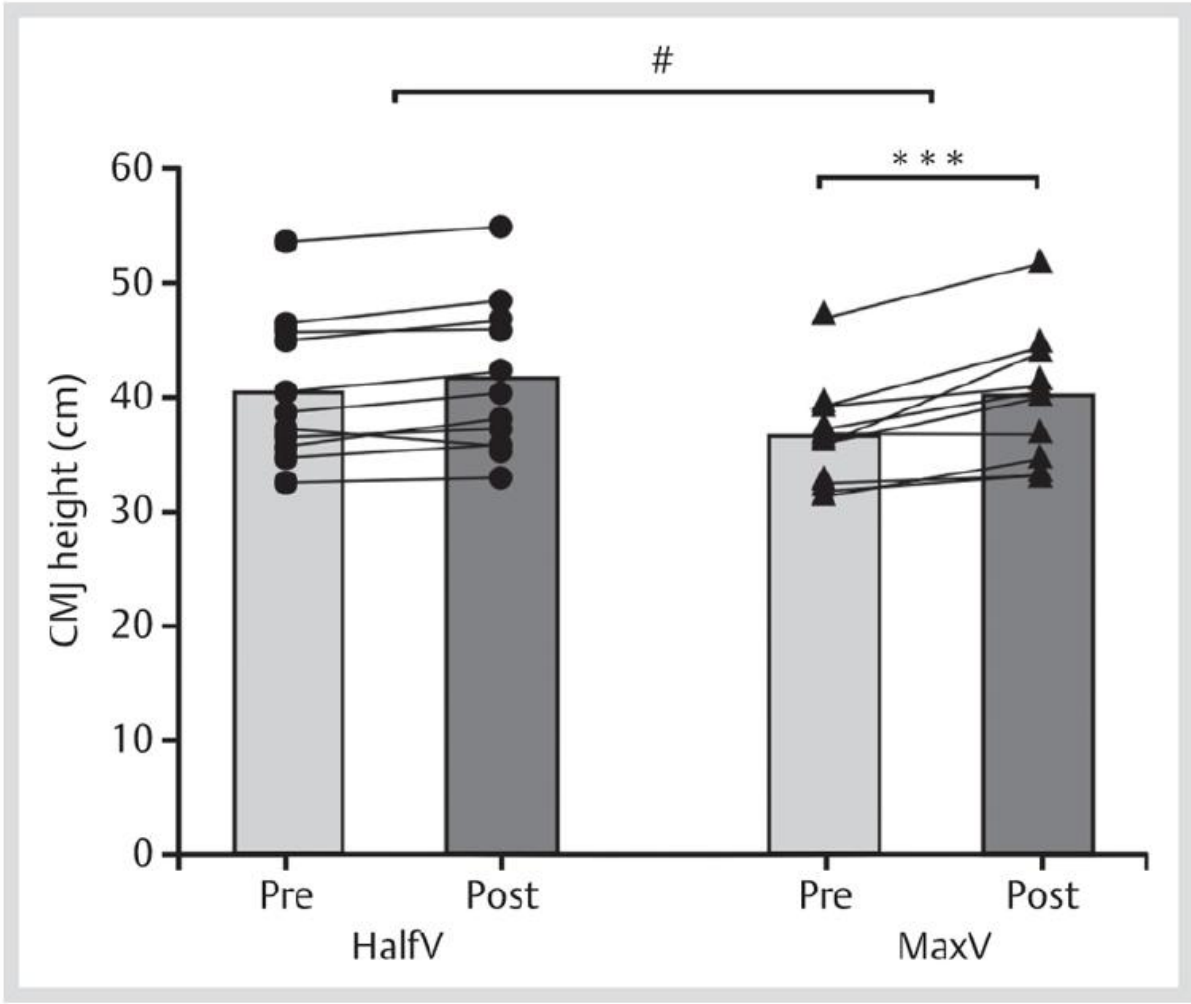
SAID-Transfer of Trainedness/Feedback

- Randell et al. Effect of instantaneous performance feedback during 6 weeks of velocity based resistance training on sport-specific performance tests

	Vertical jump			Horizontal jump			10-m Sprint			20-m Sprint			30-m Sprint		
	Pre	Post	Percent change	Pre	Post	Percent change	Pre	Post	Percent change	Pre	Post	Percent change	Pre	Post	Percent change
Feedback	0.61 (0.06)	0.64 (0.07)	4.6	2.50 (0.16)	2.56 (0.15)	2.6	1.74 (0.04)	1.73 (0.05)	1.3	3.03 (0.06)	3.00 (0.06)	0.9	4.20 (0.11)	4.14 (0.11)	1.4
Non–feedback	0.66 (0.06)	0.67 (0.01)	2.8	2.58 (0.20)	2.59 (0.20)	0.5	1.79 (0.10)	1.79 (0.09)	0.1	3.06 (0.16)	3.06 (0.15)	0.1	4.25 (0.21)	4.26 (0.19)	−0.3

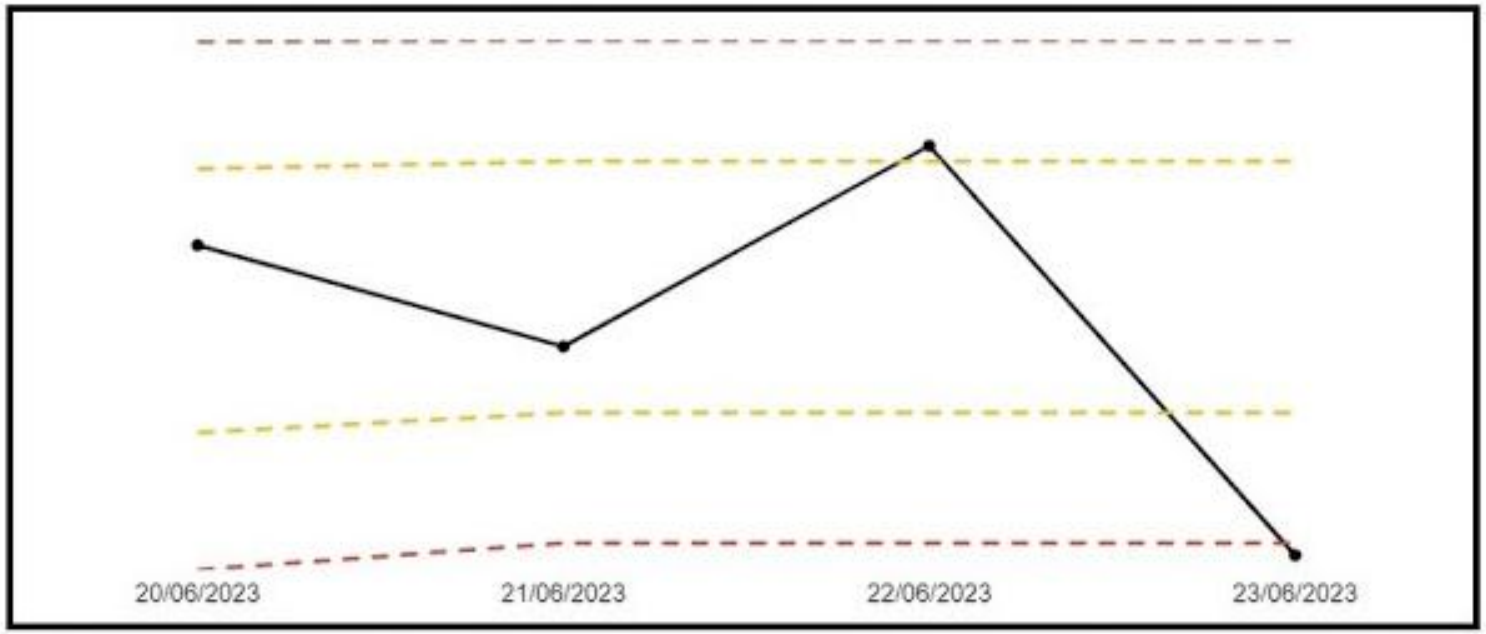
	Vertical jump	Horizontal jump	10-m sprint	20-m sprint	30-m sprint
Effect size	0.18 (Small)	0.28 (Small)	−0.28 (Small)	−0.20 (Small)	−0.46 (Moderate)
Positive	45 (Possibly)	83 (Likely)	65 (Possibly)	49 (Possibly)	99 (Almost certainly)
Trivial	51	17	33	49	1
Power	0.131	0.851	0.791	0.860	1.000

ADVANTAGES OF VBT #1- INTENT



ADVANTAGES OF VBT #2- STRESS MANAGEMENT

Readiness monitoring (CMJ)



Advantages of VBT #3- Motivation and individualization

- SET UP CHALLENGES (HIGHEST POWER, HIGHEST VELOCITY, HIGHEST FORCE, HIGHEST RSI

  FOLLOWING INDIVIDUAL LOADS AND ADJ INTENSITY

Randell et al. Effect of instantaneous performance feedback during 6 weeks of velocity based resistance training on sport-specific performance tests

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PRACTICAL SESSION PLAN

This table outlines each segment of the practical session, detailing activities and how long each part will take for effective management.

SESSION PART	ACTIVITY	DURATION
Warm-Up and Setup	Dynamic warm-up, station setup	5 min
Testing Station 1	CMJ with MyJump App	15 min
Testing Station 2	Force-Velocity Profile analysis with LPT	15 min
Testing Station 3	Load-Velocity Profiling with LTP	15 min
Review and Wrap-Up	Discussion on findings	10 min