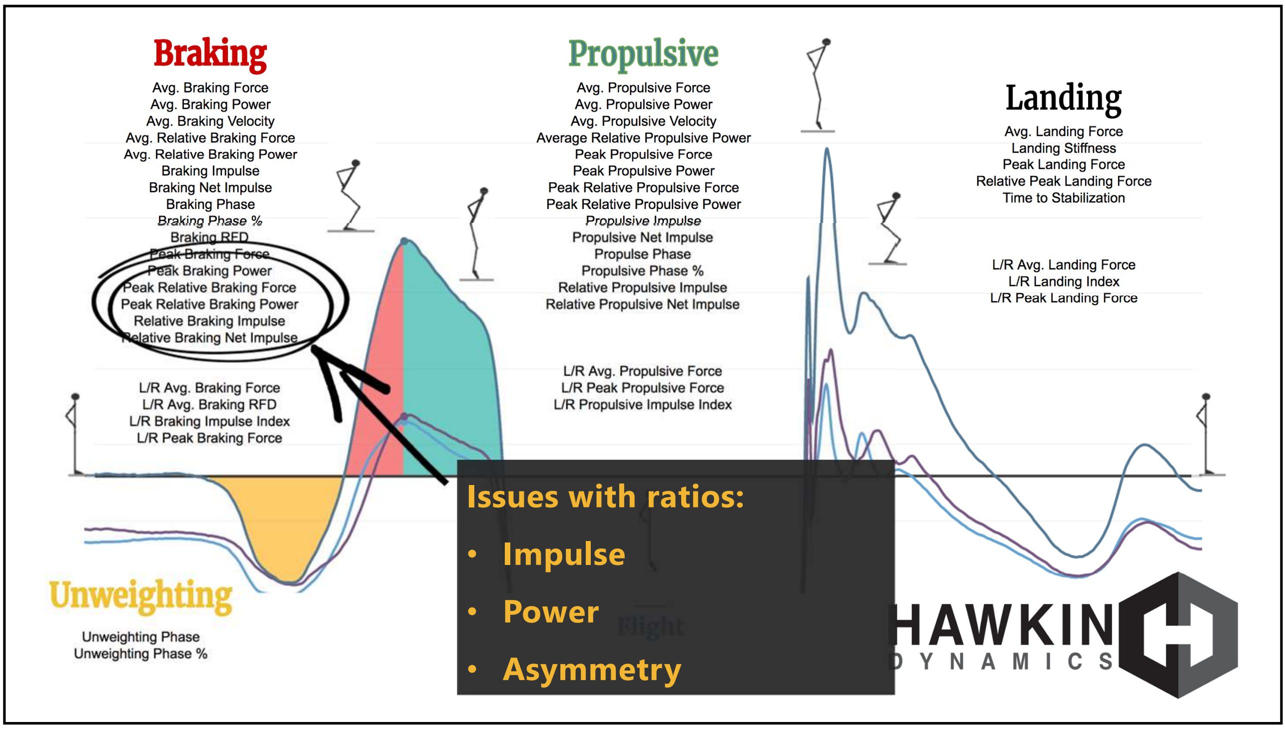
Presentation aim. How to:

1. Identify metrics that inform your practice
2. Standardize the test (apples to apples)
3. Determine how much you can trust any metric
4. N = 1 for performance (capability)
5. N = 1 for Readiness (stability)
6. Benchmarking against teammates (TSA)

Step 1. Select the metrics



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Athlete	Peak power (W)	Force at peak power (N)	Velocity at peak power ($m \cdot s^{-1}$)	How they got 4500 W
A	4500	3000	1.50	**Force-led** (big force, moderate velocity)
B	4500	2500	1.80	Balanced
C	4500	2250	2.00	**Velocity-led**
D	4500	2000	2.25	More velocity-led
E	4500	1800	2.50	**Very velocity-led**

ATHLETE	LEFT FORCE (N)	RIGHT FORCE (N)	ASYMMETRY %	INTERPRETATION (ASYM%)	INTERPRETATION (FORCES)
A	1000	1200	18%	High asymmetry — a concern	Both legs strong; asymmetry less concerning
B	600	620	3%	Low asymmetry — seems fine	Both legs weak; higher risk despite symmetry
C	800	960	17%	High asymmetry — a concern	Moderate force; both asymmetry and capacity matter
D	1400	1430	2%	Low asymmetry — no concern	Very strong athlete; asymmetry irrelevant
E	500	650	26%	Very high asymmetry — major concern	Both weak and imbalanced — highest risk

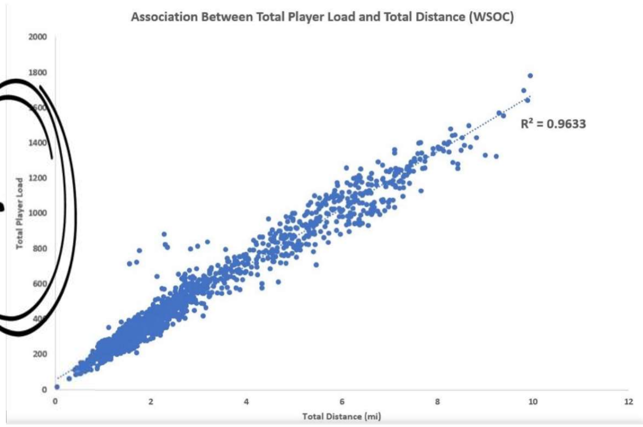
[redacted]

Blackbox metric!

It's likely you're looking at too many GPS metrics to quantify external demands.

96% of the variance in Total Player Load is explained by total distance!

Data from ~1700 data points in WSOC.



Step 2. Standardize the test

…And what happens when you don't

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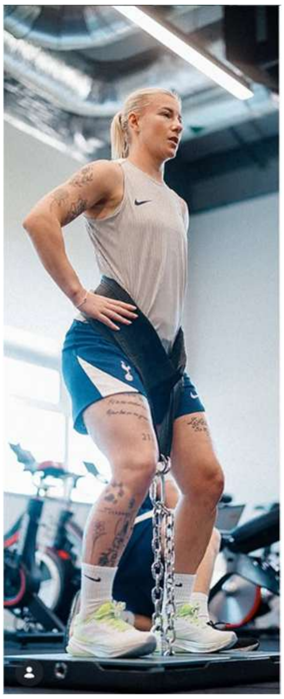
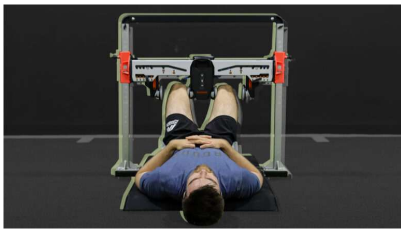
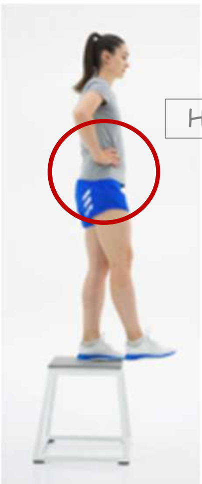




Standardise the test to:

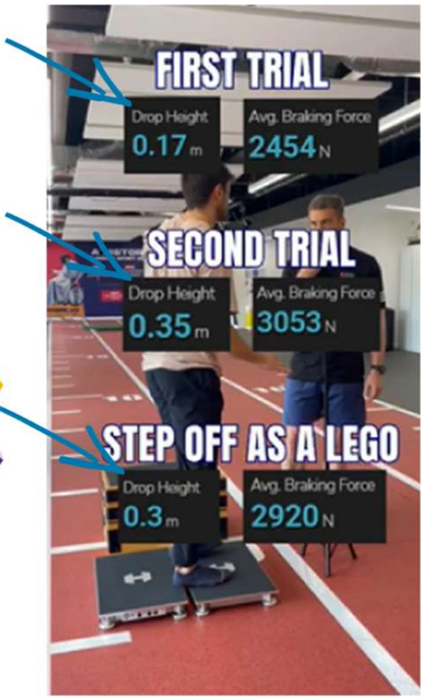
1. Isolate the muscle/s
2. Compare apples with apples

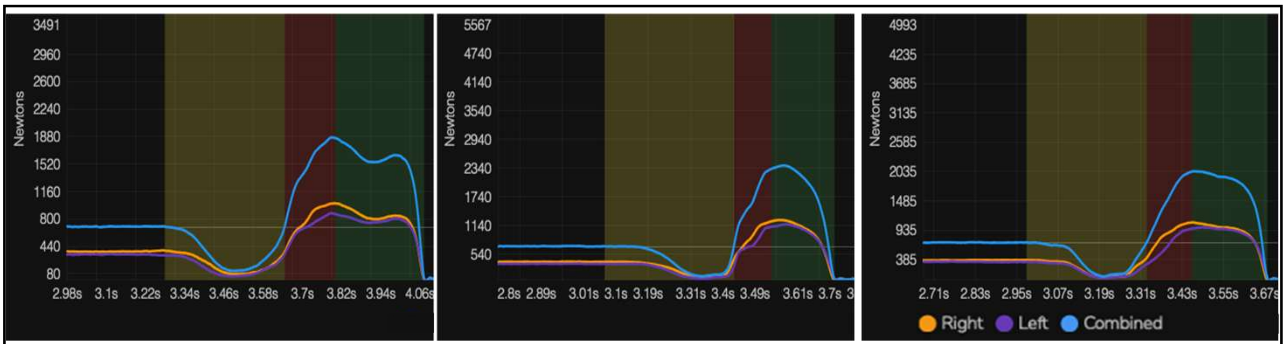
Step from the box...



Hands on hips

Walk like Lego
(with arms on hips!)





Metric	“high as you can"	“fast as you can”	“Fast and high”
Height (cm)	51		
CM depth (cm)	41		
Ave Braking F (N)	1477		
Braking phase (s)	0.15		
Ave Propulsive F (N)	1512		
Propulsive phase (s)	0.27		
TTT	0.79		
RSImod	0.64		

Step 3. Is the metric reliable

...How much should I trust it?

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Explain this to your athlete

You bench press 3 times in a week

- In session 1 you bench 70 kg
- In session 2 you bench 72 kg
- In session 3 you bench 69 kg

What about this…

You weigh yourself everyday for 5 days

- On day 1 you weigh 70 kg
- On day 2 you weigh 70.5 kg
- On day 3 you weigh 69.9 kg
- On day 4 you weigh 70.1
- On day 5 you weigh 70.3

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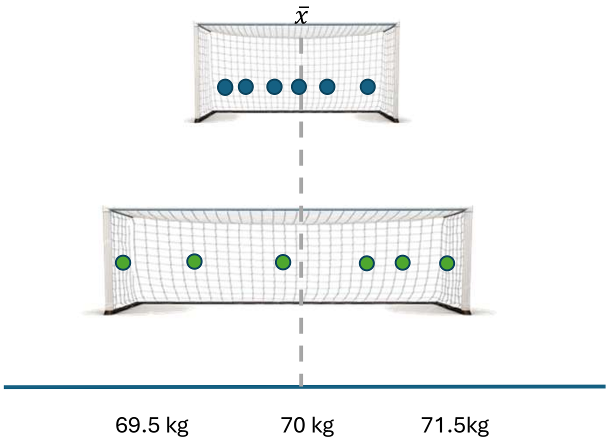
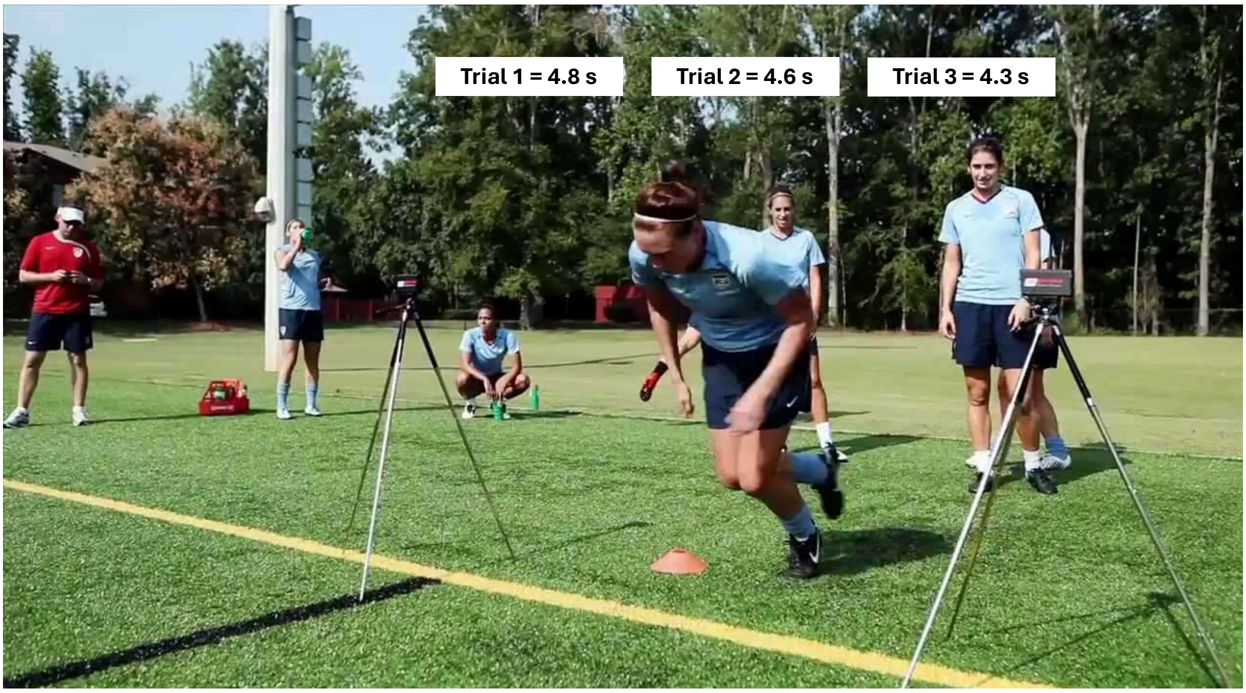
Which weighing scale would you buy?





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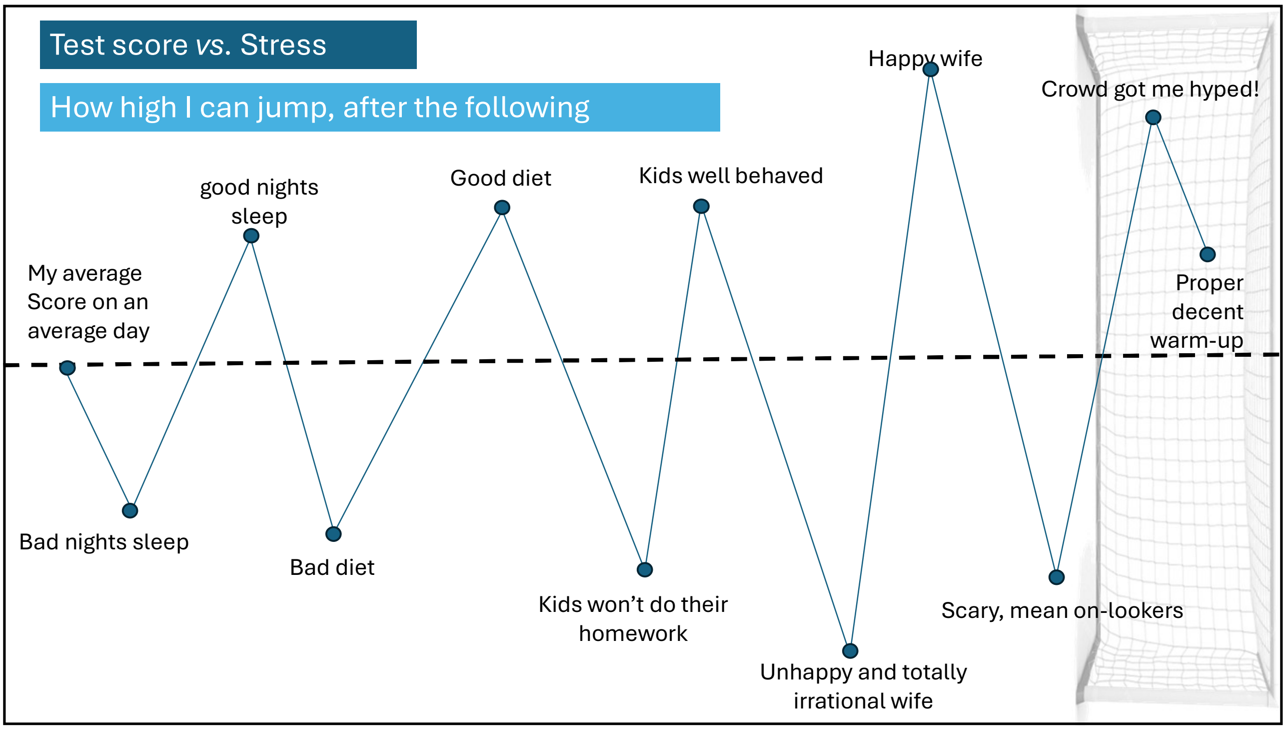

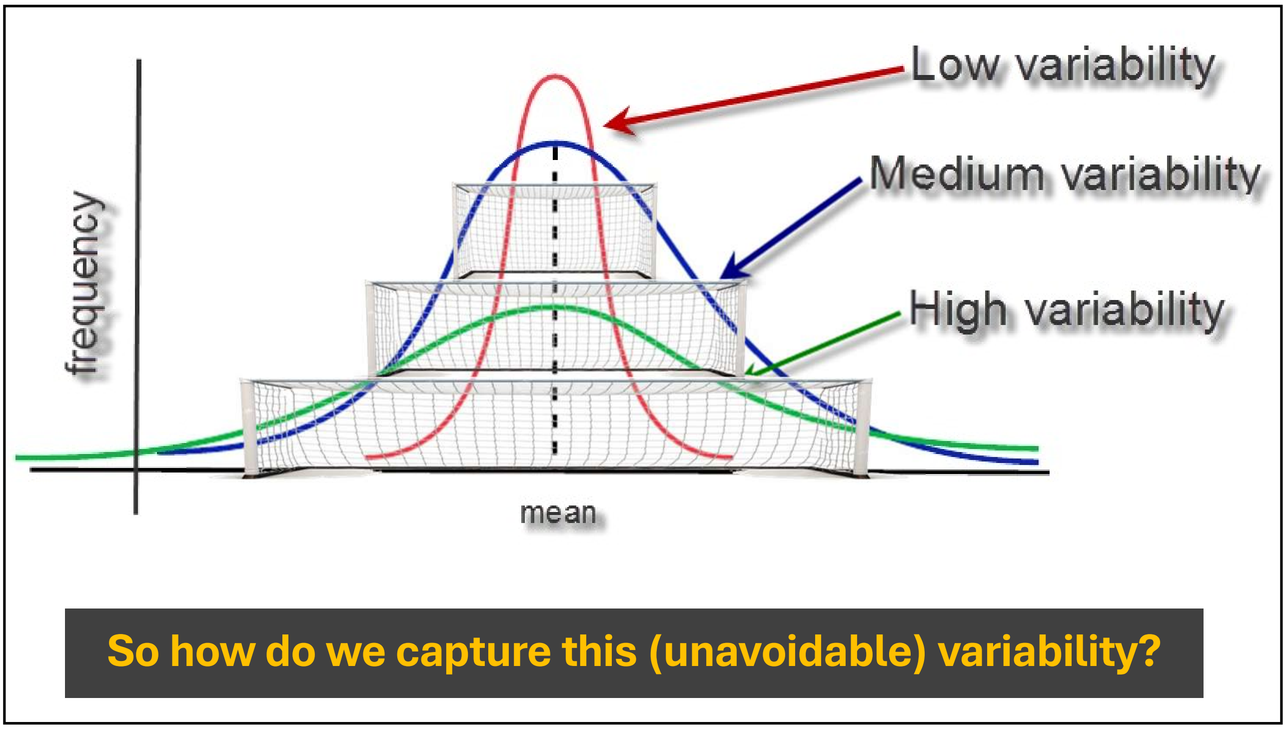

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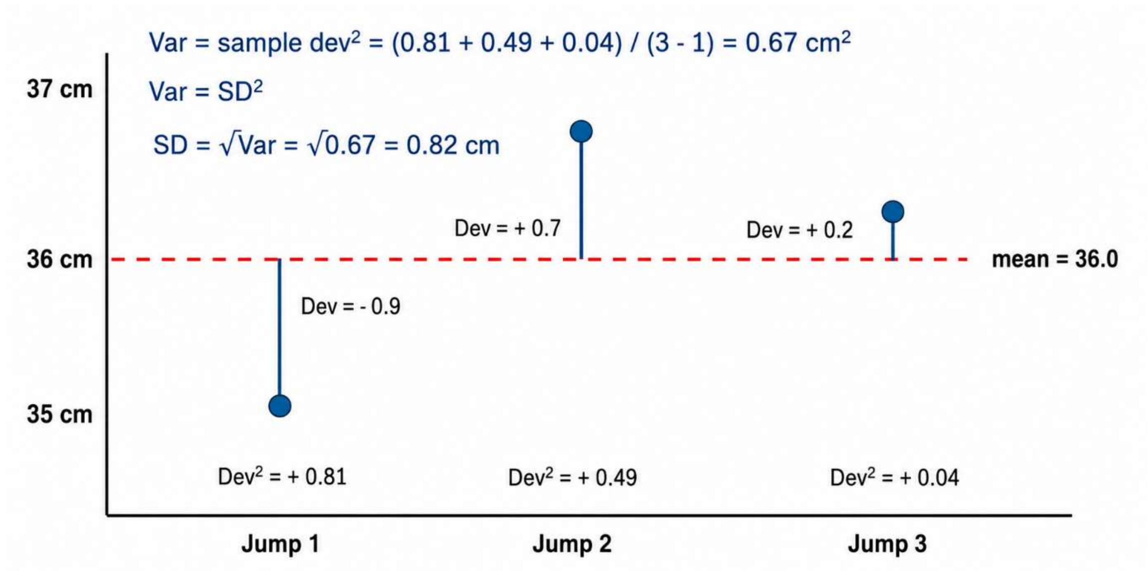
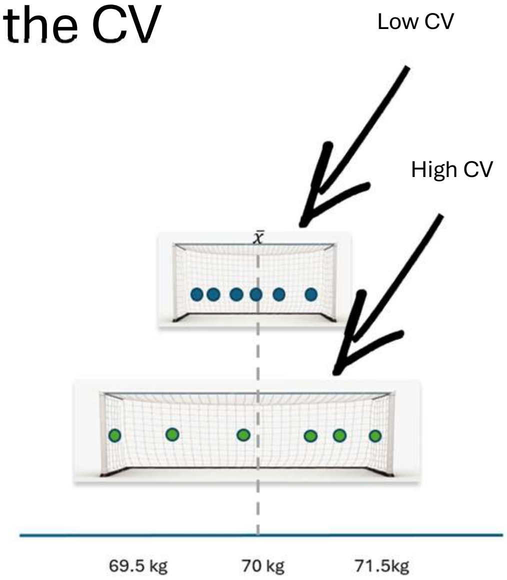
The Standard Deviation



SD relative to the mean = the CV

- The CV is an intuitive representation of variation
- It is therefor our first line of defence
- The higher the CV the more varied the data points



Original Research — Journal of Strength and Conditioning Research

Intra- and Interday Reliability of Weightlifting Variables and Correlation to Performance During Cleans

Angela M. Sorensen,[1] Shyam Chavda,[1] Paul Comfort,[2] Jason Lake,[3] and Anthony N. Turner[1]

[1]London Sports Institute, Middlesex University, London, United Kingdom; [2]Human Performance Laboratory, University of Salford, Salford, United Kingdom; and [3]Department of Sport and Exercise Sciences, University of Chichester, Chichester, United Kingdom

Level one: Which variables are reliable?

Level 2: Which variables are highly correlated (multicollinearity)?

Level 3. Of the correlated variables which one statistically or logically best explains the performance outcome

Results

Sixteen of the 70 variables analyzed were found to have good to excellent intra- and interday ICC (0.779–0.994 and 0.969–0.996, respectively) and CV (0.64–6.42 and 1.14–6.37, respectively) values (30,36). Using the Pearson's correlation coefficients (r = 0.5–1.0 at $p < 0.005$), these 16 variables were also shown to have strong correlations (r = 0.880–0.988) to cleans performed at 90% 1RM. From these 16 variables, bar work variables that were used to calculate bar power variables were then excluded because they are derived from the same force and displacement data and represented duplicate data. The resulting variables were further assessed for multicollinearity, which can be seen in Table 3. This system of filtering resulted in a total of 11 variables exhibiting "good to excellent" ICC with a CV of ≤10% for both intraday and interday reliability measures and with correlations to clean performance as reported in Table 2.

Table 2. Reliability of countermovement jump concentric force–time and

	Trial 1 Mean ± SD	Trial 2 Mean ± SD	%CV (LCI, UCI)
CON Duration (ms)	2.80 ± 0.50	2.86 ± 0.58	4.67 (3.84, 5.49)
CON Impulse (N·s)	158.46 ± 45.23	158.77 ± 45.82	1.62 (1.03, 2.20)
CON Mean Force (N)	1273 ± 319	1265 ± 321	2.15 (1.81, 2.48)
CON Mean Power (W)	1633 ± 544	1630.7 ± 553	3.20 (2.55, 3.86)
CON Peak Force (N)	1605 ± 407	1612 ± 418	2.91 (2.44, 3.37)
CON Peak Velocity ($m \cdot s^{-1}$)	2.38 ± 0.26	2.38 ± 0.28	1.44 (0.89, 1.99)
CON RFD ($N \cdot s^{-1}$)	720 ± 1138	759 ± 1244	**76.45 (66.86, 86.03)**
CON RPD ($W \cdot s^{-1}$)	14,673 ± 6521	14,308 ± 6599	7.15 (6.08, 8.21)
Jump Height (Flight) (cm)	27.30 ± 6.41	27.46 ± 6.36	2.92 (2.49, 3.35)
Jump Height (Imp-Dis) (cm)	26.01 ± 6.40	26.17 ± 7.09	3.21 (2.09, 4.33)
Jump Height (Imp-Mom) (cm)	25.96 ± 6.39	26.13 ± 7.09	3.20 (2.08, 4.33)
Lower Limb Stiffness ($N \cdot m^{-1}$)	4971 ± 3081	6181 ± 10,643	**10.21 (7.59, 12.82)**
Peak Power (W)	2979 ± 972	2955 ± 982	2.48 (1.88, 3.08)
RSI-modified ($m \cdot s^{-1}$)	0.37 ± 0.11	0.37 ± 0.12	5.81 (4.87, 6.75)

Pick one

Are you calculating jump momentum?

WTF!

Same thing

Only if you take height and TTT

sports — MDPI

Article

Identifying Reliable and Relatable Force–Time Metrics in Athletes—Considerations for the Isometric Mid-Thigh Pull and Countermovement Jump

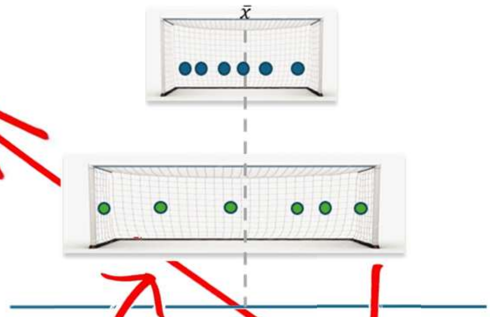
Justin J. Merrigan [1,*], Jason D. Stone [1], W. Guy Hornsby [1,2] and Joshua A. Hagen [1]

Let's now move towards individual analysis

=STDEV.S(D2:F2)/AVERAGE(D2:F2)*100

CMJ_1	CMJ_2	CMJ_3	CV%
38.1	43.6	47.7	11.2
34.1	35.7	36	2.9
42.8	42.2	41.9	1.1
50.4	52.2	52.2	2.0
37	36.1	36.9	1.3
42.1	40.7	45.1	5.3
44.5	42.3	45.2	3.4
37.9	33.3	39.6	8.8
43.6	44.9	37.4	9.6
35.4	40.1	39.5	6.7
45.3	44.4	43.9	1.6
46.6	47.7	47.7	1.3
30.2	31	31.5	2.1
50.8	51.2	53.7	3.0
41	46.7	36.4	12.5
43.7	40.4	43	4.1
43.6	44.1	48.9	6.4
43.6	44.8	43.5	1.6
51.6	50.4	53.6	3.1
27.8	28.5	28.7	1.7
29	28.3	30.9	4.6
29	27.7	26.3	4.9
30.3	35.7	34.2	8.3
34.9	36.1	35.4	1.7
39.7	**40.3**	**40.8**	**4.6**

The SD



So how much do we need to improve by in the next test?

What value represents the width of these goal posts?

Issues using the average CV?

Variability helps us define thresholds for meaningful change in follow-up tests.

But when we compare two test scores, we have two sets of variability to account for

We use propagation of variance to add the variability from both tests.

And we compare the **signal** relative to the **noise**?

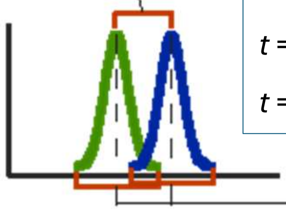
For example, consider group-based probability (NHST) statistics

$$\frac{\text{signal}}{\text{noise}} = \frac{\text{difference between group means}}{\text{variability of groups}}$$

$$= \frac{\bar{X}_T - \bar{X}_C}{SE(\bar{X}_T - \bar{X}_C)}$$

$$= \text{t-value}$$

$$SE = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

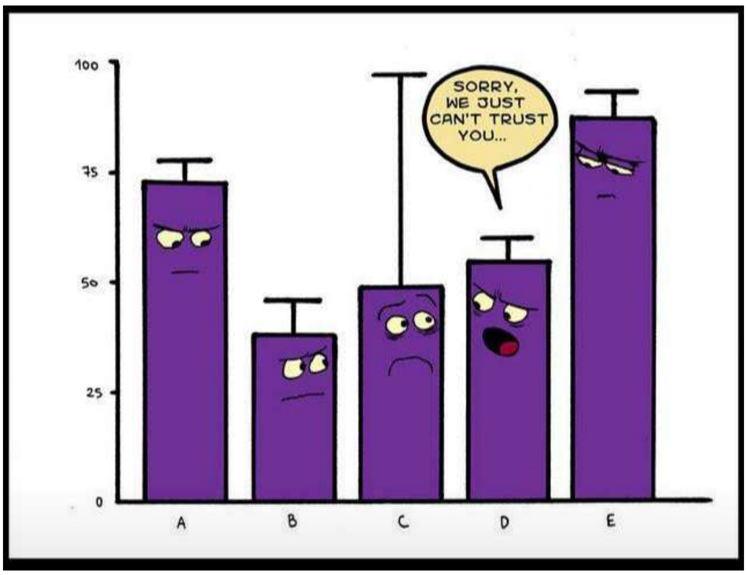


t = (45 – 41) / SQRT (5^2/16 + 5^2/16)

t = 4 / SQRT (3.125)

t = 2.26, p = 0.031

Probability of getting this value, assuming no difference between groups is 3%



How to reduce the noise (***SD)***

The tester

- Expert
- Strict
- Coaching cues

Post CMJ – Pre CMJ
Variability

The environment

- Temperature
- Audience
- competition
- Music

The athlete:

- Homogenous group
- Technique
- Motivation
- Biological variability

The equipment

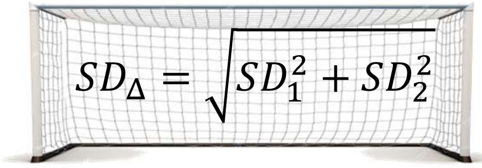
- Recording frequency
- Calibration
- Unobtrusive

Step 4. Individual athlete analysis

…determining meaningful change in performance

Combining uncertainty across two tests: Propagation of variance

The SD of the difference (i.e., expected noise in the change score) is therefore:



$$SD_\Delta = \sqrt{SD_1^2 + SD_2^2}$$

How much change would you expect to see purely based on variability

Once SD_Δ is known, the change can be expressed relative to its expected noise **(signal-to-noise ratio)**:

$$Noise\ scaled_\Delta = \frac{\text{Perf}_1 - \text{Perf}_2}{SD_\Delta}$$

- Stable: $|Perf_\Delta| < 1$
- Likely change: $1 \leq |Perf_\Delta| < 2$
- Meaningful change: $|Perf_\Delta| \geq 2$

- **CMJ height$_1$: 37 cm | CMJ height$_2$: 40 cm SD$_1$ = 0.8 cm | SD$_2$ = 0.7 cm**
- **Performance change:** Δ = 3 cm
- **Expected noise (Propagation of Variance):**

$$SD_\Delta = \sqrt{0.8^2 + 0.7^2} = 1.06\ cm$$

- **Noise-scaled change:**

$$\frac{3}{1.06} = 2.83$$

The change in performance is almost 3 times larger than what we would expect from variability alone

- ✅ **Meaningful change (≥ 2)**

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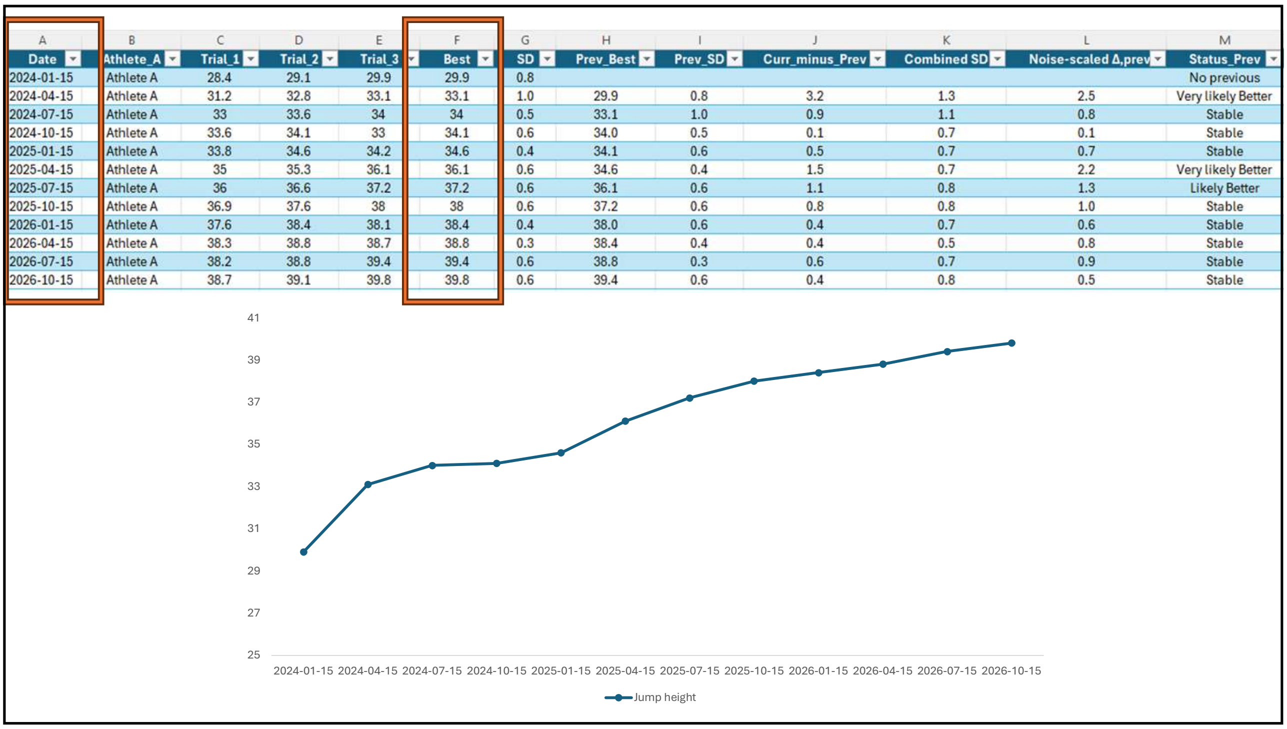
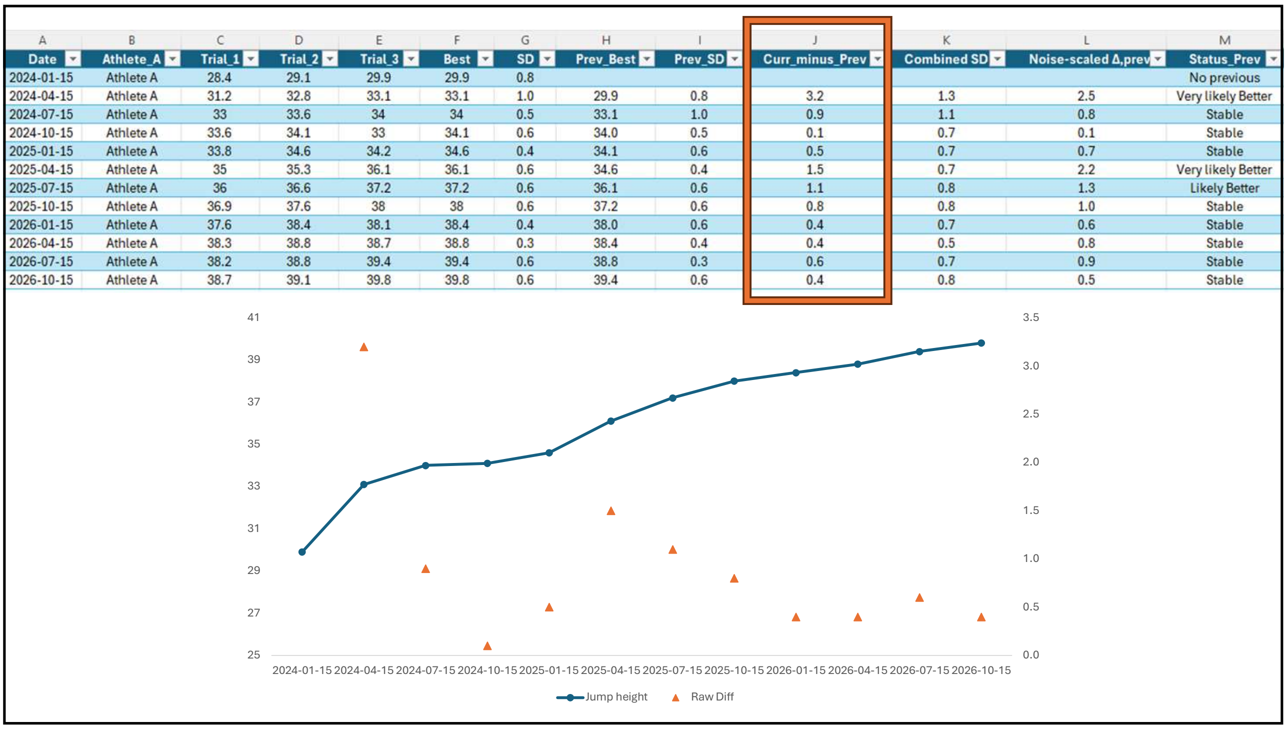


A	B	C	D	E	F	G	H	I	J	K	L	M
Date	Athlete_A	Trial_1	Trial_2	Trial_3	Best	SD	Prev_Best	Prev_SD	Curr_minus_Prev	Combined SD	Noise-scaled Δ,prev	Status_Prev
2024-01-15	Athlete A	28.4	29.1	29.9	29.9	0.8						No previous
2024-04-15	Athlete A	31.2	32.8	33.1	33.1	1.0	29.9	0.8	3.2	1.3	2.5	Very likely Better
2024-07-15	Athlete A	33	33.6	34	34	0.5	33.1	1.0	0.9	1.1	0.8	Stable
2024-10-15	Athlete A	33.6	34.1	33	34.1	0.6	34.0	0.5	0.1	0.7	0.1	Stable
2025-01-15	Athlete A	33.8	34.6	34.2	34.6	0.4	34.1	0.6	0.5	0.7	0.7	Stable
2025-04-15	Athlete A	35	35.3	36.1	36.1	0.6	34.6	0.4	1.5	0.7	2.2	Very likely Better
2025-07-15	Athlete A	36	36.6	37.2	37.2	0.6	36.1	0.6	1.1	0.8	1.3	Likely Better
2025-10-15	Athlete A	36.9	37.6	38	38	0.6	37.2	0.6	0.8	0.8	1.0	Stable
2026-01-15	Athlete A	37.6	38.4	38.1	38.4	0.4	38.0	0.6	0.4	0.7	0.6	Stable
2026-04-15	Athlete A	38.3	38.8	38.7	38.8	0.3	38.4	0.4	0.4	0.5	0.8	Stable
2026-07-15	Athlete A	38.2	38.8	39.4	39.4	0.6	38.8	0.3	0.6	0.7	0.9	Stable
2026-10-15	Athlete A	38.7	39.1	39.8	39.8	0.6	39.4	0.6	0.4	0.8	0.5	Stable



A	B	C	D	E	F	G	H	I	J	K	L	M
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2025-01-15	Athlete A	33.8	34.6	34.2	34.6	0.4	34.1	0.6	0.5	0.7	0.7	Stable
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2025-10-15	Athlete A	36.9	37.6	38	38	0.6	37.2	0.6	0.8	0.8	1.0	Stable
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2026-04-15	Athlete A	38.3	38.8	38.7	38.8	0.3	38.4	0.4	0.4	0.5	0.8	Stable
2026-07-15	Athlete A	38.2	38.8	39.4	39.4	0.6	38.8	0.3	0.6	0.7	0.9	Stable
2026-10-15	Athlete A	38.7	39.1	39.8	39.8	0.6	39.4	0.6	0.4	0.8	0.5	Stable

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Date	Athlete_A	Trial_1	Trial_2	Trial_3	Best	SD	Prev_Best	Prev_SD	Curr_minus_Prev	Combined SD	Noise-scaled Δ,prev	Status_Prev
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2024-10-15	Athlete A	33.6	34.1	33	34.1	0.6	34.0	0.5	0.1	0.7	0.1	Stable
2025-01-15	Athlete A	33.8	34.6	34.2	34.6	0.4	34.1	0.6	0.5	0.7	0.7	Stable
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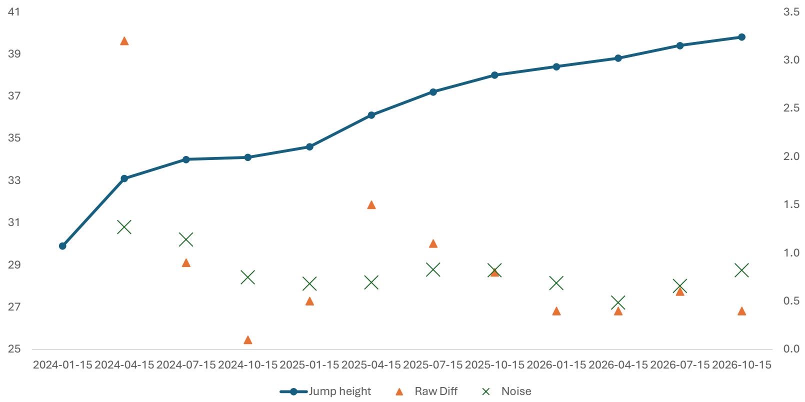
2026-07-15	Athlete A	38.2	38.8	39.4	39.4	0.6	38.8	0.3	0.6	0.7	0.9	Stable
2026-10-15	Athlete A	38.7	39.1	39.8	39.8	0.6	39.4	0.6	0.4	0.8	0.5	Stable

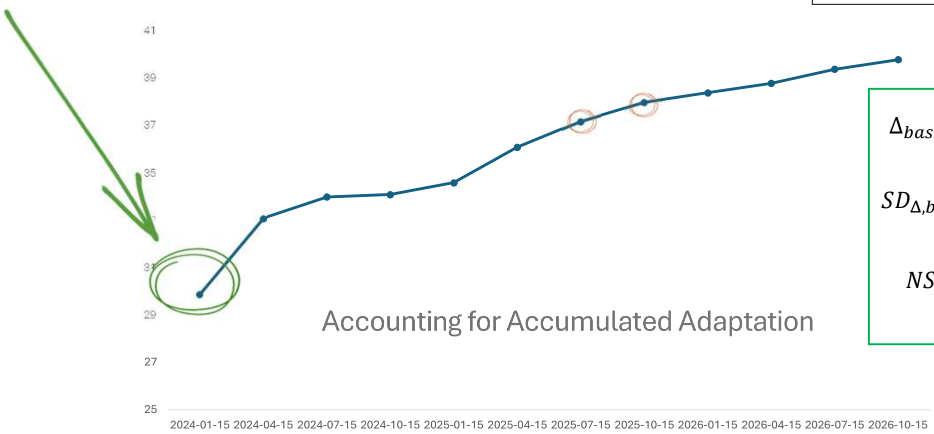


Avoiding the "Incremental Improvement Paradox"

Make comparisons relative to a base-line or start of new block

Relative to a previous

$$NS_{\Delta,prev} = \frac{\text{Perf}_t - \text{Perf}_{t-1}}{SD_{\Delta}}$$



Accounting for Accumulated Adaptation

$$\Delta_{base} = Perf_t - Perf_0$$

$$SD_{\Delta,base} = \sqrt{SD_t^2 + SD_0^2}$$

$$NS_{\Delta,base} = \frac{\Delta_{base}}{SD_{\Delta,base}}$$

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Step 5. Individual athlete analysis

...determining meaningful change in readiness monitoring

Mean

Comparison Dimension	Performance Testing	Readiness Monitoring
Focus	Capability change	State stability
Testing Frequency	Infrequent assessments	Frequent assessments
Reference Point	Baseline often fixed (start-of-block/season)	Baseline dynamic (rolling window)
Goal	Detect adaptation	Detect fluctuations
Interpretation	Accumulated improvement	Transient fluctuation

Mean of past 4 sessions

SD of the previous 4 means

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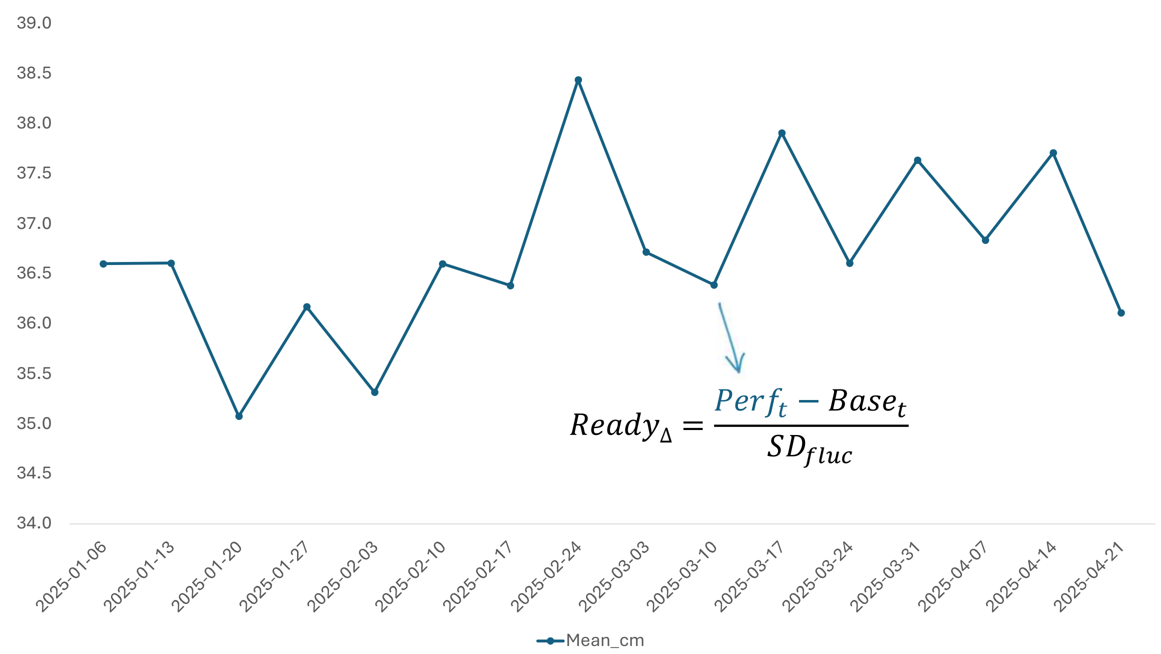
	A	B	C	D	E	F	G	H	I	J	K
1	Date	Trial 1	Trial 2	Trial 3	Mean	SD	Roll Base mean last 4	Roll Fluc (SD of mean of last 4)	Curr-Roll Base	Readiness (Δ/fluc)	Status
2	2025-01-06	37.35	36.54	35.9	36.6	0.73					Insufficient history
3	2025-01-13	36.12	36.49	37.2	36.6	0.55					Insufficient history
4	2025-01-20	34.56	35.41	35.25	35.1	0.45					Insufficient history
5	2025-01-27	36.4	35.6	36.5	36.2	0.49					Insufficient history
6	2025-02-03	36.44	34.95	34.89	35.4	0.88	36.1	0.7	-0.7	-0.9	Normal
7	2025-02-10	36.03	37.04	36.72	36.6	0.52	35.8	0.7	0.8	1.1	Likely Increase
8	2025-02-17	37.42	36.02	35.7	36.4	0.91	35.8	0.7	0.6	0.8	Normal
9	2025-02-24	38.94	38.68	37.69	38.4	0.66	36.1	0.5	2.3	4.5	Meaningful Increase
10	2025-03-03	36.28	36.33	37.53	36.7	0.71	36.7	1.3	0.0	0.0	Normal
11	2025-03-10	35.9	36.9	36.36	36.4	0.50	37.0	0.9	-0.6	-0.7	Normal
12	2025-03-17	37.37	38.3	38.05	37.9	0.48	37.0	1.0	0.9	0.9	Normal
13	2025-03-24	36.8	37.1	35.91	36.6	0.62	37.4	1.0	-0.8	-0.8	Normal
14	2025-03-31	37.69	37.92	37.29	37.6	0.32	36.9	0.7	0.7	1.1	Likely Increase
15	2025-04-07	36.85	37.24	36.41	36.8	0.42	37.1	0.7	-0.3	-0.4	Normal
16	2025-04-14	38.2	37.55	37.37	37.7	0.44	37.2	0.6	0.5	0.7	Normal
17	2025-04-21	35.91	36.61	35.8	36.1	0.44	37.2	0.6	-1.1	-1.9	Likely Drop



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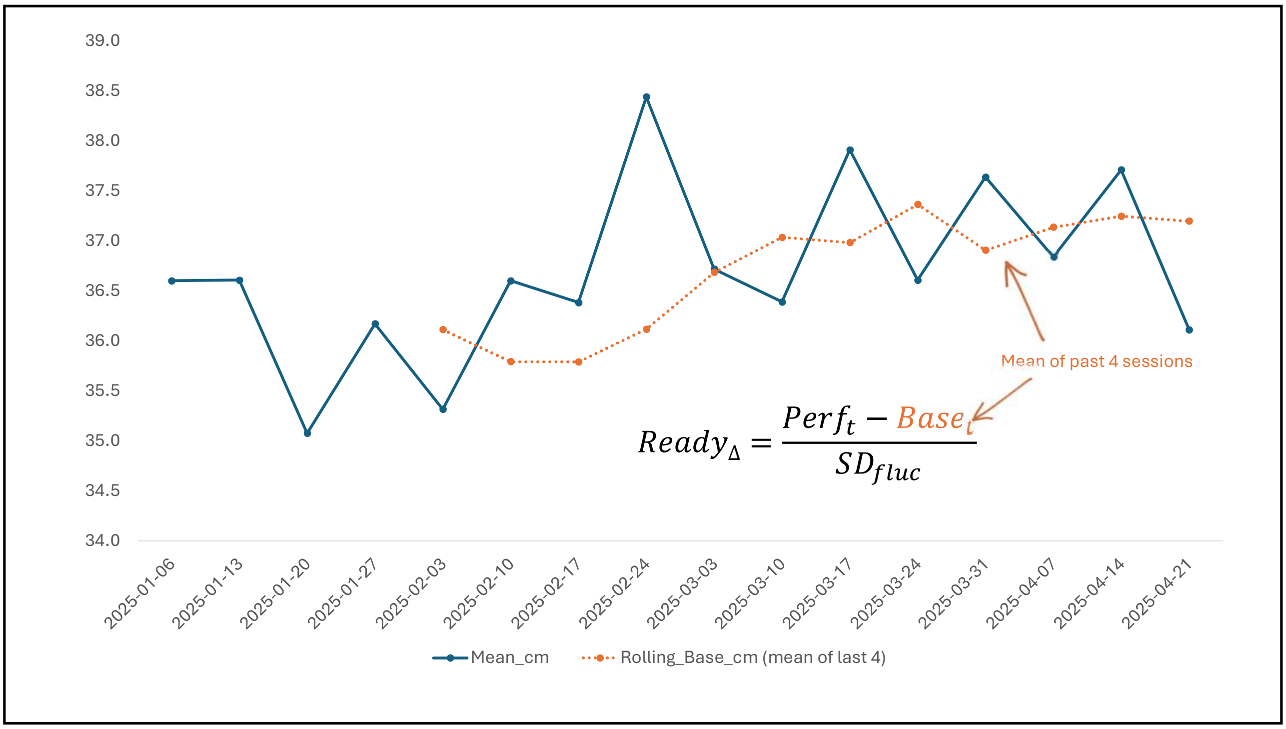

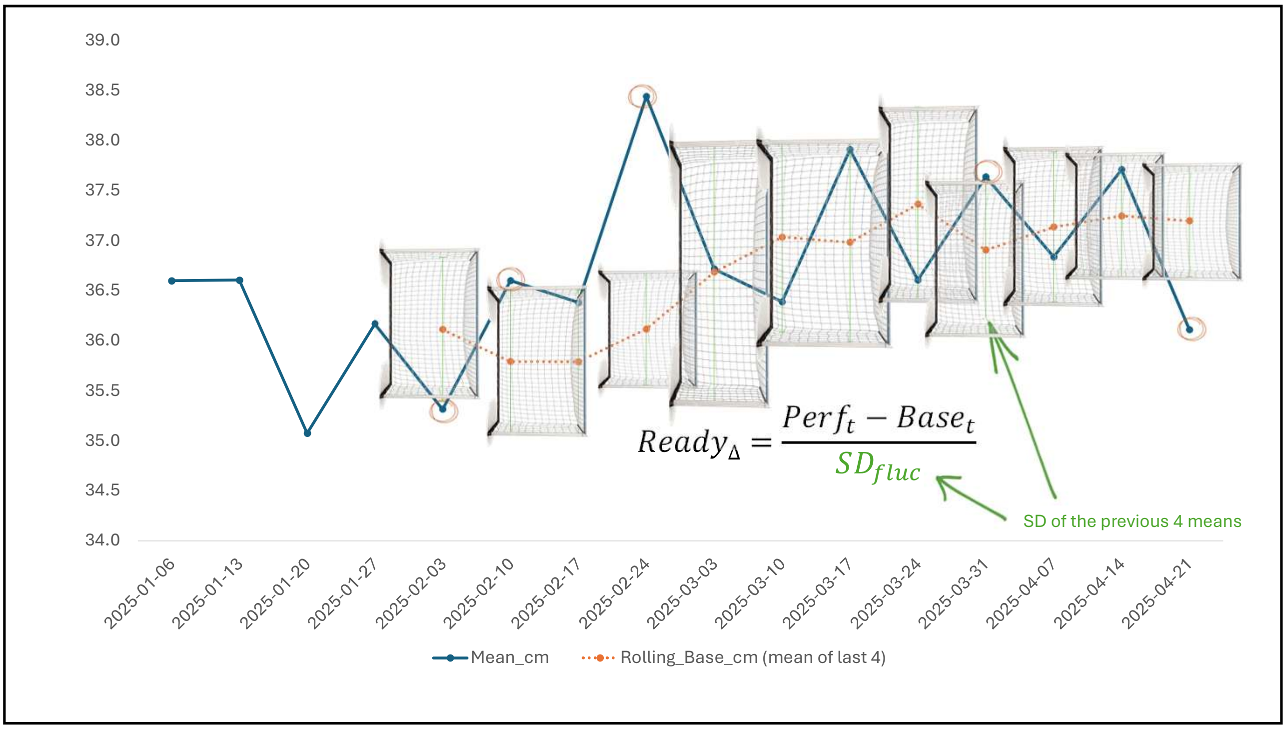

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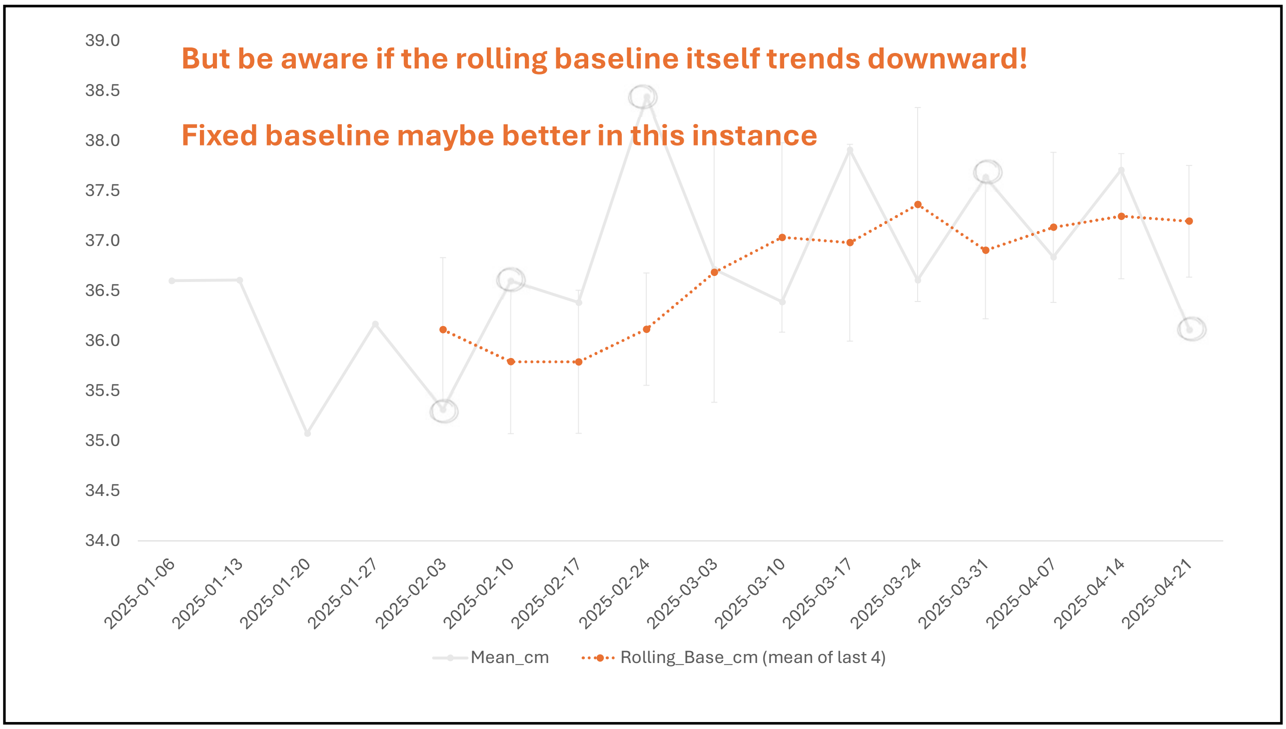
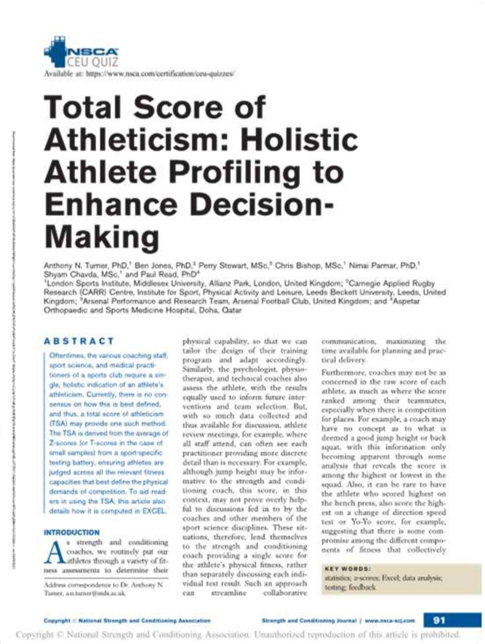

But be aware if the rolling baseline itself trends downward!
Fixed baseline maybe better in this instance
39.0
38.5
38.0
37.5
37.0
36.5
36.0
35.5
35.0
34.5
34.0
2025-01-06
2025-01-13
2025-01-20
2025-01-27
2025-02-03
2025-02-10
2025-02-17
2025-02-24
2025-03-03
2025-03-10
2025-03-17
2025-03-24
2025-03-31
2025-04-07
2025-04-14
2025-04-21
Mean_cm
Rolling_Base_cm (mean of last 4)


Step 6. Comparison with teammates
...to set realistic targets

z-scores and the TSA


NSCA CEU QUIZ
Available at: https://www.nsca.com/certification/ceu-quizzes/

Total Score of Athleticism: Holistic Athlete Profiling to Enhance Decision-Making

Anthony N. Turner, PhD,[1] Ben Jones, PhD,[2] Perry Stewart, MSc,[3] Chris Bishop, MSc,[1] Nimai Parmar, PhD,[1] Shyam Chavda, MSc,[1] and Paul Read, PhD[4]
[1]London Sports Institute, Middlesex University, Allianz Park, London, United Kingdom; [2]Carnegie Applied Rugby Research (CARR) Centre, Institute for Sport, Physical Activity and Leisure, Leeds Beckett University, Leeds, United Kingdom; [3]Arsenal Performance and Research Team, Arsenal Football Club, United Kingdom; and [4]Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar

ABSTRACT

Oftentimes, the various coaching staff, sport science, and medical practitioners of a sports club require a single, holistic indication of an athlete's athleticism. Currently, there is no consensus on how this is best defined, and thus, a total score of athleticism (TSA) may provide one such method. The TSA is derived from the average of Z-scores (or T-scores in the case of small samples) from a sport-specific testing battery, ensuring athletes are judged across all the relevant fitness capacities that best define the physical demands of competition. To aid readers in using the TSA, this article also details how it is computed in EXCEL.

INTRODUCTION

As strength and conditioning coaches, we routinely put our athletes through a variety of fitness assessments to determine their physical capability, so that we can tailor the design of their training program and adapt accordingly. Similarly, the psychologist, physiotherapist, and technical coaches also assess the athlete, with the results equally used to inform future interventions and team selection. But, with so much data collected and thus available for discussion, athlete review meetings, for example, where all staff attend, can often see each practitioner providing more discrete detail than is necessary. For example, although jump height may be informative to the strength and conditioning coach, this score, in this context, may not prove overly helpful to discussions fed in to by the coaches and other members of the sport science disciplines. These situations, therefore, lend themselves to the strength and conditioning coach providing a single score for the athlete's physical fitness, rather than separately discussing each individual test result. Such an approach can streamline collaborative communication, maximizing the time available for planning and practical delivery.

Furthermore, coaches may not be as concerned in the raw score of each athlete, as much as where the score ranked among their teammates, especially when there is competition for places. For example, a coach may have no concept as to what is deemed a good jump height or back squat, with this information only becoming apparent through some analysis that reveals the score is among the highest or lowest in the squad. Also, it can be rare to have the athlete who scored highest on the bench press, also score the highest on a change of direction speed test or Yo-Yo score, for example, suggesting that there is some compromise among the different components of fitness that collectively

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KEY WORDS:
statistics; z-scores; Excel; data analysis; testing; feedback

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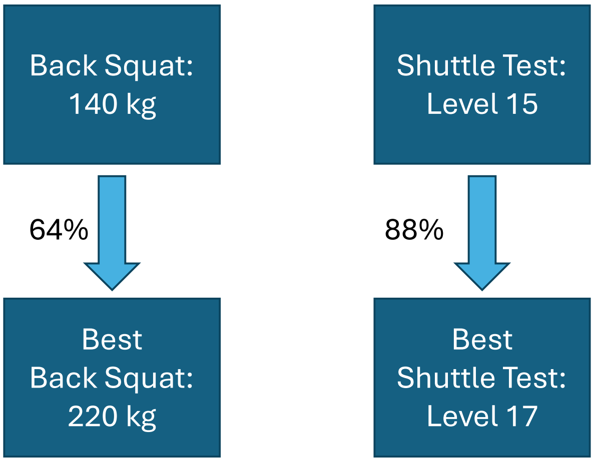
.

So, are they fit or not!?

But is that score any good!?

Are they getting better!?

Is that score any good and which test did they do best on?



- But maybe the team is fit and they all scored well on the shuttle test…
- Level 15 may have been one of the lowest
- Conversely, there may only be a few strong athletes, so 140kg is really good!

Turn test scores into a *z*-scores

- *Z*-scores tell you how many SD's a score is from the mean
- If a *z*-score = 0, it is identical to the mean score
- If a *z*-score = 1, it is 1 SD above the mean
- If a *z*-score = -1, it is 1 SD below the mean

Then average them across all relevant tests

VLOOKUP =(S2-S$26)/S$27

	S	T	U	V	AE	AF	AG	AH	AI	AJ
1	Best_CMJ	Best_RSI	Best_ProA	Best_30m	z_CMJ	z_RSI	z_ProA	z_30m	TSA	Rank
2	47.7	1.6	5	4.5	S$27	-0.23	0.15	-1.49	-0.23	18
3	36	1.63	4.9	4.46	-0.77	-0.16	0.38	-1.25	-0.45	19
4	42.8	1.72	6.4	4.19	0.06	0.05	-3.06	0.41	-0.64	20
5	52.2	2.5	4.4	4.34	1.21	1.83	1.52	-0.51	1.01	2
6	37	2.02	4.6	4.25	-0.65	0.73	1.06	0.04	0.30	10
7	45.1	1.81	4.8	4.16	0.34	0.25	0.60	0.59	0.45	7
26	42.29	1.70	5.1	4.26						
27	8.16	0.44	0.44	0.16						

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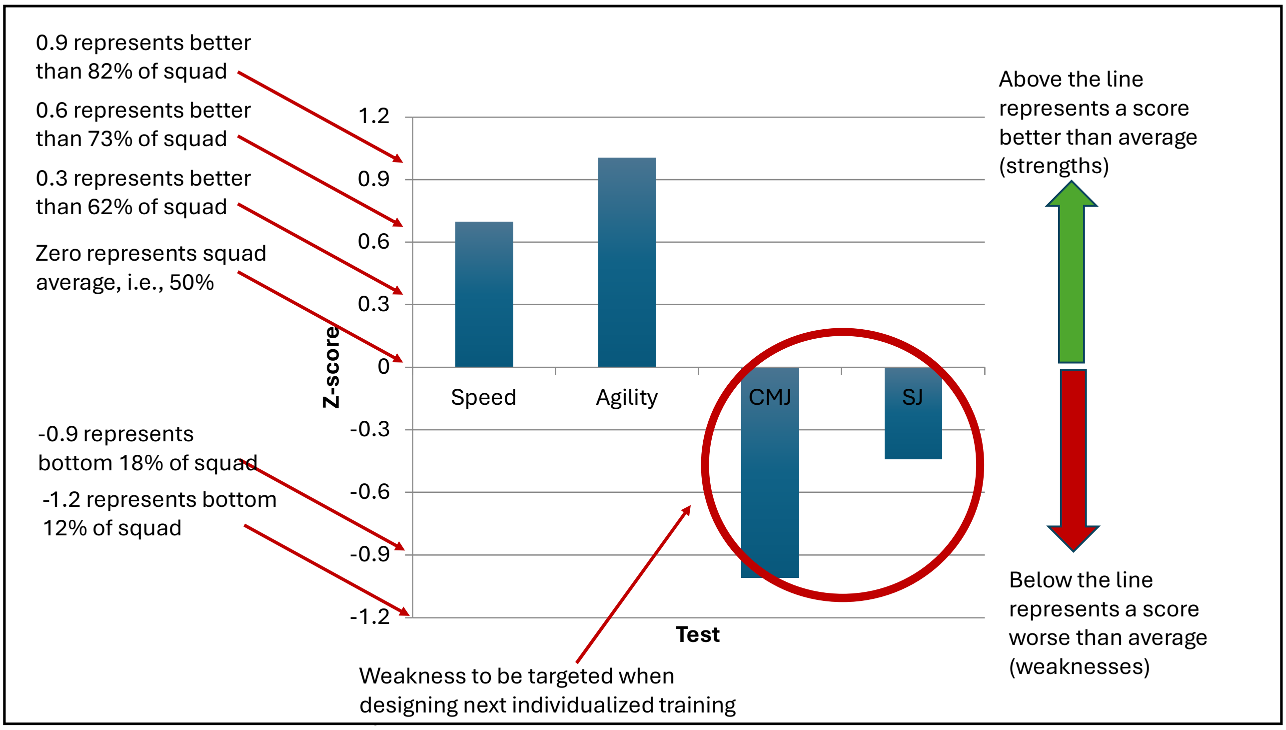
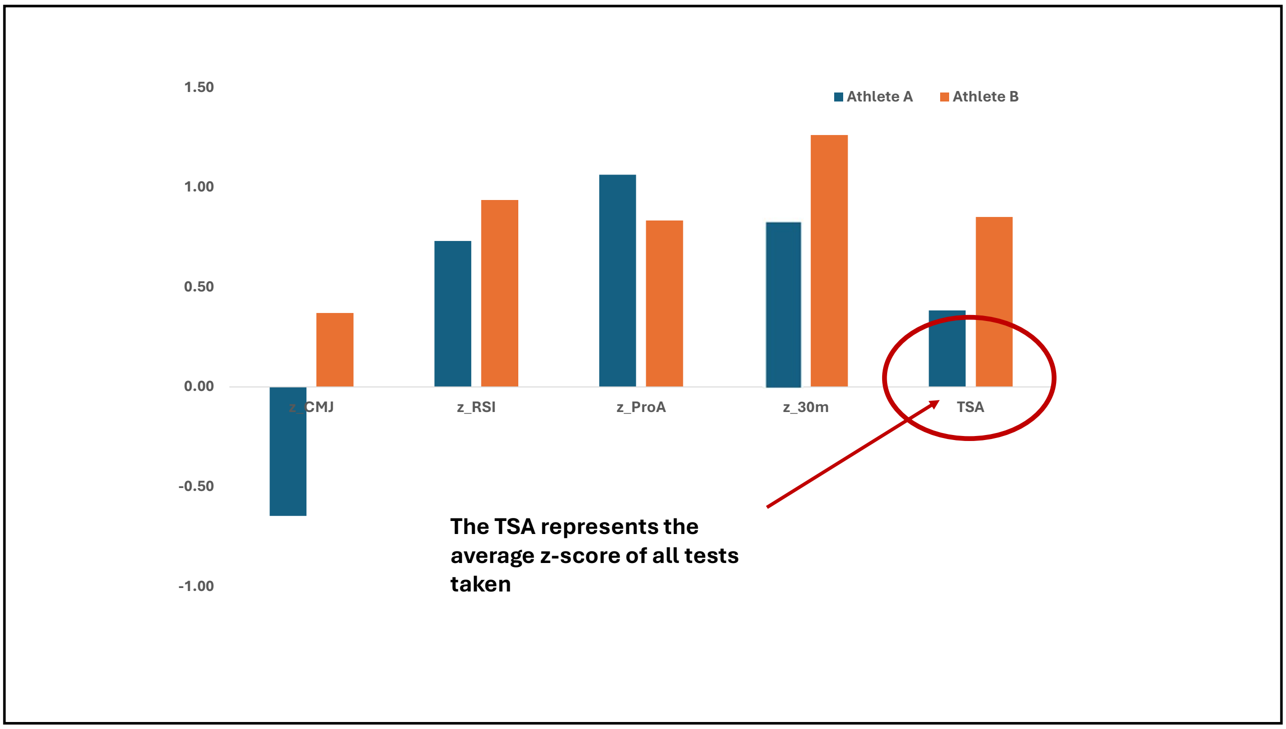
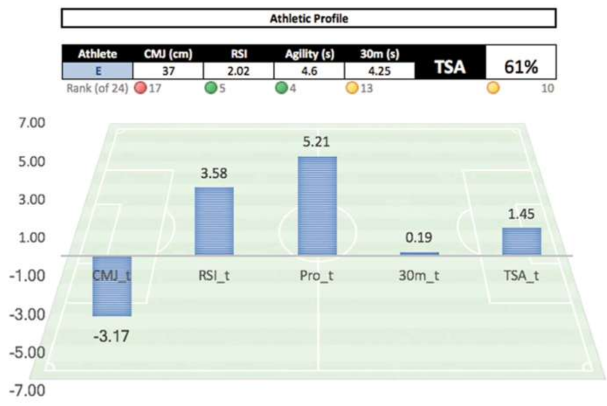
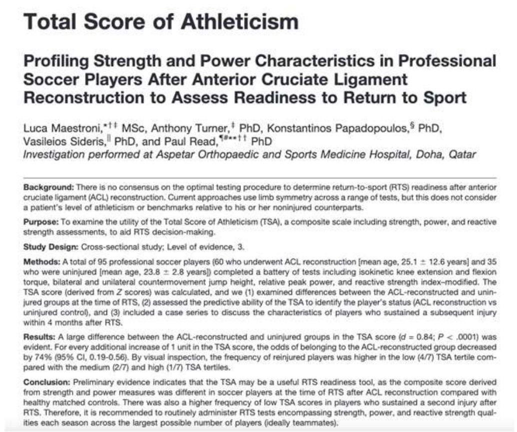

0.9 represents better than 82% of squad
0.6 represents better than 73% of squad
0.3 represents better than 62% of squad
Zero represents squad average, i.e., 50%
-0.9 represents bottom 18% of squad
-1.2 represents bottom 12% of squad
1.2
0.9
0.6
0.3
0
-0.3
-0.6
-0.9
-1.2
Z-score
Speed
Agility
CMJ
SJ
Test
Above the line represents a score better than average (strengths)
Below the line represents a score worse than average (weaknesses)
Weakness to be targeted when designing next individualized training


1.50
1.00
0.50
0.00
-0.50
-1.00
Athlete A
Athlete B
z_CMJ
z_RSI
z_ProA
z_30m
TSA
The TSA represents the average z-score of all tests taken



Total Score of Athleticism



Profiling Strength and Power Characteristics in Professional Soccer Players After Anterior Cruciate Ligament Reconstruction to Assess Readiness to Return to Sport

Luca Maestroni,[*†‡] MSc, Anthony Turner,[‡] PhD, Konstantinos Papadopoulos,[§] PhD, Vasileios Sideris,[||] PhD, and Paul Read,[¶#**††] PhD
Investigation performed at Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar

Background: There is no consensus on the optimal testing procedure to determine return-to-sport (RTS) readiness after anterior cruciate ligament (ACL) reconstruction. Current approaches use limb symmetry across a range of tests, but this does not consider a patient's level of athleticism or benchmarks relative to his or her noninjured counterparts.

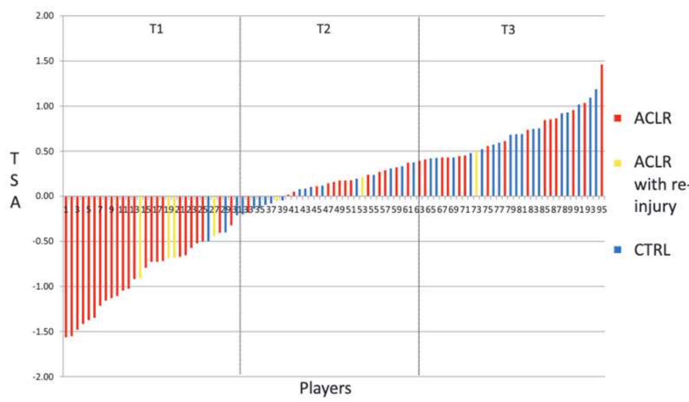
Purpose: To examine the utility of the Total Score of Athleticism (TSA), a composite scale including strength, power, and reactive strength assessments, to aid RTS decision-making.

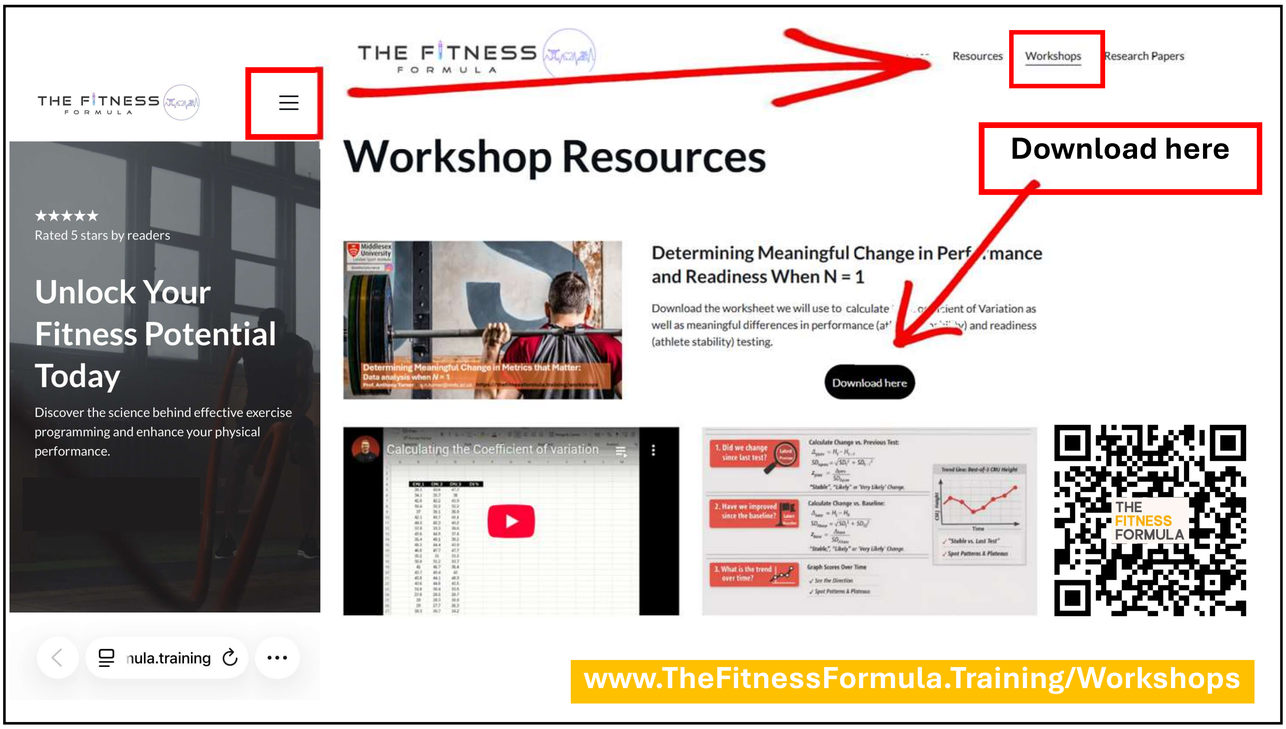
Study Design: Cross-sectional study; Level of evidence, 3.

Methods: A total of 95 professional soccer players (60 who underwent ACL reconstruction [mean age, 25.1 ± 12.6 years] and 35 who were uninjured [mean age, 23.8 ± 2.8 years]) completed a battery of tests including isokinetic knee extension and flexion torque, bilateral and unilateral countermovement jump height, relative peak power, and reactive strength index–modified. The TSA score (derived from *Z* scores) was calculated, and we (1) examined differences between the ACL-reconstructed and uninjured groups at the time of RTS, (2) assessed the predictive ability of the TSA to identify the player's status (ACL reconstruction vs uninjured control), and (3) included a case series to discuss the characteristics of players who sustained a subsequent injury within 4 months after RTS.

Results: A large difference between the ACL-reconstructed and uninjured groups in the TSA score ($d = 0.84$; $P < .0001$) was evident. For every additional increase of 1 unit in the TSA score, the odds of belonging to the ACL-reconstructed group decreased by 74% (95% CI, 0.19-0.56). By visual inspection, the frequency of reinjured players was higher in the low (4/7) TSA tertile compared with the medium (2/7) and high (1/7) TSA tertiles.

Conclusion: Preliminary evidence indicates that the TSA may be a useful RTS readiness tool, as the composite score derived from strength and power measures was different in soccer players at the time of RTS after ACL reconstruction compared with healthy matched controls. There was also a higher frequency of low TSA scores in players who sustained a second injury after RTS. Therefore, it is recommended to routinely administer RTS tests encompassing strength, power, and reactive strength qualities each season across the largest possible number of players (ideally teammates).

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