

# Differences in Countermovement Jump Characteristics in “Strong” vs. “Weak” Major League Rugby Athletes

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## PURPOSE

- The isometric mid-thigh pull (IMTP) is widely used to measure peak force (PF) in rugby athletes (2, 4).
- Lower-body power is critical for sprinting, cutting, and absorbing contact, but jump height (JH) is often over-relied on to assess power (3, 4).
- This study compares countermovement jump (CMJ) characteristics between “strong” and “weak” rugby athletes, grouped by IMTP PF using a median split.
- The aim is to determine whether greater maximal strength (via IMTP) translates to superior lower-body power outputs during CMJ (1, 4).**

## METHODS

### Participants:

30 Major League Rugby athletes

### Grouping:

Strong group (n = 13): IMTP PF = 4881.6 ± 489.6 N

Weak group (n = 17): IMTP PF = 3985.1 ± 348.6 N

### Testing Protocol:

IMTP and CMJ on Hawkins Dynamics force plates (1000 Hz)

### CMJ Metrics:

Jump Height (JH, cm)

Concentric Impulse (CI, Ns)

Peak Concentric Force (PCF, N)

Eccentric Rate of Force Development (eRFD, kN/s)

### Analysis:

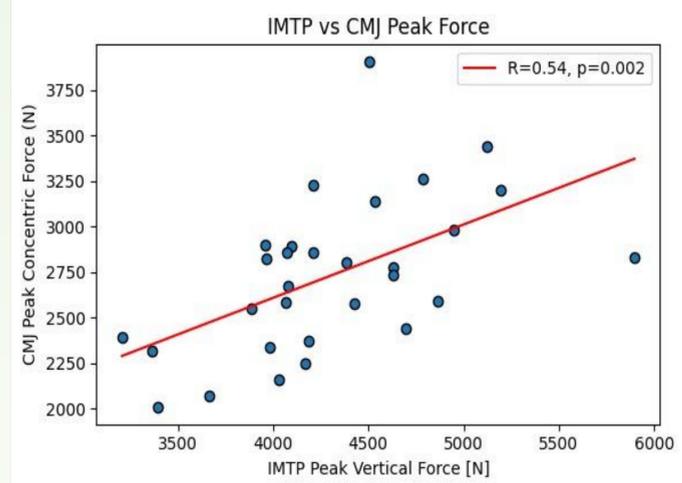
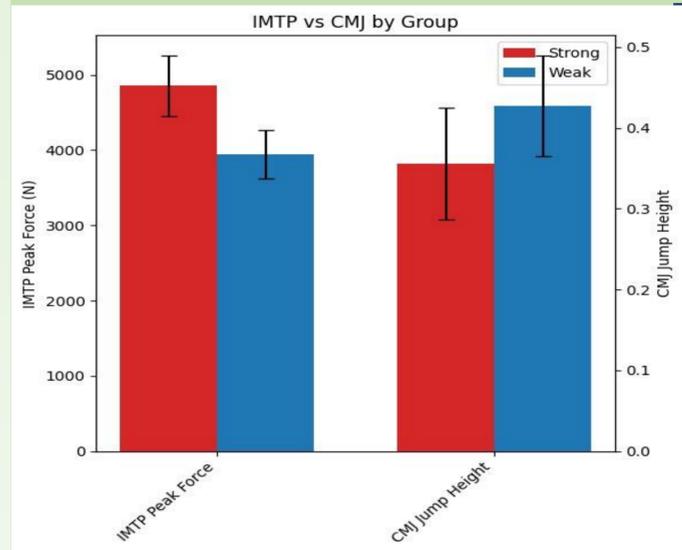
Welch’s t-test (α = 0.05)

### Data Normalization:

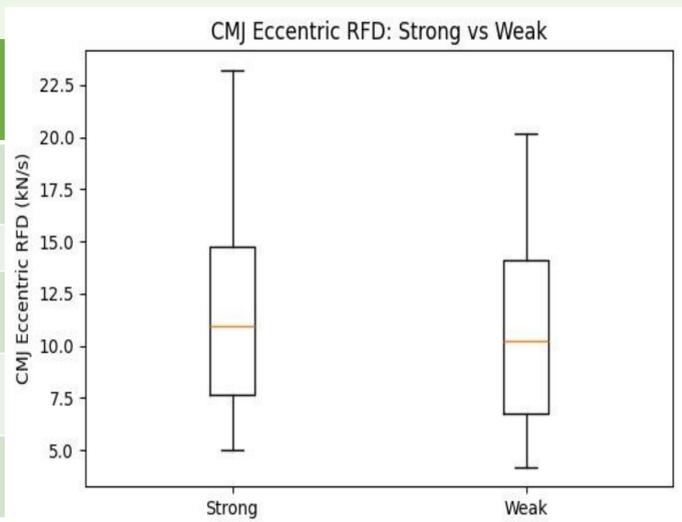
Raw values, bodyweight-scaled, and z-scores

## RESULTS

Major League Rugby athletes who were stronger in the IMTP produced more force and power during jumping, even though they didn’t jump higher. This suggests that jump height alone doesn’t fully reflect an athlete’s lower-body power.



Metric	Strong (Mean ± SD)	Weak (Mean ± SD)	T-Statistic	P-Value
IMTP PF (N)	4881.58 ± 489.6	3985.00 ± 348.6	6.51	0.0
CMJ JH (cm)	0.36 ± 0.07	0.43 ± 0.06	-2.88	0.009
CMJ CI (Ns)	617.25 ± 42.61	524.83 ± 47.77	5.54	0.0
CMJ PCF (N)	2990.70 ± 421.21	2561.05 ± 339.51	2.95	0.008
CMJ eRFD (kN/s)	11.58 ± 5.27	10.65 ± 4.63	0.49	0.626



## CONCLUSIONS

### Maximal Strength Improves Force, Not Displacement

- While the “strong” group showed significantly greater CI and PCF during CMJ, JH was significantly lower in that same group. This reinforces the dissociation between absolute force capacity and movement outcome (i.e., vertical displacement), possibly due to technique, rate-based factors, or body mass effects.

### eRFD May Lack Sensitivity in High-Level Rugby Players

- The lack of significant difference in eRFD between groups suggests it may not distinguish performance among elite athletes, or it may be more relevant in talent ID or developmental populations where eccentric strategy varies more.

### Body Size and Strength Mask Jump Output

- Despite greater force production, stronger athletes showed lower JH, likely due to greater body mass and diminished elastic or velocity-dependent qualities in stronger individuals.

## PRACTICAL APPLICATIONS

### Move Beyond JH in Power Diagnostics

- JH alone is insufficient to represent lower-body power in elite rugby athletes. Coaches should prioritize CI and PF metrics for more valid assessment of explosive capacity.

### Dual-Test Strategy Enhances Athlete Profiling

- Combine IMTP and CMJ testing to capture maximal force capacity (IMTP PF) and dynamic expression of force and power over time (CMJ metrics). This helps differentiate athletes with “high strength but low speed” vs. “high speed but low force” profiles.

### Normalize Metrics for Fair Comparison

- Use bodyweight-normalized or z-score data to compare athletes equitably, especially in contact sports where body mass varies widely.

### Revisit Normative Value

- IMTP PF values in both groups exceed most published norms. Consider developing updated benchmarks for Major League Rugby athletes to inform return-to-play and profiling protocols.

### Use CMJ Metrics to Target Interventions

- If an athlete has high IMTP PF but low CI or PCF, consider emphasizing ballistic or velocity-based training (e.g., loaded jump squats, dynamic effort work). If an athlete has high jump height but low IMTP PF, introduce maximal strength interventions to raise ceiling force capacity.

## REFERENCES

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 2. Martin, E. A., & Beckham, G. K. (2020). Isometric Mid-Thigh Pull Performance in Rugby Players: A Systematic Literature Review. *Journal of Functional Morphology and Kinesiology*, 5(4), 91.  
 3. Merrigan, J. J., Stone, J. D., Homzy, W. G., & Hagen, J. A. (2021). Identifying Reliable and Repeatable Force-Time Metrics in Athletes—Considerations for the Isometric Mid-Thigh Pull and Countermovement Jump. *Sports*, 9(1), 4.  
 4. Thomas, C., Jones, P., Rothwell, J., Chiang, C., Comfort, P. (2015). An Investigation Into the Relationship Between Maximum Isometric Strength and Vertical Jump Performance. *Journal of Strength and Conditioning Research*, 29(8), 2176-2185.