THE RELATIONSHIPS BETWEEN COUNTERMOVEMENT JUMP BRAKING AND PROPULSION PHASES WITH SPRINT SPEEDS AMONG NCAA DIVISION III SOCCER ATHLETES

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Introduction

Countermovement jumps (CMJ) and short sprints are common tests that are used during athlete monitoring. When performed on force plates, the CMJ can provide practitioners with much more information than just a measurement of jump height. CMJ variables such as braking mean force (BMF), braking duration (BDur), propulsion mean force (PMF), and propulsion duration (PDur) may provide more insight into how an athlete performs

A 2005 study involving high-level rugby athletes found the fastest athletes also had a higher CMJ height (1). Another study looked at specific CMJ variables in Australian Rules Football athletes in comparison to their 0-20- and 20-40-m sprint performance and found relationships between CMJ variables and various sprint distances (2). To the authors' knowledge, there is lack of research examining these relationships in soccer players. Therefore, the purpose of this study is to examine the relationships between the CMJ force-time characteristics and sprint speeds among National Collegiate Athletic Association (NCAA) Division III male soccer athletes.

Methods

- 38 NCAA Division III male soccer athletes (age: 19.0 ± 1.2 years, height: 178.2 ± 6.6 cm, weight: 72.8 ± 9.0 kg)
- After completing a standardized warm-up, the athletes performed two maximal effort CMJs on force plates.
- Force-time data were used to calculate CMJ BMF, BDur, PMF, and PDur.
- Following the CMJ testing, athletes performed two maximal effort 20-m sprints from a staggered stance on an indoor track. Sprint times at 10- and 20m were recorded by laser timing gates and converted to sprint velocity.
- Pearson correlation coefficients and coefficients of determination (R^2) were used to examine the relationships between the CMJ force-time characteristics and sprinting performance. The averages of each CMJ variable and sprint velocities were used for the correlational analyses.

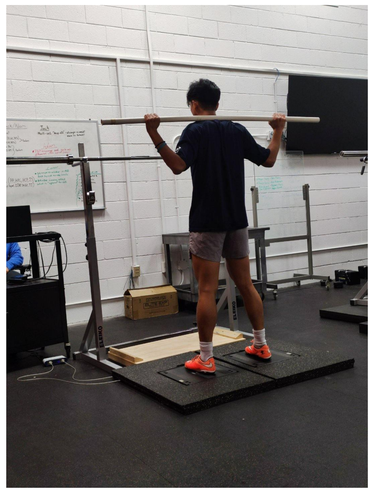

Figure 1. Starting position of the participant on the force platform.

Results

Table 1. Descriptive countermovement jump and sprint performance characteristics and correlational analyses between variables

	BMF (N/kg)	BDur (s)	PMF (N/kg)	PDur (s)	0-10m Speed (m/s)	10-20m Speed (m/s)
Mean	10.0	0.52	20.1	0.27	5.81	7.79
SD	0.2	0.08	1.9	0.04	0.22	0.41
0-10 r	0.320	-0.069	0.258	-0.056	--	--
0-10 R^2	0.102	0.005	0.066	0.003	--	--
10-20 r	-0.012	-0.022	0.108	0.023	--	--
10-20 R^2	0.0001	0.0004	0.011	0.001	--	--

SD= standard deviation; r= Pearson correlation coefficient; R^2 = coefficient of determination; BMF = braking mean force; BDur= braking duration; PMF= propulsion mean force; PDur= propulsion duration

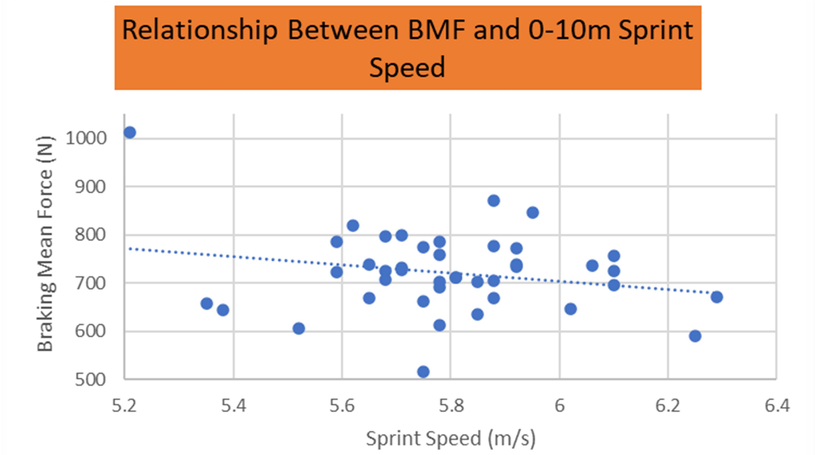

Figure 2. Relationships between BMF and 0-10m sprint speed.

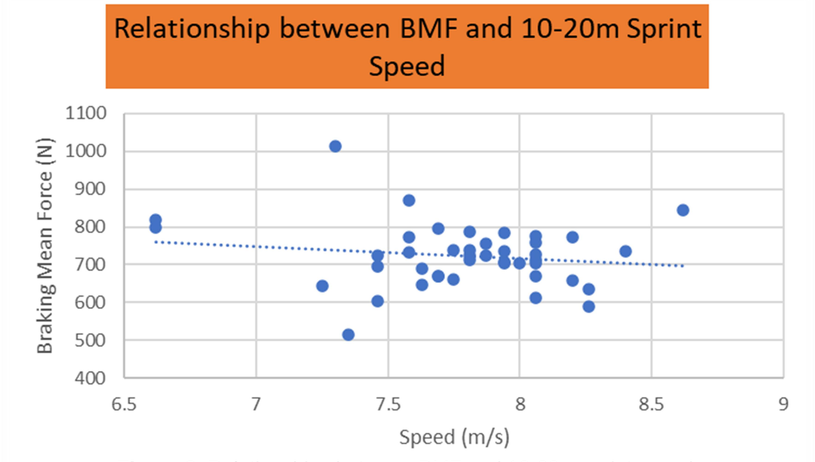

Figure 3. Relationships between BMF and 10-20m sprint speed.

Conclusions

- Despite a lack of statistical significance, a moderate relationship between CMJ BMF and 0-10m sprint velocity was present.
- The remaining CMJ variables and their relationships to sprinting velocities were trivial to small and explained very little variance.

Practical Applications

- When conducting thorough athlete monitoring, both the CMJ and sprint tests should be utilized to provide an accurate representation of each athlete's abilities
- The current findings suggest that both the CMJ and sprinting are distinct skills whose performances may not necessarily relate to each other in NCAA Division III male soccer players.
- Given the frequent use of CMJ testing in athlete monitoring, it is suggested that researchers continue to examine the relationships of the current variables with other performance characteristics of collegiate athletes.

References

1.Cronin, J. B., & Hansen, K. T. (2005). Strength and power predictors of sports speed. *The Journal of Strength & Conditioning Research*, *19*(2), 349-357.
2.Morris, C. G., Weber, J. A., & Netto, K. J. (2022). Relationship between mechanical effectiveness in sprint running and force-velocity characteristics of a countermovement jump in Australian rules football athletes. *Journal of strength and conditioning research*, *36*(3), e59-e65.

Figure 4. Peak CMJ height.

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