"GETTING STRONG IS THE RIGHT MOVE" AN INSIGHT INTO PROFESSIONAL LOWER LEAGUE ENGLISH SOCCER PLAYERS: A BAYESIAN APPROACH

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INTRODUCTION

The most common assessment for ballistic qualities is the **countermovement jump (CMJ).**

Peak propulsive force, peak braking force can differentiate between soccer players with **high and low deceleration** abilities [1]. While isometric mid-thigh pull (IMTP) **peak force** production have been shown to be related to **sprint acceleration performance** [2]. Jump- and sprint-based tasks rely on the **acceleration of one's own mass** which are key to athletic and sporting performance within soccer [3].

Therefore, the purpose of the present study was to determine the effect of strength on CMJ performance in professional English soccer players. Hypothesizing that stronger athletes would have higher CMJ performance.

METHODS

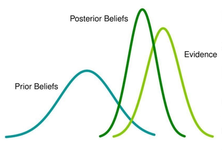
Seventy-six professional lower league soccer players (mass: 82.5 ± 8.2 kg, height: 1.80 ± 0.07 m, age: 25.8 ± 4.3 years, Average relative peak force = 33.4 N/Kg).

Three trials of the CMJ and IMTP as part of pre-season testing using Hawkin Dynamics force plates (Westbrook, ME, USA). The mean of the three trials was taken for analysis. Metrics were selected based on the PODS acronym, specifically observing the person, outcome, driver and strategy metrics (Table 1).

Table 1. Countermovement jump metrics selected for Bayesian Analysis

Person	Body mass (kg)
Outcome	Jump height (m) Jump momentum (kg.m/s^{-1}) mRSI (AU)
Driver	Relative force at minimum displacement (N/kg) Relative average braking force (N/kg) Relative average propulsive force (N/kg) Relative peak propulsive force (N/kg)
Strategy	Countermovement depth (m) Time to take off (s)

mRSI = modified reactive strength index



One-way Bayesian independent t-tests were performed to determine the difference between strong and weak groups. Bayes factors (BF) 1.00-3.00 = weak, 3.01-10.00 = moderate and >10.00 strong evidence to support the hypothesis (h_1). BF of <1 were interpreted as supporting the null hypothesis (h_0) interpreted as 1.00-0.33 = weak, 0.33-0.10 = moderate evidence and <0.10 strong evidence supporting the null hypothesis (h_0). The prior was set at the default BF10 = 0.707. Cohen's *d* effect sizes and 95% confidence intervals (95CI) were also reported.

RESULTS

Strong

(n = 37; 37.4 ± 3.4 N/Kg)

Weak groups

(n = 39; 29.7 ± 2.7 N/Kg)

Strong evidence to to a **very large magnitude** for relative peak force (**h_1** = 1022, ***d* [95% CI]** = 2.53 [1.92-3.13])

Moderate evidence to a **small magnitude** for relative average braking force and modified reactive strength index (mRSI) (Table 2, Figures 1-4).

Weak evidence to a **small magnitude** for jump height, relative force at minimum displacement and relative average propulsive force (Table 2).

Weak-strong evidence supporting the **null hypothesis** was observed for body mass, jump momentum, countermovement depth, time to take off (TTT) and relative peak propulsion force (Table 2).

Table 2. Mean ± SD, Bayesian independent t-test (BF_{10}) and Cohen's d effect size difference for "strong" vs. "weak" players.

Metric	Mean ± SD	BF_{10}	Bayes interpretation	Cohen's d effect size (95% CI)
Body mass (kg)	Strong: 79.44 ± 7.65 Weak: 85.93 ± 7.66	0.060	Strong h_0	-0.78 (-1.23 to -0.30)
Jump height (m)	Strong: 0.39 ± 0.05 Weak: 0.38 ± 0.06	1.040	Weak h_1	0.33 (-0.13 to 0.78)
Jump momentum (kg.m/s^{-1})	Strong: 220.44 ± 25.38 Weak: 231.57 ± 27.11	0.091	Weak h_0	-0.42 (-0.87 to 0.04)
mRSI (AU)	Strong: 0.61 ± 0.12 Weak: 0.55 ± 0.09	5.202	Moderate h_1	0.54 (0.08 to 1.00)
Relative force at minimum displacement (N/kg)	Strong: 27.73 ± 3.67 Weak: 26.11 ± 4.13	1.819	Weak h_1	0.41 (-0.05 to 0.86)
Relative average braking force (N/kg)	Strong: 20.80 ± 2.39 Weak: 19.37 ± 2.65	6.017	Moderate h_1	0.56 (0.10 to 1.02)
Relative average propulsive force (N/kg)	Strong: 22.67 ± 2.28 Weak: 21.83 ± 2.38	1.272	Weak h_1	0.36 (-0.10 to 0.81)
Relative peak propulsive force (N/kg)	Strong: 28.53 ± 3.71 Weak: 27.21 ± 4.47	0.992	Weak h_0	0.32 (-0.14 to 0.77)
Countermovement depth (m)	Strong: -0.28 ± 0.06 Weak: -0.29 ± 0.07	0.346	Weak h_0	0.10 (-0.35 to 0.55)
Time to take off (s)	Strong: 0.66 ± 0.09 Weak: 0.70 ± 0.11	1.376	Weak h_1	-0.37 (-0.82 to 0.09)

95% CI = 95% confidence intervals, BF_{10} = Bayes factor, h_1 = supporting the hypothesis, h_0 = supporting the null hypothesis

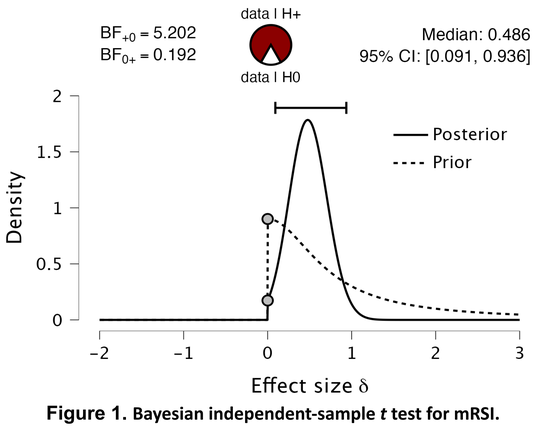


Figure 1. Bayesian independent-sample *t* test for mRSI.

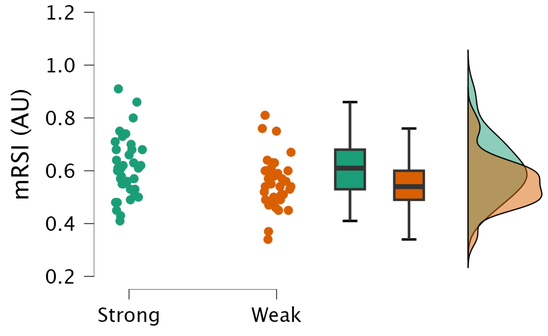


Figure 2. Raincloud plot with individual data points for mRSI.

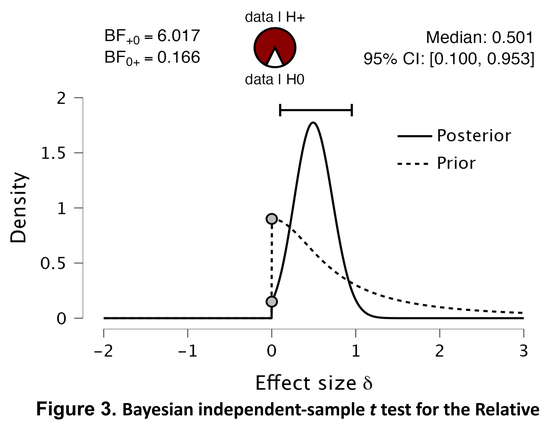


Figure 3. Bayesian independent-sample *t* test for the Relative average braking force.

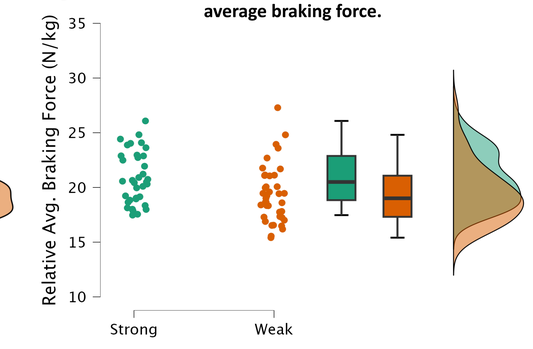


Figure 4. Raincloud plot with individual data points for Relative average braking force.

CONCLUSIONS

Maximal relative strength has implications on jump performance, albeit not in the jump outcome.

Stronger players perform CMJ more efficiently when observing the **mRSI while producing greater average relative forces** during the braking phase. Although the same outcome was achieved, the stronger players achieved this in a shorter duration.

PRACTICAL APPLICATION

English soccer players and practitioners should prioritize relative strength to enhance braking phase kinetics and overall jump performance.

As **stronger players reach the same outcome faster** and would be in an advantageous in competition.

Practitioners should aim to achieve **relative peak forces >33 N/Kg** would be seen as beneficial for soccer players. **Spanish senior professional soccer players average peak force was >38 N/kg** (7), indicating greater relative peak forces should be the target.

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