

ASSOCIATIONS BETWEEN MUSCLE STRENGTH AND POWER IN MALE COLLEGIATE ATHLETES: AN ANALYSIS OF POWER CLEAN, BACK SQUAT, AND DROP JUMP PERFORMANCE



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INTRODUCTION

- Prior research has explored the correlation between drop jump (DJ) performance and one-repetition maximum (1RM) performance in the power clean and squat exercises, finding a lack of association with DJ height in female collegiate athletes.
- However, further investigation is necessary to determine the applicability of these findings to male collegiate athletes.

PURPOSE

- To determine and compare the relationship between power clean and squat 1RM with DJ performance.

METHODS

- A total of 75 male football athletes participated in this study.
- Each participant completed three trials of a DJ from a height of 45.74 cm onto two force platforms sampling at 1000 Hz, with the best jump trial used for statistical analyses.
- Moreover, athletes were assessed for their 1RM power clean and barbell back squat performance.
- 1RM data were then normalized to the participant's body mass.
- Spearman's Rho correlation was conducted to determine the association between DJ variables including relative propulsive peak force, relative concentric impulse, vertical stiffness, jump height, and reactive strength index (RSI) with the 1RM power clean and squat performance. Significance was set at an alpha level of $p < 0.05$.

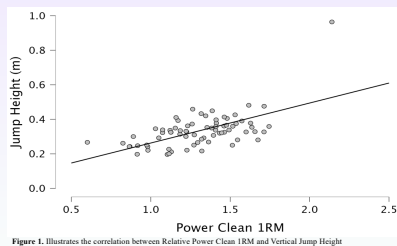


Figure 1. Illustrates the correlation between Relative Power Clean 1RM and Vertical Jump Height

Table 1. Means and Standard Deviations of Strength and Drop Jump Variables

| | Means | Standard Deviations |
|--------------------------------|----------|---------------------|
| Squat 1RM | 1.964 | 0.355 |
| Power Clean | 1.304 | 0.262 |
| Drop Jump Variables | | |
| Propulsive Peak Force | 2965.787 | 670.649 |
| Concentric Impulse | 4.513 | 0.536 |
| Vertical Stiffness | 13.873 | 7.870 |
| Jump Height | 0.333 | 0.101 |
| Reactive Strength Index | 0.898 | 0.352 |

Table 2. Spearman Rank Correlations of asymmetries with drop jump and strength measures

| | Squat (kg) | Power Clean (kg) |
|--------------------------------|-----------------|------------------|
| Propulsive Peak Force | -0.277* | -0.120 |
| Concentric Impulse | -0.077 | -0.183 |
| Vertical Stiffness | -0.256* | -0.170 |
| Jump Height | 0.540*** | 0.444*** |
| Reactive Strength Index | 0.625*** | 0.603 |

* $p < .05$, ** $p < .01$, *** $p < .001$

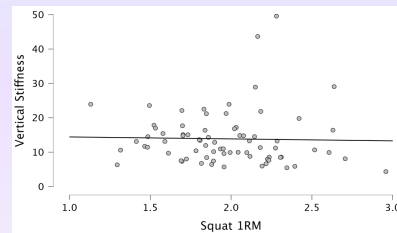


Figure 2. Illustrates the correlation between Relative Squat 1RM and Vertical Stiffness

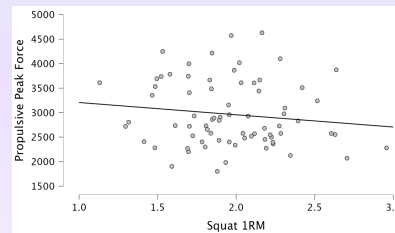


Figure 3. Illustrates the correlation between Relative Squat 1RM and Propulsive Peak Force

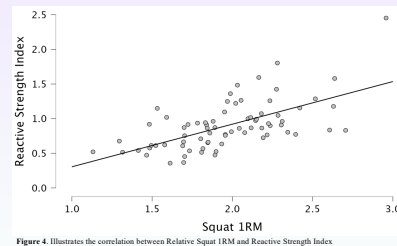


Figure 4. Illustrates the correlation between Relative Squat 1RM and Reactive Strength Index

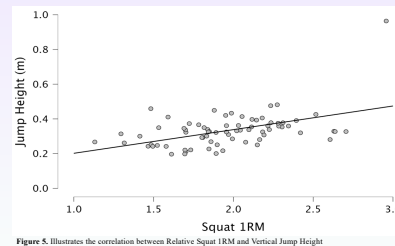


Figure 5. Illustrates the correlation between Relative Squat 1RM and Vertical Jump Height

RESULTS

- Findings indicate that the power clean is significantly correlated with relative propulsive peak force ($r = -0.277$, $p < 0.05$), vertical stiffness ($r = -0.256$, $p < 0.05$), jump height ($r = 0.540$, $p < 0.001$), and RSI ($r = 0.635$, $p < 0.001$).
- However, no significant correlation was found between the power clean and DJ concentric impulse ($r = -0.077$, $p = 0.511$).
- Squat 1RM is significantly correlated to jump height ($r = 0.444$, $p < 0.001$), and RSI ($r = 0.603$, $p < 0.001$).
- On the contrary, squat 1RM was not significantly correlated to relative propulsive peak force ($r = -0.120$, $p = 0.306$), relative concentric impulse ($r = -0.183$, $p = 0.119$), and vertical stiffness ($r = -0.170$, $p = 0.147$).

CONCLUSION

- Power clean seem to demonstrate a correlation with relative propulsive peak force, vertical stiffness, jump height, and RSI during drop jumps.
- Squat 1RM performance was associated only with DJ height and RSI.
- Data showed that relative concentric impulse of DJ was not associated with either power clean or squat 1RM.

PRACTICAL APPLICATIONS

- Given the associations between the various DJ variables and 1RM power clean and squat performance, practitioners should consider including these exercises in their program when aiming for improvements in lower-body explosiveness.
- Practitioners should also consider that power clean may have a greater transferability to overall drop jump performance.

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