

THE RELATIONSHIP BETWEEN DROP JUMP REACTION FORCES AND THE MEASURES OF FORCE DEVELOPMENT IN THE ISOMETRIC MID-THIGH PULL



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INTRODUCTION

- The assessment of lower-body athletic performance characteristics is imperative for effective training in various sports, as measures of both strength and power are indicative of athletic progression.
- There is an association between explosive force and the rate of force development (RFD) outputs generated by the lower limbs.
- Few studies examine the relationship between the rate of force development in lower limbs during different epochs to the reactive strength index.

PURPOSE

- To determine the correlation between the rate of force development (RFD) in isometric mid-thigh pull (IMTP) at different epochs and the reactive strength index (RSI) during drop jump (DJ).

METHODS

- Thirty NCAA Division I collegiate-level athletes (n = 9 basketball, n = 21 track athletes) participated in this cross-sectional study.
- Athletes performed two to three trials of DJ from a 45.74 cm high box with a subsequent one to two-minute rest period between trials. Following the DJ, two trials of the IMTP were performed.
- DJ and IMTP trials were performed on two force platforms at a sampling rate of 1000 Hz. The best trials of each test were used for analysis.
- The force-time variables calculated from the IMTP were the rates of force development (RFD) during specific epochs of 0-50ms, 0-100ms, 0-150ms, 0-200ms, and 0-250ms.

Table 1. Means ± Standard Deviations and between-group comparisons of Track and Basketball Athletes.

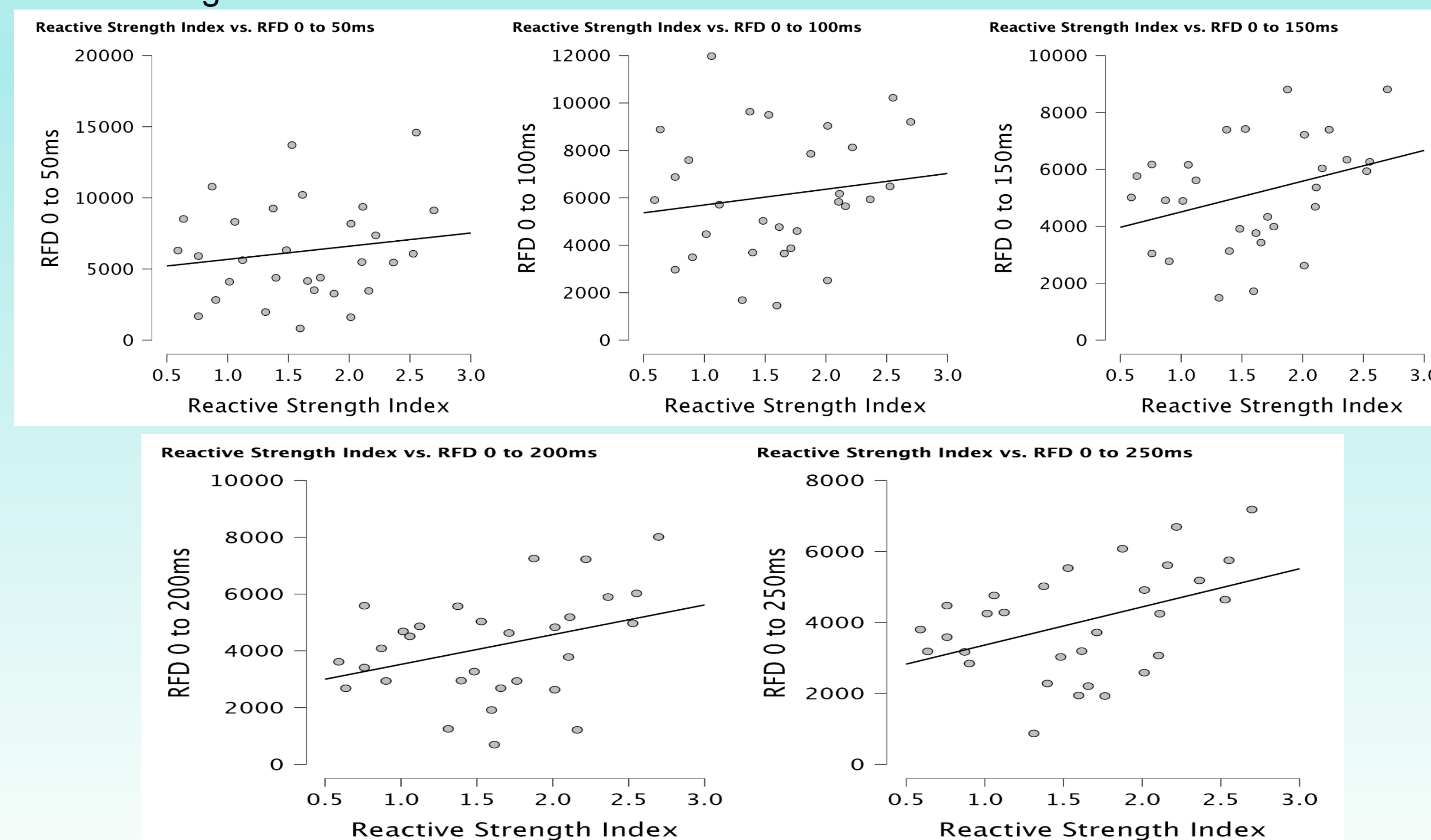
	All Athletes	Track (n= 21)	Basketball (n= 9)
Reactive Strength Index	1.59 ± 0.61	1.91 ± 0.41	0.86 ± 0.19
Duration of Ecc/Con. Phase	0.257 ± 0.10	0.20 ± 0.04	0.38 ± 0.07
Rate of Force Development Epochs			
0 to 50 (ms)	6224.91 ± 3456.24	6319.11 ± 3732.69	6005.09 ± 2897.03
0 to 100 (ms)	6093.34 ± 2673.16	5948.42 ± 2666.831	6431.5 ± 2817.75
0 to 150 (ms)	5146.52 ± 1926.43	5240.20 ± 2174.37	4927.91 ± 1247.52
0 to 200 (ms)	4144.54 ± 1814.02	4188.55 ± 2097.02	4041.86 ± 958.10
0 to 250 (ms)	4000.68 ± 1512.51	4079.66 ± 1765.76	3816.39 ± 665.99

Table 2. Pearson Correlations and between-group comparisons of the rate of force development epochs and reactive strength index.

	Reactive Strength Index		
Rate of Force Development Epochs	All Athletes	Basketball (n= 9)	Track (n= 21)
0 to 50 (ms)	0.163	-0.048	0.259
0 to 100 (ms)	0.150	0.095	0.447
0 to 150 (ms)	0.340	0.099	0.515
0 to 200 (ms)	0.350	0.483	0.547
0 to 250 (ms)	0.431*	0.435	0.635

* = p<0.05 ** = p<0.01

Figure 1. Pearson Correlation plots of the different rate of force development epochs and the reactive strength index.



STATISTICAL ANALYSIS

- Pearson (r) correlations were conducted to evaluate the relationship between DJ RSI and IMTP RFD epochs.
- The significance level for all analyses was set at p < 0.05

RESULTS

- Athletes' mean ± standard deviation (SD) RSI performance on the DJ was 1.59 ± 0.61. The mean ± SD duration of total DJ contact time (duration of concentric and eccentric phases) was 256 ± 10ms.
- A significant positive correlation was found between 0-250ms IMTP RFD and RSI (r= 0.431, p= 0.017).
- There was no significant correlation between RSI and IMTP RFD 0-50ms (r= 0.163), 0-100ms (r= 0.150), 0-150ms (r= 0.340), and 0-200ms (r= 0.350), (p > 0.05).

CONCLUSION

- Findings suggest that a longer epoch of RFD IMTP is associated with RSI as measured during the DJ. This can be partly explained by the similarity in total DJ contact time and the duration of RFD during IMTP near the 250ms mark.

PRACTICAL APPLICATIONS

- Assessing RFD may be most meaningful over longer epochs, for example at 250ms during IMTP to provide the best insights into an athlete's force generation capacities that are most relevant to explosive movements such as drop jumps.

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