

# A LOOK INTO PEAK FORCE AND RATE OF FORCE DEVELOPMENT ACROSS MID-THIGH PULL AND BROAD JUMP EXERCISES



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## INTRODUCTION

- The isometric mid-thigh pull (IMTP) is an exercise that is widely used to gather information on peak force production and rate of force development (RFD) of athletes.
- This information can be used throughout many different sports and there is an abundance of research which involves mid-thigh pull as it relates to other aspects of sports performance.
- While studies have predominantly focused on the force production in the IMTP and its relationship with movements such as the vertical jump, no previous studies have examined its relationship with broad jump.
- Additionally, the rate of force production in broad jump is important as it can play a role in the running and jumping performance of track and field athletes.

## PURPOSE

- To examine the correlation of the rate of force development and peak force between broad jump and isometric mid-thigh pull movements in track and field athletes.

## METHODS

- A total of 28 Division I collegiate athletes were recruited for this study.
- These athletes performed 3 trials of IMTP and broad jump, and all trials were included for further analysis.
- The IMTP testing involved athletes standing on two force plates, one under each foot. Each athlete performed a five second isometric mid-thigh pull of a 45-pound bar against squat rack J-hooks.

## METHODS (Continued)

- Broad jump testing required athletes to stand on two force plates with one under each foot. Every trial included athletes placing their hands on their hips and performing a broad jump off the force plates.
- The IMTP analysis included rate of force development (IRFD) from 50-250 at each 50ms intervals and Peak Force (PF).
- Broad jump measures included the peak propulsive force (PPF) and the propulsive rate of force development (PRFD).
- Repeated measures correlation analysis was used to assess associations between broad jump and IMTP measures with statistical significance at  $p < 0.05$ .

## RESULTS

- Broad Jump was not correlated with IMTP RFD across the intervals of 0ms to 50ms, 0ms to 100ms, 0ms to 150ms, 0ms to 200ms, or 0ms to 250ms (See Table 1).
- Additionally, the PF between broad jump and IMTP also had no significant correlation ( $r=0.115$ ,  $p=0.45$ ).

## CONCLUSION

- The results of this study showed that there is no association between RFD or PF during broad jump and Mid-Thigh Pull exercises.
- This could be due to the broad jump being predominantly a horizontal movement, while IMTP is predominantly a vertical movement.

## PRACTICAL APPLICATIONS

- The rate at which force was produced in broad jump was not associated with the IMTP.
- Coaches should train athletes for these two movement patterns with the understanding of minimum to no transferability between them.

**Table 1.** Illustrates the correlations between Broad Jump Propulsive Rate of Force Development and Isometric Mid-thigh Pull Rate of Force Development

		Isometric Mid-thigh Pull				
		RFD 0-50 ms	RFD 0-100 ms	RFD 0-150 ms	RFD 0-200 ms	RFD 0-250 ms
Broad Jump Propulsive RFD	r-value	0.115	-0.117	-0.04	-0.06	-0.002
	p-value	0.45	0.44	0.77	0.70	0.98

RFD = Rate of Force Development