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Tactical Athlete Performance Centre (TAPC)

The Relationship Between Isometric-Mid-Thigh-Pull Force-Time Characteristics And 2-Km Load Carrying Performance In Trained British Army Soldiers

Mr Jonpaul Nevin BSc (Hons), MSc, ASCC, CSCS[1]
Sgt Michael Ramsdale BSc (Hons), GSCC[2]
SSgt Kim Bowling BSc (Hons), GSCC[2]
Cpl Robert Bambrough BSc (Hons), GSCC[3]
SSgt Charles Coussens BSc (Hons), GSCC[2]

[1]Tactical Athlete Performance Centre (TAPC) Buckinghamshire New University, [2] Royal Army Physical Training Corps (RAPTC) , [3] Royal Marines (RM)

Introduction

Body mass, body composition, aerobic capacity, and dynamic lower- and upper-body strength have all been identified as key physiological determinants of load carrying performance[1,2,3,4]. However, no research has yet investigated the relationship between isometric strength measures and load carrying ability. Therefore, the aim of this study was to assess the relationship between Isometric Mid-Thigh Pull (IMTP) force-time characteristics, Standing Long Jump (SLJ) distance, and 2-Km load carrying performance.

Methods

Thirty-nine, full-trained, male British Army soldiers (age 31 ± 6.1 yrs; height 176 ± 7.3 cm; body mass 85.8 ± 11.5 kg) performed three IMTP trials, three SLJ trials, and a 2-km loaded march carrying an external load of 25 kg. Data collected included body mass, absolute isometric PF, relative isometric PF, 0 – 250 ms Rate of Force Development (RFD), SLJ distance, and 2-Km loaded march time to completion.

Force-time data were analysed by use of an instrumented force platform (Hawkins Dynamics, G3 Force Plates, Boston, USA, sampling frequency 1,000 Hz), IMTP testing rack, and a proprietary Hawkins Dynamics data collection software package. Within-session reliability between repeated trials (i.e., IMTP, SLJ) was assessed via Intra-Class Correlation Coefficient (ICC). Relationships between all variables were assessed using Pearson's correlation coefficient.

Results

- Excellent ICC was observed for all IMTP force (0.96, 95% CI [0.94 - 0.98]) and SLJ (0.91, 95% CI [0.84 - 0.95]) data.
- Absolute isometric PF (r =-.059, 95% CI [-0.37 - 0.26], p = 0.72), relative isometric PF (r =-.135, 95% CI [-0.43 - 0.19], p = 0.41), and RFD (r = -.162, 95% CI [-0.45 - 0.16], p = 0.32) displayed a small correlation with loaded march time to completion.
- However, relative isometric PF displayed a large correlation with standing long jump performance (r =.545; 95% CI [0.28 - 0.73] p = < 0.01).

	Absolute Isometric PF (N)	Relative Isometric PF (N/Kg)	0-250 m/s RFD (N/s)	Standing Long Jump (cm)	2-Km loaded March Time (s)
Absolute Isometric PF (N)	-	-			
Relative Isometric PF (N/Kg)	.121	-			
0-250 m/s RFD (N/s)	.544**	.35	-		
Standing Long Jump (cm)	.123	.545**	-.045	-	
2-Km loaded March Time (s)	-.059	-.135	-.162	.009	-

**Correlation significant at the <0.01 level (2-tailed)

Table.
Correlation matrix between IMTP force-time characteristics, SJL distance and 2-Km loaded march performance.

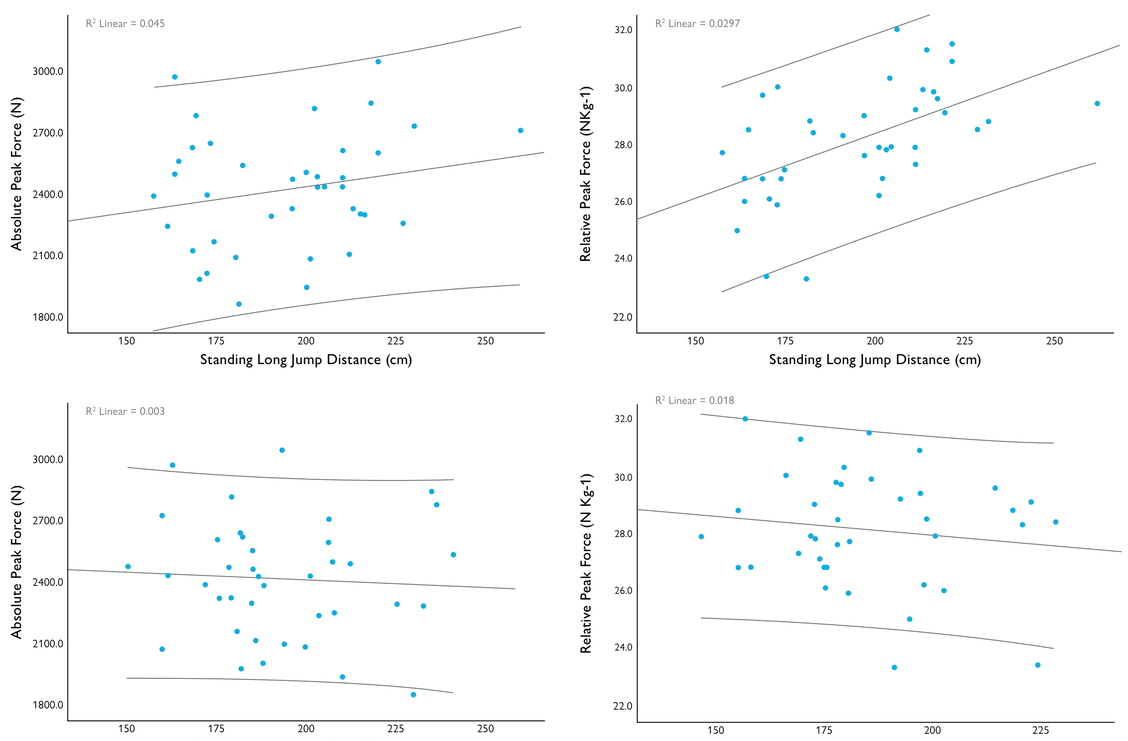

Fig.
Correlation plots between absolute isometric PF, relative isometric PF, 2-Km Loaded March Time and SLJ distance

Practical Applications

Our data demonstrates that unlike dynamic measures of lower limb strength (i.e., 1RM back squat)[2,3] IMTP force-time characteristics display only a weak relationship with load carriage performance. However, relative isometric PF demonstrates a significant relationship with SLJ performance. Isometric testing may have utility for assessing explosive strength, monitoring neuromuscular fatigue, and assessing training readiness in military populations. However, its use as a potential proxy measure of load carrying ability should be questioned.

References

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