IMPACT OF BODY COMPOSITION, STRENGTH, AND ENDURANCE ON ALL-OUT EXERCISE AND SINGLE-ROUND PACE FOR HIGH-INTENSITY FUNCTIONAL TRAINING

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INTRODUCTION

High Intensity Functional Training (HIFT) workouts often require work to be completed as quickly as possible (3), though this does not always mean an all-out pace. Trainees will modify pace to match a workout's design and their ability to perform required exercises. The pace they average over a workout's duration, relative to their "max speed", can serve as a scalable and personalized indicator of relative intensity (7).

Body composition, strength, and endurance are known to affect HIFT pacing and performance (1,5,6,10). Excess adiposity can hinder exercise execution and efficiency (8), whereas muscular strength and endurance are crucial for maintaining higher power outputs over the duration of a workout (4,9). It is unknown how these affect max speed, and then ultimately the average pace or relative intensity of HIFT workouts.

PURPOSE

To examine the impact of baseline body composition, strength, and endurance on the maximal speed of the exercises and a single round of a HIFT workout.

METHODS

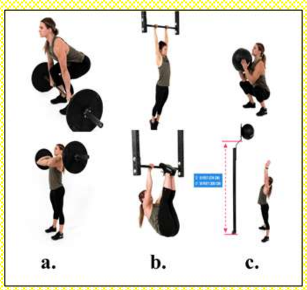
Men (n = 10) and women (n = 9) with HIFT experience (≥2 years) (27.0 ± 7.6 years, 173 ± 8 cm, 79.3 ± 11.0 kg) completed a baseline body composition and performance assessment and two experimental visits separated by at least 48 hours.

Baseline assessment included one-repetition maximum (1-RM) strength in the power clean (PC) and repetition-maximum (RM) endurance in toes-to-bar (TTB) and wall balls (WB).

On experimental visits, participants completed a standard warmup and then five repetitions as fast as possible of PC, TTB, and WB, as well as one round of either low- or high-volume workout randomly assigned on that visit. Each of these max speed efforts were separated by 3 – 5 minutes of rest.

Figure 1. Workout designs

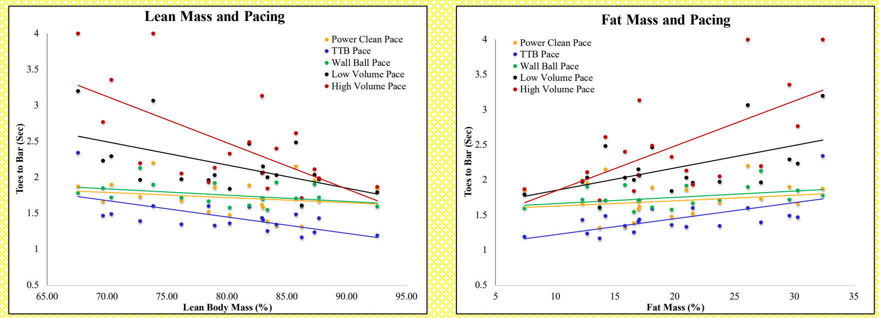
Participants completed 5 repetitions of **a)** Power Cleans (men = 52.2 kg; women = 34.0 kg), **b)** Toes-to-Bar, and **c)** Wall Ball Shots (men: 9.1 kg medicine ball to a 2.04 m target, women: 6.4 kg medicine ball to a 2.74 m target), as well as 1-round of either the Low- (5, 10, 15 repetitions) or High-Volume (10, 15, 20 repetitions) circuit to determine maximal pace. Movement standards adapted from (2).



RESULTS

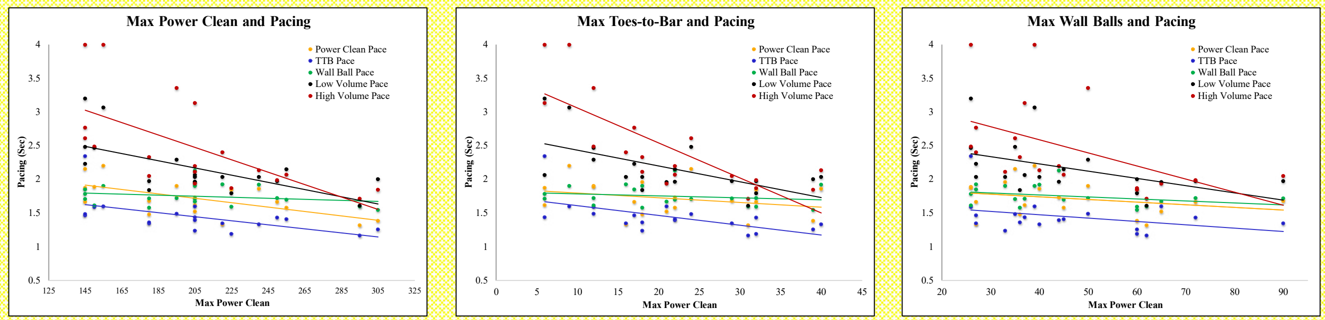
Rate (reps/min)	Body Mass r	Body Mass p-value	% Body Fat r	% Body Fat p-value	Lean Mass r	Lean Mass p-value	Max Power Clean r	Max Power Clean p-value	Max Toes to Bar r	Max Toes to Bar p-value	Max Wall Balls r	Max Wall Balls p-value
Power Clean	0.07	0.779	-0.23	0.351	0.23	0.350	**0.64**	**0.003**	0.28	0.244	0.25	0.306
Toes to Bar	0.10	0.684	**-0.66**	**0.002**	**0.66**	**0.002**	**0.65**	**0.002**	**0.64**	**0.003**	0.37	0.123
Wall Ball	-0.21	0.386	-0.41	0.08	0.41	0.080	0.28	0.249	0.23	0.350	0.35	0.138
Low Volume	0.09	0.719	**-0.55**	**0.014**	**0.55**	**0.014**	**0.68**	**0.001**	**0.61**	**0.006**	**0.51**	**0.027**
High Volume	0.14	0.562	**-0.64**	**0.003**	**0.64**	**0.003**	**0.73**	**0.001**	**0.82**	**0.001**	**0.59**	**0.007**

Figure 2. Impact of Body Composition and Maximal Scores on Pacing Variables



Greater lean mass was associated with faster pacing across all measured variables, while higher fat mass is linked to slower pacing. Athletes with better body composition tended to perform repetitions more efficiently, especially during high volume workloads.

Greater strength, as reflected by maximum power clean, and greater endurance, as shown in toes-to-bar and wall ball measures, correlated to greater overall pacing in low- and high-volume performance. Of these, Power Clean was the most impactful, increasing performance in all measures.



CONCLUSIONS and PRACTICAL APPLICATIONS

Higher body fat and lesser lean mass were consistently associated with slower repetition completion rates. Body composition is a known determinant of one's ability to sustain their pace during HIFT-style workouts (1,5,6). Greater adiposity can impair the execution of and efficiency in performing certain exercises (8), whereas the quantity of lean mass affects force production (4,9). The observed relationships suggest body composition affects both the absolute and relative intensity of HIFT workouts.

Although strength or endurance in each tested exercise was related to max round speed and max speed of the same exercise when performed for speed independently, only PC strength was influential of max speed in another movement pattern (TTB). Strength and power are influential of most acts of athleticism (4,9) and max PC strength reflects both. Meanwhile, the TTB and WB assessments reflected endurance and the technical skill of cycling these movements, traits that would not necessarily have been important to a "max speed" test in other movement patterns (9). Additionally, WB speed is naturally modulated by the rate in which gravity allows the medicine ball to drop, and 5 repetitions may not be sufficient to distinguish ability. Thus, PC maximal strength testing may be a suitable indicator of general HIFT ability, whereas TTB and WB endurance tests are more specific indicators.

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