

LIMB LENGTH IS NOT RELATED TO OVERALL NOR INDIVIDUAL EXERCISE PACING IN HIGH-INTENSITY FUNCTIONAL TRAINING

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INTRODUCTION

High-intensity functional training (HIFT) performance relies on how quickly an athlete can complete repetitions of the various resistance training, gymnastics, and aerobic exercises that are programmed into workouts (1). This does not necessarily mean that athletes must maintain an all-out pace. Rather, the optimal pace depends on the workout's specific prescription, individual strategy, workout stage, and the athlete's individual physical characteristics (2).

An athlete's arm and leg length influence their ability to produce torque and impart speed onto an object (3). Longer limbs travel a greater distance on each effort, and therefore, are traveling at greater speeds when they express force onto an object. Greater speed will be more influential in affecting the momentum of that object. For example, Vidal Perez and colleagues observed both the upper- and lower-limbs to be influential of barbell velocity and ranking for the Snatch and Jerk exercises in competitive weightlifters (4).

Since speed in completing work is important to HIFT (2), it is reasonable to suspect that limb length might influence a HIFT athlete's workout pace. However, this has not been investigated within the context of HIFT. It remains unknown whether a greater ability to impart speed on an object for a single repetition is relevant activities requiring sustained effort over several consecutive repetitions (1, 2).

PURPOSE

The purpose of this study was to analyze limb length as it pertains to overall and individual exercise pacing during lower- and higher-volume HIFT workouts.

METHODS

Ten men and nine women (26.7 ± 7.6 years; 173 ± 8 cm; 79.3 ± 11.2 kg) with HIFT experience (≥ 6 months) completed a baseline and two experimental visits separated by at least 48 hours.

Dual-energy X-ray Absorptiometry (DXA) on Baseline Visit

Images were collected using standard procedures and then used to calculate individual limb lengths (see Figure 2)

Experimental Workout Visits

Low- (LV) or high-volume (HV) HIFT-style circuits were randomly completed across visits for time (Figure 1)

Video recordings of both workouts were analyzed to determine overall, exercise, and round repetition completion rates

RESULTS

Table 1. Correlations between measures of limb length and workout performance

		Arm length						Leg length						
		Total		Upper		Lower		Total		Upper		Lower		
		<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	
Workout Rate (repetitions · min⁻¹)														
	High-volume	-0.06	0.814	-0.20	0.406	0.12	0.637	0.02	0.921	0.07	0.773	-0.03	0.905	
	Low-volume	0.07	0.768	-0.05	0.837	0.21	0.395	0.11	0.662	0.17	0.481	0.02	0.939	
Power clean rate (repetitions · sec⁻¹)														
	High-volume	-0.01	0.997	-0.09	0.707	0.11	0.668	-0.07	0.764	-0.11	0.647	-0.02	0.938	
	Low-volume	0.01	0.988	-0.07	0.789	0.07	0.780	-0.11	0.668	-0.13	0.598	-0.06	0.805	
Toes-to-bar rate (repetitions · sec⁻¹)														
	High-volume	-0.06	0.797	-0.23	0.349	0.13	0.586	-0.08	0.747	0.01	0.968	-0.16	0.515	
	Low-volume	-0.10	0.690	-0.24	0.328	0.07	0.764	-0.12	0.618	-0.04	0.863	-0.19	0.449	
Wall ball rate (repetitions · sec⁻¹)														
	High-volume	0.06	0.823	0.06	0.806	0.04	0.862	0.19	0.438	0.24	0.316	0.10	0.690	
	Low-volume	0.24	0.313	0.24	0.316	0.22	0.366	0.30	0.215	0.34	0.151	0.20	0.420	
Round rate (repetitions · sec⁻¹)														
	High-volume	-0.03	0.919	-0.17	0.484	0.15	0.548	0.04	0.885	0.08	0.735	-0.02	0.931	
	Low-volume	0.10	0.678	-0.03	0.891	0.25	0.306	0.13	0.603	0.19	0.429	0.04	0.886	

Figure 1. Workout Design

Five-round circuit of A) Power cleans (PC; men: 61.2 kg; women: 34.0 kg), B) toes-to-bar (TTB), and C) wall balls (WB; men: 9.1 kg medicine ball to a 3.04 m target, women: 6.4 kg medicine ball to a 2.74 m target)

LV (5 x PC, 10 x TTB, 15 x WB)
HV (10 x PC, 15 x TTB, 20 x WB)

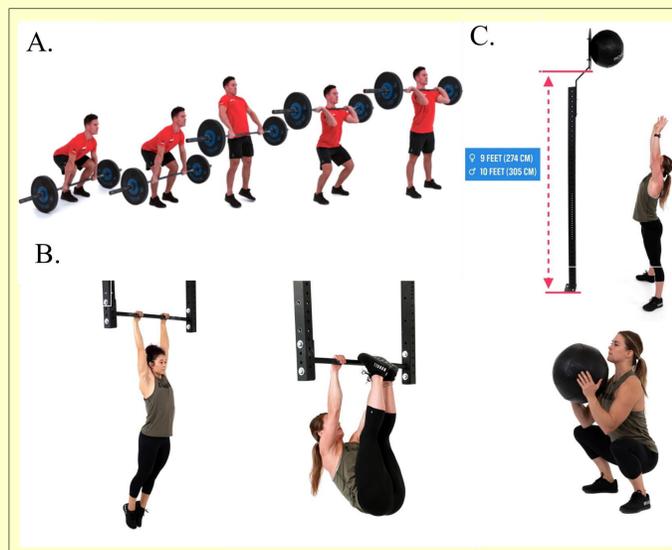
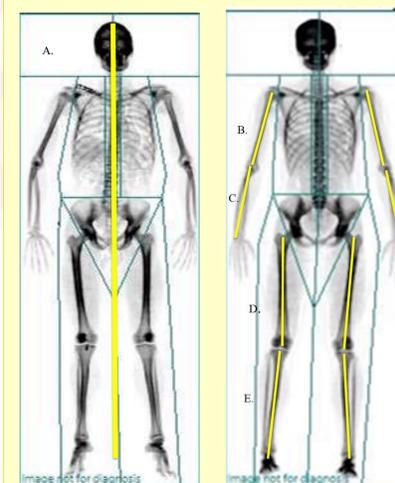


Figure 2. Body length calculations



DXA images were calibrated using body height (A) to estimate arm (B & C) and leg (D & E) lengths. Total arm (B + C) and total leg (D + E) lengths were then calculated using ImageJ (v 1.45s; National Institute of Health)

CONCLUSIONS & PRACTICAL APPLICATIONS

Regardless of workout volume, limb length was not related to overall nor individual exercise repetition completion rates in a HIFT-style workout consisting of power cleans, toes-to-bar, and wall balls. Although limb lengths have been previously documented to affect weightlifting performance (4), weightlifting involves singular efforts. Success in HIFT depends on the ability to sustain effort over several repetitions (1, 2), which necessitates quick and efficient recovery between repetitions. Athletes should recognize that the singular advantage of producing greater power and angular momentum on the concentric phase of movement may be negated by a slower eccentric recovery and transition to a subsequent repetition.

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