

# LIMITED AGREEMENT BETWEEN RELATIVE PACING AND TRADITIONAL INTENSITY MARKERS IN HIGH-INTENSITY FUNCTIONAL TRAINING

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## INTRODUCTION

**High-Intensity Functional Training (HIFT) combines varied functional movements performed at high intensity across multiple modalities (1).** Because HIFT workouts can differ greatly in structure and exercise combinations, traditional markers like heart rate (HR), blood lactate ( $[La^-]$ ), and rating of perceived exertion (RPE) may fail to consistently quantify intensity (2,3). Coaches and athletes often rely on subjective pacing to guide performance, but this approach lacks scientific validation.

**A novel, speed-derived metric, expressed as percent of maximal speed (%MS), may better reflect real-time effort by comparing actual pace to an athlete's maximum effort for each movement or round.** While pacing is a central goal in these workouts, few studies have directly compared %MS to traditional physiological and perceptual markers. This study addresses that gap by evaluating agreement between %MS and HR,  $[La^-]$ , and RPE during low- and high-volume HIFT workouts.

## PURPOSE

**To examine the agreement between relative pacing (% of maximal speed) and traditional intensity markers (heart rate, blood lactate, and RPE) during low- and high-volume HIFT workouts.**

## METHODS

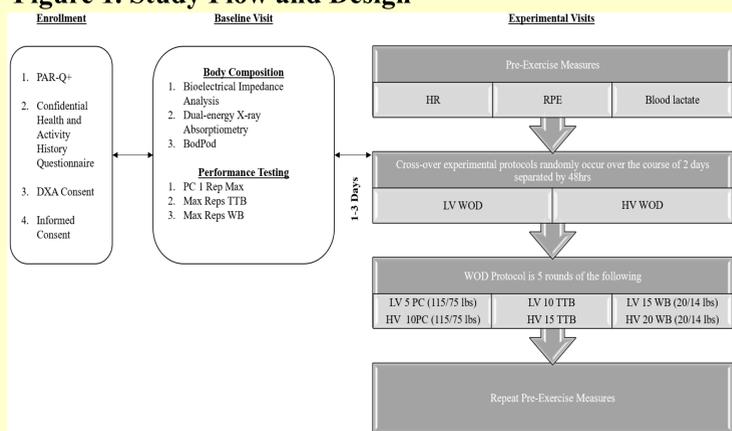
This study used a within-subjects, repeated-measures design to compare a speed-derived intensity metric (% of maximal speed, %MS) to traditional physiological and perceptual markers during high-intensity functional training (HIFT). Recreationally trained adults (n = 24; 12 men, 12 women) completed baseline testing and two randomized experimental workouts under low-volume (LV) and high-volume (HV) conditions.

Each workout included power cleans (PC), toes-to-bar (T2B), and wall balls (WB) performed in a circuit format. The LV workout consisted of 5 rounds of 5 PC, 10 T2B, and 15 WB per round (150 total reps). The HV workout consisted of 5 rounds of 10 PC, 15 T2B, and 20 WB per round (225 total reps).

Participants performed maximal speed tests for each movement and a full round before each workout. Heart rate (HR), blood lactate ( $[La^-]$ ), and rating of perceived exertion (RPE) were recorded pre- and post-exercise. Movement speed during workouts was calculated relative to maximal values.

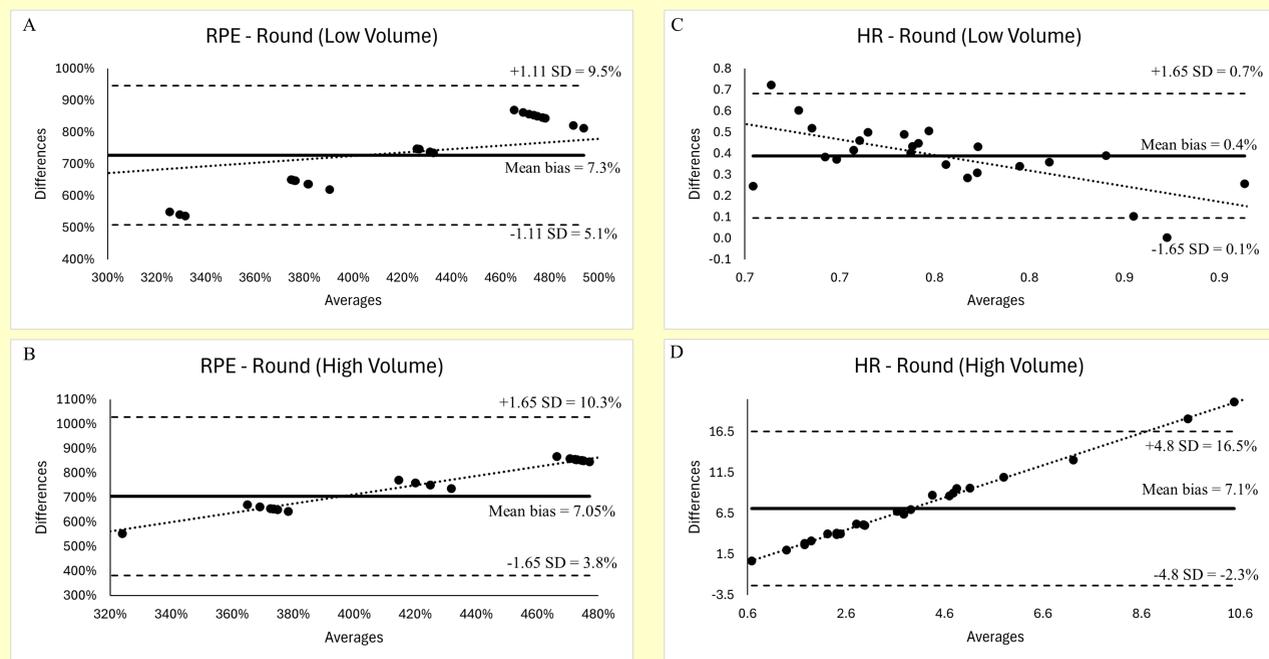
Spearman rank-order correlations and Bland-Altman plots were used to assess agreement between %MS and traditional intensity markers. Descriptive statistics were calculated for all variables. Statistical significance was set at  $p < 0.05$ . Figures 1–2 illustrate the workout design and agreement comparisons.

## Figure 1. Study Flow and Design



## RESULTS

**Figure 2. Bland-Altman plots comparing Round %MS with traditional intensity markers across volume conditions.** Plots A and B display RPE versus Round %MS for low (LV) and high (HV) volume workouts, respectively. Plots C and D show HR versus Round %MS for LV and HV. Bias (solid line) and limits of agreement (dashed lines) illustrate individual variability between pacing and each marker, highlighting how agreement may change with workout volume and the type of marker used.



**Relative pacing (%MS) demonstrated variable agreement with traditional intensity markers under both low- and high-volume conditions.** For Round %MS, RPE showed the strongest relationships, with a significant moderate correlation in LV ( $\rho = 0.62$ ,  $p = 0.01$ ) and a weaker, non-significant correlation in HV ( $\rho = 0.39$ ,  $p = 0.09$ ). HR consistently exhibited the weakest correlations in both conditions ( $\rho < 0.20$ ,  $p > 0.05$ ). Bland-Altman plots (Figure 2, plots A–D) illustrate these patterns, showing narrower bias and tighter limits for RPE compared to HR. Agreement was consistently weaker during HV, with greater spread and wider limits, highlighting substantial individual variability.

**Table 1 summarizes all Spearman correlations for Round and movement-specific %MS comparisons with HR, RPE, and  $[La^-]$ .** Notably, some individual movements like Wall Balls (WB) and Toes-to-Bar (T2B) demonstrated significant correlations with RPE and  $[La^-]$  in LV (e.g., WB %MS vs. RPE:  $\rho = 0.52$ ,  $p = 0.03$ ). However, these relationships generally weakened under HV conditions. This variability suggests that pacing-based metrics may align better with RPE but that no single marker reliably captures intensity for all individuals or workout volumes.

**Table 1.** Spearman correlations ( $\rho$ ) and  $p$ -values comparing Round and movement-specific %MS to traditional intensity markers (HR, RPE,  $[La^-]$ ) under low- and high-volume conditions.

	Low-volume $\rho$	p-value	High-volume $\rho$	p-value
<b>RPE (%A)</b>				
Power Clean %MS	-0.05	0.820	0.26	0.213
Toes To Bar %MS	-0.08	0.729	0.26	0.224
Wall Balls %MS	-0.19	0.377	0.08	0.706
Single Round %MS	-0.25	0.246	0.23	0.288
<b>Heart rate (%HRmax)</b>				
Power Clean %MS	-0.06	0.791	-0.13	0.542
Toes To Bar %MS	-0.12	0.571	-0.03	0.886
Wall Balls %MS	0.09	0.677	0.04	0.865
Single Round %MS	-0.15	0.495	0.19	0.364
<b>Lactate (%A)</b>				
Power Clean %MS	-0.06	0.780	-0.13	0.553
Toes To Bar %MS	0.31	0.140	0.22	0.299
Wall Balls %MS	0.18	0.398	-0.06	0.774
Single Round %MS	0.32	0.125	-0.16	0.443
<b>Power clean (%1-RM)</b>				
Power Clean %MS	0.02	0.910	0.10	0.656
Toes To Bar %MS	-0.25	0.246	-0.02	0.926
Wall Balls %MS	-0.39	0.058	-0.34	0.105
Single Round %MS	-0.35	0.092	-0.03	0.886
<b>Toes-to-Bar (%MR)</b>				
Power Clean %MS	-0.43*	0.036	-0.29	0.175
Toes To Bar %MS	-0.36	0.080	-0.20	0.358
Wall Balls %MS	-0.42*	0.043	-0.50*	0.013
Single Round %MS	-0.52*	0.009	-0.06	0.797
<b>Wall balls (%MR)</b>				
Power Clean %MS	-0.02	0.918	-0.20	0.360
Toes To Bar %MS	-0.24	0.255	0.00	0.989
Wall Balls %MS	-0.49*	0.014	-0.57*	0.004
Single Round %MS	-0.46*	0.023	0.02	0.927

\* Denotes statistical significance

## CONCLUSIONS and PRACTICAL APPLICATIONS

**Round %MS demonstrated the strongest overall agreement with RPE compared to HR and  $[La^-]$ ,** supporting its use as a practical pacing metric when laboratory measures are unavailable (2,3,4). While some single-movement pacing metrics, such as Wall Balls (WB) and Toes-to-Bar (T2B), showed significant correlations in low-volume workouts, agreement weakened under higher volumes, suggesting that workout structure and fatigue may influence intensity monitoring (5,6). Coaches and athletes may benefit from testing maximal speed for key movements or a full workout round to create %MS targets for training sessions (4,7). Using %MS alongside perceptual measures like RPE may help individuals sustain appropriate pacing, manage fatigue, and reduce performance variability in HIFT settings (4,8). However, substantial individual differences in pacing ability and experience highlight that no single marker consistently quantifies intensity for all participants (2,7). Future research should explore %MS-based pacing strategies across a variety of workout formats, training levels, and tactical populations to refine practical, field-ready tools for functional fitness coaches and athletes (2,3,7,8).

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