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PURPOSE

- The current guidelines to warm-up for a one-repetition maximum (1-RM) lift suggest a general warmup consisting of longer duration (~15 minutes) and low-intensity exercise should be performed.
- However, these guidelines are based on limited studies that used single modality aerobic exercise (e.g., cycle ergometer); therefore, general warmups have not been fully explored to assess differences on 1-RM performance.

METHODS



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Participants

- Healthy males (N = 8) aged 18 – 25 years who are free of disease and musculoskeletal injury.
- Minimum one-year deadlift experience and could lift at least 1.5 times body weight.

Protocol

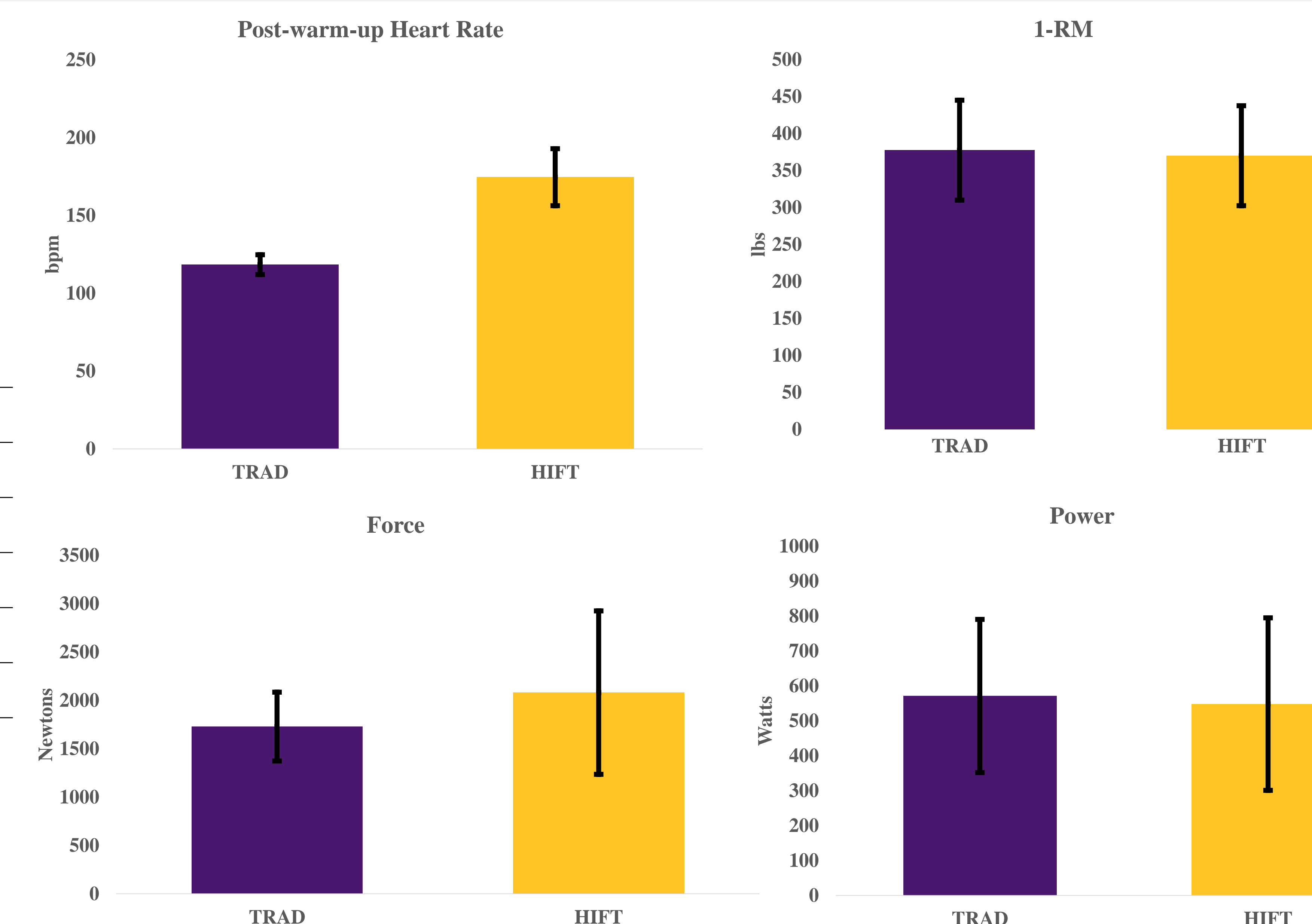
- Three visits to the laboratory, separated by one-week at approximately the same time of day (± 1 hour).
- Visit 1: Biometric measurements, maximal voluntary contractions (MVC) for gluteus maximus (GM), vastus lateralis (VL), and biceps femoris (BF) muscles using surface electromyography (IX BIO4, iWorx).
- Visits 2 and 3: Randomly counterbalanced into traditional (TRAD) and high-intensity functional training (HIFT) general warmups.
- TRAD: 15 minutes of stationary cycle ergometry at 55-60% of age-predicted maximal heart rate (NSCA general warmup preceding a 1-RM).
- HIFT: 15 minutes to complete as many rounds and reps as possible of 250-meter row (Concept 2), 5 burpees, 10 kettlebell swings, 15 air squats.
- Heart rate (Polar H10) and perceived exertion (RPE; Borg 6-20) assessed immediately after warmups.
- After one-minute of rest, the NSCA specific warmup for a 1-RM commenced.
- A velocity transducer (Tendo Power Analyzer, Tendo Sport Machines) was attached to the barbell and electromyography were attached to the GM, VL, and BF prior to the 1-RM attempts.
- Mean differences were investigated via paired-samples *t*-tests.

RESULTS

- No differences ($p \geq 0.35$ for all) for 1-RM, force, power, velocity, or muscular activity (% of MVC) between TRAD and HIFT.
- Higher ($p \leq 0.001$ for both) heart rate and RPE (TRAD: 9.4 ± 1.6 ; HIFT: 15.4 ± 1.7) in the HIFT versus the TRAD condition immediately post-warm-up.

Table 1. %MVC of the GM, VL, and BF between TRAD and HIFT conditions (Mean %MVC \pm SD).

| Condition and Muscle | % MVC | SD |
|----------------------|-------|-----|
| TRAD GM | 80 | 14 |
| HIFT GM | 94 | 21 |
| TRAD VL | 270 | 179 |
| HIFT VL | 260 | 199 |
| TRAD BF | 86 | 25 |
| HIFT BF | 73 | 15 |



CONCLUSIONS

- A bout of HIFT exercise preceding a 1-RM lift does not impair conventional barbell deadlift 1-RM performance.
- Greater intensity of exercise is elicited from the HIFT compared with the TRAD general warm-up.

PRACTICAL APPLICATIONS

- Athletes who perform concurrent aerobic and resistance training in the same session may feel confident to engage in high-intensity aerobic activity before heavy resistance exercise; it may not negatively affect strength.
- Performing a bout of higher intensity exercise before heavy resistance exercise may be a useful modality order for those who do not engage in regular aerobic exercise, since there may be greater health benefits to engaging in higher intensities of physical activity.