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Heart Rate and Rating of Perceived Exertion During High-Intensity Interval Training: Implications for Prescribing Intensity

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Rating of perceived exertion should be used in combination with heart rate when prescribing intensity for HIIT

Heart Rate and Rating of Perceived Exertion During High-intensity Interval Training: Implications of Prescribing Intensity

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Introduction

High-intensity interval training (HIIT) has become a popular time efficient alternative to traditional moderate-intensity continuous training[1]. However, current exercise prescription of HIIT often involves monitoring heart rate or workload which may limit the accessibility of this training modality[2].

Rating of perceived exertion (RPE) has been utilized as a practical way to prescribe exercise intensity, as RPE has been positively associated with physiological markers of intensity[3].

Little research has investigated the relationship among RPE and physiological markers of intensity, such as heart rate, during HIIT. Therefore, the efficacy of using RPE to prescribe intensity for HIIT is relatively unknown.

Purpose

To determine heart rate and RPE responses across a bout of HIIT, as well as examine the relationships between heart rate and RPE.

Methods

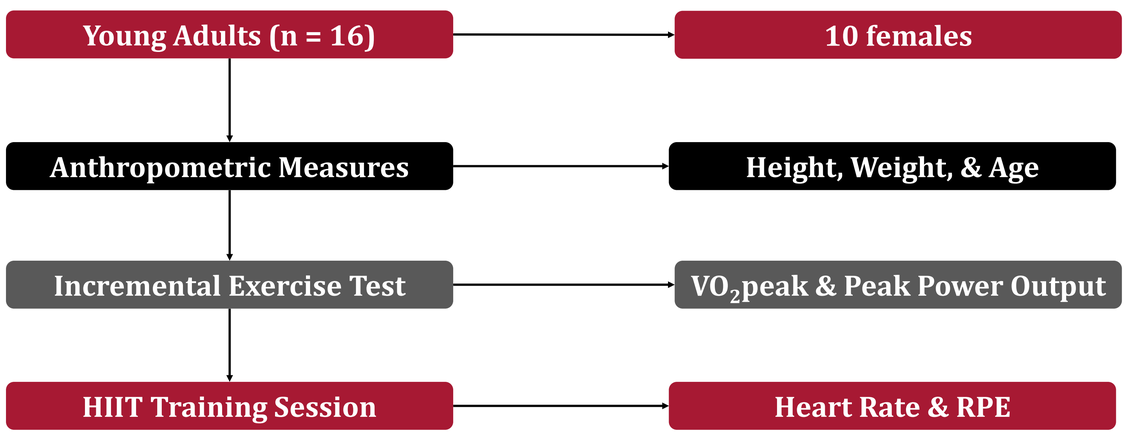

Figure 1. Study design schematic.

Figure 2. Incremental exercise test protocol schematic.

Warm-up and cool-down (black) at 50 watts. Resistance increased 1 watt every 3 seconds (red) until the participant was unable to maintain a cadence of 50 rpm.

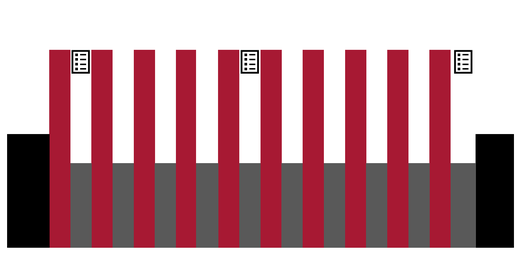

Figure 3. High-intensity interval training protocol schematic.

Ten 1-min work intervals cycling at 80% peak power output (red) interspersed with active rest at 20% peak power output (grey).

RPE was measured at the end of the interval

Differences in heart rate and RPE across the HIIT session were analyzed using one-way repeated measures ANOVAs. Relationships were assessed using Pearson correlations.

All data were analyzed in SPSS v.25.0 with an alpha level set at 0.05.

Results

Table 1. Baselines participant characteristics (n = 16).

Variable	Mean	Standard Deviation	Range
Age (years)	21.8	± 1.4	20.0 – 25.0
Height (cm)	164.1	± 10.5	138.0 – 184.0
Weight (kg)	68.7	± 10.0	52.7 – 87.0
Body Mass Index ($kg \cdot m^{-2}$)	25.6	± 3.8	19.0 – 33.4
VO_2Peak ($ml \cdot kg^{-1} \cdot min^{-1}$)	40.4	± 8.3	29.0 – 58.0
Peak Power Output (watts)	225.3	± 42.0	152.0 – 321.0

Note: VO_2Peak = peak oxygen consumption.

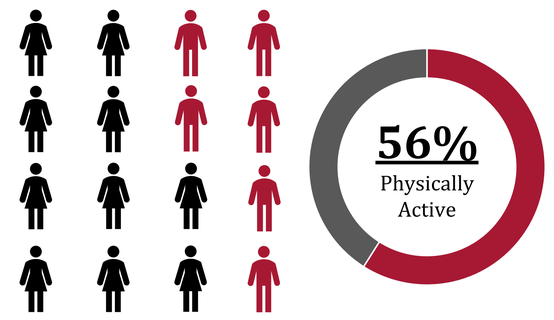

Figure 4. Study sample characteristics.

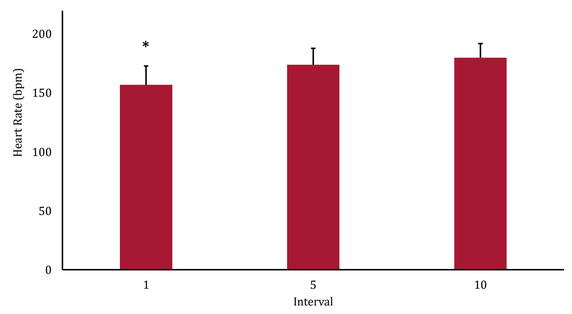

Figure 5. Heart rate across a single bout of high-intensity interval training.
*Significantly different from interval 5 and 10, p <0.05.

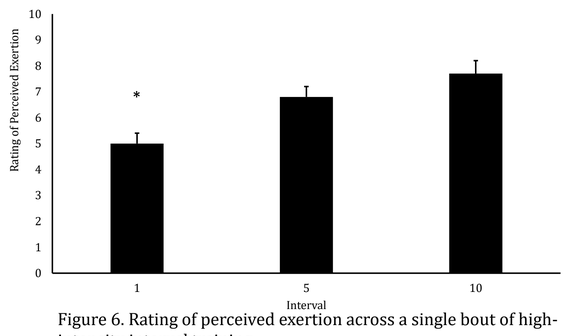

Figure 6. Rating of perceived exertion across a single bout of high-intensity interval training.
*Significantly different from interval 5 and 10, p <0.05.

Table 2. Correlation between heart rate and rating of perceived exertion.

Time Point	r	*p*
Interval 1	-0.33	0.21
Interval 5	-0.34	0.19
Interval 10	-0.07	0.80
Average	0.37	0.16

Conclusions

Heart rate and RPE both significantly increased across a HIIT session.

Heart rate and RPE were not significantly related across the HIIT session.

If RPE is used to prescribed intensity for HIIT, it may beneficial to use it in combination with another method to monitor intensity, such as heart rate.

Future research may be beneficial to investigate the use of heart rate and RPE to prescribe exercise intensity in long-term, real-world HIIT intervention studies.

References

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