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Conference Abstract

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Cadence influences exercise thresholds and peak power output from a ramp test in recreational cyclists

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Keywords

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1 Abstract

1.1 Purpose

The purpose of this study was to examine how cadence influences performance outcomes and physiological responses during ramp incremental (RI) exercise tests. Specifically, we investigated whether cycling at 70, 90, or 110 rpm affects time to exhaustion (TTE), peak power output (PPO), and ventilatory thresholds (VT1 and VT2), and whether the effect of cadence differs across these exercise intensity levels.

1.2 Methods

Nine healthy male recreational cyclists (22.4 ± 1.2 y; 74.9 ± 8.5 kg; 182 ± 5 cm) completed three RI tests at 70, 90, and 110 rpm in randomized order. Breath-by-breath gas exchange was recorded. VT1 and VT2 were determined using standard criteria and their associated PO were corrected for dissociation in the mean response time. Cadence and intensity effects were assessed using repeated-measures ANOVAs.

1.3 Results

TTE for the RI tests was longer at 70 rpm (747 ± 103 s), followed by 90 rpm (727 ± 98 s) and 110 rpm (696 ± 96 s) ($p < 0.001$). Similarly, PPO was highest at 70 rpm (424 ± 51 W), intermediate at 90 rpm (414 ± 49 W), and lowest at 110 rpm (399 ± 48 W) ($p < 0.001$). Power output at VT2 was progressively lower with

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increasing cadence (70 rpm: 284 ± 50 W; 90 rpm: 260 ± 47 W; 110 rpm: 239 ± 46 W; $p < 0.001$). PO at VT1 was higher at 70 rpm (218 ± 46 W) compared with 110 rpm (182 ± 35 W; $p = 0.014$), while no significant difference was found at 90 rpm (198 ± 43 W). Linear regression analysis showed that the decline in PO with increasing cadence was greatest at VT2 (-1.15 W·rpm^{-1}), followed by VT1 (-0.96 W·rpm^{-1}), and PPO (-0.66 W·rpm^{-1}). There was no significant difference in VO_2peak between the different conditions (70 rpm: 4.2 ± 0.6 L·min^{-1}; 90 rpm: 4.0 ± 0.5 L·min^{-1}; 110 rpm: 3.9 ± 0.4 L·min^{-1}).

1.4 Conclusions

Cadence significantly influences key outcomes derived from RI tests, including TTE, PPO, and the PO associated with VT1 and VT2. The greater decline in PO with increasing cadence observed at ventilatory thresholds, particularly at VT2, suggests that submaximal exercise intensities are more sensitive to cadence than maximal performance. These findings highlight that exercise thresholds are cadence-dependent and suggest that prescribing training intensity based on a single threshold value without accounting for cadence may result in substantially different physiological stress.