Physiology and Fast Marathons: An Integrative Approach

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Joyner et al. (4) have presented an elegant discussion on the physiological factors that may have contributed to the improvement in marathon performance in recent years. The authors outlined classic physiological traits associated with endurance performance, such as the maximum oxygen consumption ($\dot{V}O_{2max}$), lactate threshold, and running economy (RE; (4)). Unfortunately, there are multiple combinations by which these aforementioned physiological traits result in a similar marathon performance (e.g. a modest $\dot{V}O_{2max}$ and outstanding RE; (4)). A better approach to understand the physiology of fast marathons may be derived from the maximal intensity at which a steady state can be achieved. The relationship between speed and the duration until task-failure is hyperbolic, and its asymptote termed critical speed (CS). Jones et al. (2) argued that CS is the 'gold-standard' to determine the maximal metabolic steady state. Furthermore, CS seems to be an excellent predictor of endurance performance (5). Indeed, Jones and Vanhatalo (3) reported that a group of elite athletes, on average, completed their fastest marathon at ~96% of their CS. Critical power, the cycling analogous of CS, has been shown to decline with prolonged exercise (1), which may explain the fractional utilisation of CS in the marathon. Further research should investigate whether data from elite athletes (3) are applicable to other populations (e.g. recreational athletes). In summary, marathon performance requires steady-state exercise, and CS has been proposed as the 'gold-standard' to assess maximal metabolic steady state. Therefore, CS offers an integrative approach of the physiological factors underpinning marathon performance.

References:

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