Limits in endurance performance of octogenarian athletes

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TO THE EDITOR: A recent study of Trappe et al. (3) showed that the aerobic power of octogenarian lifelong endurance athletes was approximately double that of untrained octogenarians (38 vs. 21 ml·kg\(^{-1}\)·min\(^{-1}\)). These remarkable aerobic capacities are the highest ever recorded in this age group. However, the impact of the identified physiological capacities on actual endurance performances has not been addressed, as no running performance indicators of the octogenarian athletes were provided in this study. We hereby suggest that, although trained octogenarian athletes can achieve levels of aerobic fitness well above their untrained counterpart, as a group they actually have not yet reached their limits of endurance performance.

During the past decades, masters athletes (>40 yr of age) have dramatically improved their performance in endurance events such as marathon running. An analysis of running times of the best male masters runners between 65 and 79 years of age decreased significantly (2). However, due to the low rate of participation of athletes older than 80 years, the performances of octogenarian finishers were not analyzed.

The current marathon world record for a male octogenarian athlete was set in 2011 at the Toronto marathon by a Canadian athlete (Ed Whitlock, age 80) who ran 3 h 15 min 54 s (http://www.world-masters-athletics.org/). The performance of this male octogenarian athlete is amazing; his average running speed of 3.59 m/s is only 37% lower than the current world record (5.69 m/s, Patrick Makau, age 26, 2h03min 38 s at the Berlin marathon 2011). According to a simple physiological model (1), running speed (V, in km/min) depends upon three factors: 1) the fraction of maximal oxygen uptake that can be sustained (called endurance, F), 2) maximal oxygen uptake \(V_{O2max}\) (mlO\(_2\)·kg\(^{-1}\)·min\(^{-1}\)), and 3) energy cost of running Cr (mlO\(_2\)·kg\(^{-1}\)·km\(^{-1}\)) according to the following equation: \(V = F \cdot V_{O2max} \cdot Cr^{-1}\).

If we make the assumption that F and Cr are unaltered with age and therefore that Ed Whitlock and Patrick Makau have the same F and RE, the equation above suggests that the \(V_{O2max}\) of Ed Whitlock would be 37% lower than the \(V_{O2max}\) of Patrick Makau. If we take for granted that the \(V_{O2max}\) of Patrick Makau is ~80 ml·kg\(^{-1}\)·min\(^{-1}\), then that of Ed Whitlock should be close to 50 mlO\(_2\)·kg\(^{-1}\)·min\(^{-1}\). Interestingly, this estimated value is much higher than the average \(V_{O2max}\) observed by Trappe et al. (3) in octogenarian endurance athletes (~38 ml·kg\(^{-1}\)·min\(^{-1}\)). Either Ed Whitlock has an exceptional \(V_{O2max}\) for his advancing age or he has a lower \(V_{O2max}\) but exceptional F and/or Cr. In regards to Ed Whitlock’s performance, we could expect in the future significant improvements in the performances of octogenarian athletes who had high aerobic capacities when younger. Physiologists and coaches often wonder when an athlete will break the 2-h barrier for the marathon, but we must also wonder when an octogenarian athlete will break the 3-h barrier. Octogenarian athletes have therefore probably not yet reached their limits in endurance performance.

DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the authors.

AUTHOR CONTRIBUTIONS

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