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Letter to the Editor

Limits in endurance performance of octogenarian athletes

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A recent study of Trappe et al. (2013) showed that the aerobic power of octogenarian lifelong endurance athletes was approximately double that of untrained octogenarians ($38 \text{ ml.kg}^{-1}.\text{min}^{-1}$ vs. $21 \text{ ml.kg}^{-1}.\text{min}^{-1}$). These remarkable aerobic capacities are the highest ever recorded in this age group. Trappe et al's data support the idea that a life style incorporating endurance exercise helps maintains the plasticity of physiological systems beyond 80 yr of age, which has direct benefits to overall health (Gremeaux et al. 2012). Importantly however, it does not provide a link between the identified physiological capacities of the participants and their actual endurance performances, as no actual performances of the octogenarian endurance athletes were given in their study. To this end, we hereby provide evidence to suggest that, even though trained octogenarian athletes can achieve levels of aerobic fitness well above the untrained, 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 (Lepers & Cattagni 2012). An analysis of performances at the New York City Marathon showed that during the 1980-2010 period, running times of the best male masters runners between 65 and 79 years of age significantly decreased, suggesting that they have likely not reached their limits in marathon performances running (Lepers & Cattagni 2012). However, due to the low rate of participation of athletes older than 80 years, the performances of octogenarian finishers were not analyzed. Indeed, the mean number of finishers older than 80 years per year was 6.0 ± 3.6 for males and 1.3 ± 1.4 for females, respectively.

The current World marathon record for an octogenarian athlete was set in 2011 by a Canadian athlete (Ed Whitlock) in 3h15min54s at the Toronto marathon (<http://www.world-masters-athletics.org/>). The performance of the male octogenarian athlete is amazing; his running speed of 3.59 m.s^{-1} is only 37% lower than those of the actual world marathon record (Patrick Makau 2h03min38s i.e. 5.69 m.s^{-1}). According to physiological model, running speed (V in km.min^{-1}) depends upon i) the fraction of maximal oxygen uptake that can be sustained (called endurance, F), ii) maximal oxygen uptake $\text{VO}_{2\text{max}}$ ($\text{mlO}_2.\text{kg}^{-1}.\text{min}^{-1}$) and iii) running economy RE ($\text{mlO}_2.\text{kg}^{-1}.\text{km}^{-1}$) and has been defined as:

$$V = F.\text{VO}_{2\text{max}}.\text{RE}^{-1}$$

If we consider that, for simplification, the endurance (F) and running economy (RE) are unaltered with age (Tanaka & Seals, 2008) and therefore that Ed Whitlock and Patrick Makau

have the same F and RE, the stated relationship suggests that the $\text{VO}_{2\text{max}}$ of Ed Whitlock would be only 37% lower than the $\text{VO}_{2\text{max}}$ of Patrick Makau. If we assume that the $\text{VO}_{2\text{max}}$ of Patrick Makau is $\sim 80 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$, therefore those of Ed Whitlock should be close to $50 \text{ mlO}_2\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$. This estimated value is much higher than those observed by Trappe et al (2013) in octogenarian endurance athletes ($\sim 38 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$). Either Ed Whitlock has an exceptional $\text{VO}_{2\text{max}}$ for his advancing age, or he has a lower $\text{VO}_{2\text{max}}$ but exceptional endurance and/or running economy. Ed Whitlock was not a high level runner when he was young, so in regards to his performance, we could expect in the future an improvement of the performance of octogenarian athletes who had high aerobic capacities when younger. Physiologists and coaches wonder when an athlete will break the 2-h barrier for the marathon (Joyner et al 2011), but we must also wonder when an octogenarian athlete will break the 3-h barrier. Octogenarian athletes have probably not yet reached their limits in endurance performance.

References

- Gremeaux V, Gayda M, Lepers R, Sosner P, Juneau M, Nigam A. Exercise and longevity. *Maturitas*. 2012 Dec;73(4):312-317.
- Joyner MJ, Ruiz JR, Lucia A. The two-hour marathon: who and when? *J Appl Physiol*. 2011 Jan;110(1):275-7
- Lepers R, Cattagni T. Do older athletes reach limits in their performance during marathon running? *Age (Dordr)*. 2012 Jun;34(3):773-81.
- Tanaka H, Seals DR. Endurance exercise performance in Masters athletes: age-associated changes and underlying physiological mechanisms. *J Physiol*. 2008;586(1):55-63.
- Trappe S, Hayes E, Galpin A, Kaminsky L, Jemiole B, Fink W, Trappe T, Jansson A, Gustafsson T, Tesch P. New records in aerobic power among octogenarian lifelong endurance athletes. *J Appl Physiol*. 2013 Jan;114(1):3-10.