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MAKING SENSE OF ATHLETES AGEING *gracefully*

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In the scheme of things, triathlon is a relatively young sport. While there is evidence of random triathlon events taking place in the early 1900s, "modern triathlon" was born in 1974, on the sun-kissed shores of San Diego, California. The San Diego track (running) club believed the integration of swimming, cycling and running would be a useful conditioning alternative for runners, who were usually only focussed on track and road running. Since then, the sport has evolved into a global sporting sensation, with something on offer for all abilities and ages.

As the sport of triathlon continues to grow, so too does the interest in sports science and performance monitoring applications. Athletes and coaches are constantly seeking information to improve and/or preserve performance. With increasing popularity amongst masters triathletes, an important consideration for training strategies and subsequent performance output is to factor in the effects of ageing on physiological function.

PEAK PERFORMANCE

Peak triathlon performance appears to be achieved at 33-34 years of age in both males and females (Lepers et al., 2013). After that, endurance and ultra-endurance performance is generally maintained until ~35-40 years of age, with a moderate level of decline expected during the decade between 40-50 years. For non-elite triathletes, peak performance in ultra-distance events is typically achieved between 25-44 years of age. In relative terms, the most significant age-related decline in performance occurs after 70 years of age. Therefore, a curvilinear trend in performance decline occurs with advancing age. On the flip side, however, performance in relative terms has continued to improve with each age cohort, particularly amongst master's athletes, during the past 30 years. It seems likely that performance shifts through each era of time have come as a result of increased participation rates, and improvements in coaching, science, nutrition, and technology.

WHAT HAPPENS TO OUR PHYSIOLOGY AS WE AGE?

For those of us north of 40 years of age, it's no secret that "things start to change" when it comes to anatomical form and physiological function. If you are one who regularly pushes your body, you will invariably notice that you cannot match your performance outputs of 10 years prior; nor can you recover at quite the same rate. If you started training and competing in triathlons later in life, the changes may not be so noticeable, given that you may not know any different to the present. Interestingly, most triathletes that we see in our clinic are newcomers to the sport in their mid-30s to mid-40s. Indeed, I can't recall the last time that we evaluated the physiology of a triathlete younger than mid-30s. Perhaps the increased tendency for older athletes to seek professional advice on performance capacity and risk management, reflects an innate recognition of self-preservation via life experiences in the face of adversity?

The primary contributing factors to declining performance in master's athletes include reductions in:

- Training volume and intensity
- Maximal cardiac output and stroke volume
- Maximal heart rate
- Maximal oxygen uptake (VO2max)
- Exercise economy
- Lactate threshold
- Muscle mass
- Regulatory capacity of hormones
- Thermoregulatory capacity

LINKING AGE-RELATED PHYSIOLOGICAL CHANGES TO TRIATHLON PERFORMANCE

The age-related decline in endurance performance varies in accordance with the specific mode of activity. For example, there appears to be less age-related decline in cycling performance compared to running and swimming performances, across short- and long-distance triathlons (Lepers et al. 2016).

While the precise mechanisms to explain these mode differences remains unclear, it is possible that as athletes age, they might participate in cycling training with more frequency than running and swimming, due in part to the increased prevalence in orthopaedic injuries as we age. Furthermore, the loss of muscle mass and subsequent exercise economy (the type and rate of energy expense) may have a more pronounced effect on the body during running and swimming.

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> — Lepers et al., 2013

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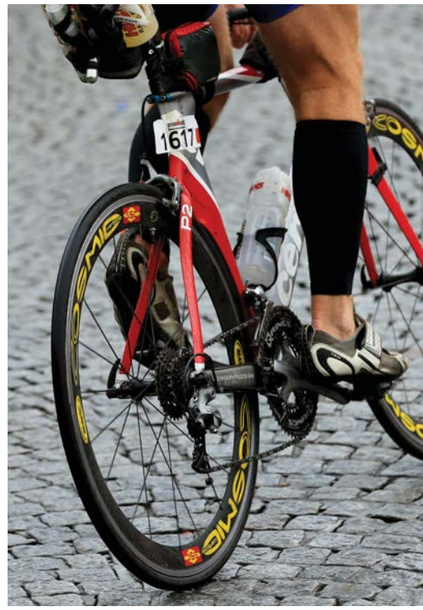

AGE-RELATED DECLINE: There appears to be less age-related decline in cycling performance compared to running and swimming.

There is also a strong link between age-related performance changes and the event duration. For example, the magnitude of change in running and cycling performance is more pronounced in longer endurance compared to shorter events. Interestingly, the magnitude of decline in swimming performance does not appear to be significantly different between shorter and longer events.

The rationale for greater age-related change in running and cycling performance as the event distance increases is likely due to the greater proportional extent of all physiological factors highlighted in the previous section; particularly diminished metabolic economy, hormonal regulation and thermoregulation. Also, one cannot dismiss that increasing age may influence determination and resilience, hence reduced interest in physically pushing hard for extended periods of time.

THE ANOMALY: This man seems to defy aging - at Ironman New Zealand 2017, Cameron Brown (aged 44) finished in second place behind winner Braden Currie (aged 30). Their times were 8:20:58 and 8:24:32 respectively.

BLENDING THE ART AND SCIENCE OF SUSTAINABLE WORK RATES

It is important to acknowledge that a broad range of physiological capacities is to be expected amongst master's athletes – just like their younger counterparts. As such, the approach to managing the training and competition needs of master's athletes should also be based on the unique nature of an individual's ambitions, health and fitness capabilities. As a younger athlete, it's beneficial to periodically (at least annually) monitor physiological changes; not only to identify specific training responses and adaptations but to also decipher realistic expectations as you age. For those coming into the sport a little later in life, a sensible approach is to consult with an exercise physiologist who will risk-assess with due diligence and can quantify your physiological characteristics and capacity. The principle evaluations to consider include;

- Sub-maximal and maximal oxygen uptake – specific training zones; metabolic economy; aerobic capacity
- DEXA – body composition, including bone mineral density; lean mass; fat mass
- Strength – a range of upper and lower body tests

After the age of 30 years, VO2max and muscle mass typically decline by ~10% and 3-8% per decade, respectively. However, master's athletes can engage with a number of strategies to minimise this rate of decline. Include 1-2x VO2 stimulus training sessions per week (vigorous intensity for short to moderate durations, with the same duration recovery; e.g. 30s/30s; 60s/60s; 3min/3min), across each mode of locomotion. Also, include 2-3x strength training sessions per week, combining a mix of upper body, trunk, and lower body exercises; 2-3 sets x5 repetitions with a heavy weight to gain strength; 2-3 x sets x 12 repetitions to build muscle mass.

Higher aerobic capacity (relative to age) is an essential ingredient in negating the decline in endurance performance. Furthermore, minimising the age-related decline in VO2max will contribute to greater cardiovascular stability, and assist with thermal demands associated with exercise metabolism and the surrounding environmental conditions. Maintaining muscle mass and strength is crucial for maximising metabolic economy and hormonal regulation, and minimising the risk of developing chronic soft tissue injuries.

From a healthcare perspective, VO2max and muscle strength are both considered very strong predictors of all-cause morbidity and mortality – so there is additional incentive to maintain aerobic fitness and strength.

Finally, with the rate of training recovery becoming prolonged as we age, carefully consider the most sustainable frequency, volume and intensity of training. For reassurance, seek the assistance of an exercise physiologist and coach with experience managing the needs of master's athletes. It's never too late to get started. Enjoy the journey! AT

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