Ageing and the master athlete

Do not go gentle into that good night
Old age should burn and rave at close of day
Rage, rage against the dying of the light

How does age truly affects us physically? There are many theories of decline, but masters bodybuilding champion Paul Ehren refuses to be a statistic. In this two-part article, he shares his wealth of personal knowledge and research reasoning with you.

The opening lines of Dylan Thomas's famous poem just about sums up my feelings on the onset of middle age, but rather than getting angry about it, can we define what we mean by ageing? Can we then apply this specifically to athletes and, more importantly, is there anything that we can do about it?

This subject is of course vast, so to even attempt to say anything meaningful inside one article, I must confine my comments to that closest to my own heart; bodybuilders and strength athletes. However, many of the comments that I make will also have direct relevance to other athletic disciplines and the population as a whole.

My enquiry into ageing really cuts to the heart of the functional model of nutrition and medicine – as functional practitioners, we strive to account for each individual's bioindividuality, as well as the synergistic effect of all bodily systems. Never has this been more true than for masters athletes: taking bioindividuality as a given, we need to account for the fact that age will take its toll on all of us in different ways. This, together with the possibility of acute and chronic diseases of ageing, and the effect of any pharmaceuticals taken to counter such maladies, means that each and every case must be taken on its individual merits and very few situations should be dismissed as 'typical'.

Sarcopenia – loss of muscle mass with age

Ageing has been defined as 'a progressive functional decline or a gradual deterioration of physiological function with age, including a decrease in fecundity' or 'the intrinsic inevitable and irreversible age related process of loss of viability and increase in vulnerability.'

As my article's focus is on strength athletes, let us, as a starting point, consider the effect of ageing on lean muscle tissue and subsequent force production. Research shows that human muscle mass reaches its peak between the ages of 20 and 40 (1), after which a steady reduction is experienced.

In 1989 Irwin Rosenburg (2) coined the word sarcopenia from the Greek words, sarx = flesh and penia = loss. The loose definition of sarcopenia has been stated as: 'the loss of skeletal muscle mass and strength that occurs with advancing age.' However, a definition suitable for research and clinical practice was still lacking until a working group was established, made up from representatives of The European Geriatric Medicine Society, the European Society for Clinical Nutrition

These body building photos are of the author's friend Martyn Yates Brown – they show him at ages 31 and 61 (30 plus years of high level competitive bodybuilding).

and Metabolism, the International Association of Gerontology and Geriatrics, and the International Association of Nutrition and Ageing. This group published a paper in 2010 (3) under the name of the Working Group on Sarcopenia in Older People and further refined the definition as: 'a syndrome characterised by progressive and generalised loss of skeletal muscle mass and strength, with a risk of adverse outcomes such as physical disability, poor quality of life, and death.'

Even though this study was obviously aimed at clinical care in later life, a quick look at the statistics confirm that the masters athlete is caught fair and square in at least the initial to middle stages of the syndrome.

Research indicates (4) that in the event of 'normal' ageing and based on a 'normal' environment, an individual can expect to lose between 0.5 and one per cent of muscle mass per annum after the age of 40, which increases substantially on an annual basis after age 60. Men and women can expect to lose between 30 and 50 per cent of muscle mass between the ages of 40 and 80. Additionally, a reduction in strength and power of between 1 and 1.5 per cent per annum is expected over the same period (5).

Seminal autopsy work by Jan Lexell (6) demonstrated that sedentary older men between the ages of 70 and 73 possessed approximately 110,000 fewer muscle fibres in their vastus lateralis muscle (in the quadriceps group) compared to younger sedentary men, aged 19 to 37.

Being somewhat more exact with our definitions, in addition to actual total loss of individual muscle fibres, we are also looking at the loss of muscle cross sectional area (CSA). The fast twitch type 2 fibres are subject to most, if not all, of these changes in fibre area and number (7).

The mechanics of skeletal muscle hypertrophy

In a previous article for this magazine (8), I explored at some length the mechanics of skeletal muscle hypertrophy in response to resistance training; using the information contained in that piece, we can start to understand the failings that take place with age.

Skeletal muscle, in keeping with most bodily tissue types, is dynamic, constantly being subject to break down (catabolism) and repair (anabolism). As strength athletes, we are looking to tip that equation slightly in the anabolic direction to achieve both functional and non-functional hypertrophy, together with increased subsequent force production.

In brief, hypertrophy is triggered by a few physiological processes: Firstly, direct mechanical loading of the muscle fibres triggers a 'cellular pathway cascade', influencing muscle protein synthesis. Secondly, the response to muscle damage or breakdown initiates muscle stem cells and immune system markers that begin a healing process on the actual muscle architecture. If you were to study a muscle fibre under an electron microscope in the event of trauma (from injury or a resistance training session), marked damage to the contractile proteins and Z-lines within the sarcomere may be noted. It is this damage that the immune response and stem cells look to correct.

It would also be expected that a large metabolic endocrine response would be triggered to include, inter alia, testosterone, growth hormone, IGF1 and insulin. These hormonal changes would create an increased level of protein synthesis and reduced level of protein breakdown, involving mRNA activity within the cell nucleus, together with phosphorylation and activation of the downstream effectors of the mTOR cellular pathway.

As strength athletes, we need to use resistance training programme management, accounting for both acute and chronic training response and recovery, to influence this catabolic/anabolic cycle, as neatly summed up by the General Adaption Theory detailed by Hans Selye (9).

Unfortunately, just about all of these anabolic/anti-catabolic responses are blunted as we start to age, with the older population often being referred to as 'anabolic resistant.'

As masters athletes, we therefore have a multi-faceted, eclectic mix of challenges to overcome. I am, however, delighted to tell you that there is a light at the end of this particular tunnel. The gold standard remedy to many of the above problems, especially sarcopenia, which is firmly backed by research, is appropriate exercise choices and healthy nutrition. This knowledge puts us masters athletes at the forefront of the battle against the ageing process – not only do we have a passion to exercise, but in order to still compete into our later years, we need to also ➤

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get our nutrition right. In this knowledge, we are looking at more than just side stepping the passage of time, but also at maintaining and possibly improving performance in our chosen athletic endeavour.

Ageing with strength

My starting position for myself and my clients 'of a certain age' is to obtain a few test results. My first test is a full spectrum biochemistry blood test that would consider, inter alia, health and condition of both red and white blood cells, liver function, kidney function, blood glucose, blood triglycerides, cholesterol, systemic inflammation (ESR), and markers to show possible excessive muscle break down (LDH & CK). If finances allow, additional tests that I would consider include vitamin D, cortisol levels, thyroid status (TSH, free T4/T3), a sex hormone panel and the genetics of health. Additionally, gastric acidity can be tested in a number of ways; even the good old bicarbonate burp test is a non-evasive test worthwhile using.

With regards to the strength and conditioning aspects of an athlete's training, I can bring personal experience to bear as well as the results of academic research, which back up the long-term strength and health benefit of resistance training time after time (11).

In layman's terms, the phrase 'train smarter not harder' jumps out at me. It has been apparent for some time that I can no longer use weights as heavy as I did in my 30's. However, this in itself can be turned into a blessing because without doubt, I am saving my large synovial joints from the sort of abuse that might result in more rapid degeneration.

I would suggest to any masters athlete (or his/her coach) that their time would be well spent in considering how the General Adaption Theory can be manipulated to best meet the needs of the athlete. Parameters such as the number of training sessions, volume and intensity of training within those sessions, amount of weight used, amount and type of recovery strategies used, and the periodisation of training over the year, are all standard areas to consider.

Again, from personal experience, I have found that recovery strategies are absolutely vital for the masters athlete. Weekly self-monitoring should highlight any fatigue state outside of the normal training response and additional rest periods or nutritional strategies can be brought to bear.

Having set the scene for strong and healthy ageing, I will leave you to anticipate my nutritional inputs next time in Part 2. **fsn**

Physiological declines with ageing

Sarcopenia is but one result of ageing. To highlight some of the other main protagonists, I would draw your attention to:

- **Endocrine response:** in addition to those already mentioned, we need to factor in increased susceptibility to insulin resistance, changes in thyroid response (TSH, free T4/T3), catecholamine production (adrenaline, noradrenaline and dopamine), oestrogen balance in both men and women, and cortisol levels.
- **Inflammatory markers:** general systemic immunity will begin to slow and the effect of inflammatory cytokines IL1, 2, 6 and TNF-α, together with immunoglobulins IgA, D, E, G and M, begin to result in an overall increase in systemic inflammation, leading to possible disease states and a reduction in anabolic response.
- **Nutrition and hydration:** nutrition will be covered in Part 2, but with regards to hydration, do bear in mind that the thirst response is likely to reduce with age; a perfect example of this is the number of urinary tract infections experienced at residential care homes for the elderly, caused in part, by lack of fluid consumption.
- **Genetic:** apoptosis (programmed cell death), telomere length and condition and the functioning of mRNA previously mentioned will have an impact on our longevity, continued health into old age and our ability to continue muscle protein synthesis above the rate of muscle protein breakdown.
- **Gut Integrity:** I would suggest that gut flora, permeability, enzyme activity and acidity are all likely to be subject to adverse changes as we age, leading to poorer assimilation of nutrients and possible inflammatory states as pathogens are allowed to enter the blood stream.
- **Neural degeneration:** it has been suggested that the loss of muscle fibres is, in large part, due to failure or partial failure of the motor units which innervate the fibres. This may be due to the degeneration of the neural axons and neuromuscular junctions (10).
- **Disease states and pharmaceutical intervention:** as mentioned previously, the maladies of ageing, and the long-term side effects of their management, will need to be accounted for during intervention strategies by the coach and nutritionalist.
- **Mental aspects:** the challenges faced by masters athletes will include the continued drive to train/compete, changing life values, and peer pressure to retire and be 'normal'.

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