# A lifelong approach to muscle resilience: implications for policy and practice

**MyAge is a UK interdisciplinary network researching muscle resilience across the life course: from cells to society.**

Funded by the Biotechnology and Biological Sciences Research Council and the Medical Research Council, we aim to improve understanding of the mechanisms leading to reduced muscle function and set the direction of future research leading to effective interventions. We work with policy makers, funders, healthcare professionals, inequality experts and the public, to tackle the biggest questions in muscle ageing.

# Executive summary

A lack of muscle resilience across the life course is contributing to a significant and growing health and social care burden, health disparities, and economic disadvantage, through early exit from the workplace. Addressing this crisis with a preventative mindset to improve muscle development and counteract loss at critical stages throughout life will yield important benefits:

- → during childhood development and adolescence to improve physical and mental health,
- → during adulthood to reduce sickness absence, enhance productivity and retain people in the workforce,
- → into later life to reduce frailty-associated ill health and retain greater independence in old age.

**“Poor musculoskeletal health is a leading cause of adults leaving the workforce early and of ill health in later life. ”**

*Professor Janet Lord, CBE, Director, MRC Versus Arthritis Centre for Musculoskeletal Ageing Research, University of Birmingham*

**Relevant Sustainable Development Goals:**


# Key messages

Muscle resilience is important for health and well-being across the life course, from childhood to later life. Physical activity can help **build and maintain muscle resilience.**

Interventions aimed at building and maintaining muscle resilience should be developed with consideration for the **different stages of life.**

Physical activity can take many forms and its **promotion, accessibility and inclusivity should be integrated across sectors.**

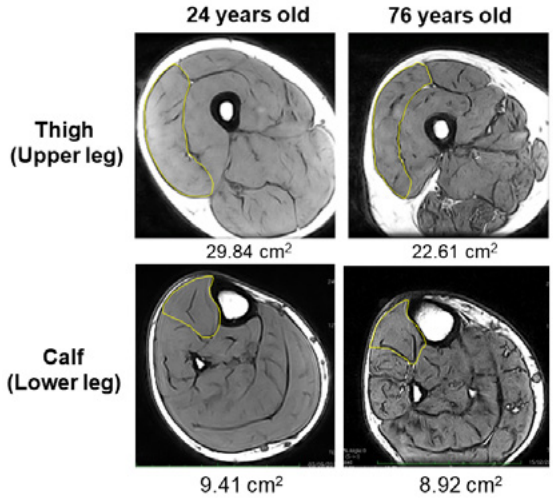
# Context

## An ageing population in poorer health

The challenge of population ageing is increasing dramatically. In 2019 there were nearly 12 million people aged 65 and older in the UK[1]. This number is expected to increase by more than 40% within 20 years. Although many people are living longer, they are not healthier; adults in the UK, particularly women, often spend the last decade of life in poor health[2]. One of the most prominent changes, associated with other ageing-related disorders, is the loss of muscle mass and function, with up to 50% of muscle mass being lost by the 8th decade of life[3].

## Loss of muscle mass and function is a growing problem for society

A leading cause of loss of independence in later life[4], muscle loss can lead to impaired mobility, falls, fractures, and physical disability. Loss of muscle mass is also linked to type 2 diabetes and impaired mobility increases the risk of cardiovascular disease, loss of cognitive ability and neurological disorders[5]. These all place a substantial burden on health and social care services; the excess healthcare costs alone for the UK have been estimated as £2.5 billion each year[6]. Poor musculoskeletal health is a leading cause of adults leaving the workforce early[7]. The effects of muscle loss are not experienced evenly across society, because sex and social environment strongly drive health inequalities in ageing. This means that we must adopt a holistic approach to tackling muscle resilience and in so doing, there is an opportunity to improve health and economic outcomes for the most deprived in our society.




*Magnetic resonance images of thigh and calf muscles: comparison of muscle cross-sectional area between young and older individuals. Image courtesy of Dr Mathew Piasecki, University of Nottingham.*

## Research aims

The research community is addressing the following topics:

- Establish the effectiveness and adherence to different forms of physical activity during childhood development and adolescence.
- Determine mechanisms underlying reduced muscle mass and function in older age.
- Identify key intervention points across the life course that will improve muscle resilience.
- Explore the relative influence of determining factors such as socioeconomic status, ethnicity, lifelong activity levels and biological sex on frailty-associated ill-health in older age.
- Develop accessible and feasible interventions to mitigate loss of muscle resilience across the life course.

# Key findings

- → **Physical activity** is effective in improving **mental health** in young people[8].
- → In the UK, approximately **470,000** people of working age **suffer from musculoskeletal symptoms,** many of which are **preventable**[9].
- → Beyond the age of 65 those in the wealthiest areas of England have approximately **twice as many** years **without disability** than those in the poorest areas[10].
- → Up to **50%** of muscle mass will be **lost by the age of 70**[3].
- → **Females typically live longer** and have younger 'biological age' than males. Importantly, females typically also have **worse neuromuscular health** in older age than males[11].
- → Physical activity can minimise functional losses in older age, but **adherence and behavioural change is low**[12].

# Policy recommendations

Muscle resilience is critical throughout the life course and physical activity is highly effective in building and maintaining resilience. In many instances physical activity is as effective as healthcare and pharmacological intervention, yet notably more cost effective.

**The following recommendations are based upon research findings:**

1. **Promote** physical activity in relation to muscle resilience with the target population in mind, because recommendations differ according to sex and stage of life.
2. **Incentivise** workplaces to encourage physical activity and increase uptake in the UK workforce.
3. **Implement** community-based physical activity programmes that are accessible, and affordable, which will benefit the health of the older population.
4. **Invest** in muscle resilience research to aid in the development of new and more effective and timely therapies and interventions, which directly benefit people of all ages and backgrounds.

**Question for policy makers**

As muscle resilience is critical throughout the life course, how can physical activity be more effectively implemented at each stage of life?

## Authors


**Dr Mathew Piasecki** Centre of Metabolism, Ageing and Physiology, University of Nottingham

**Dr Kambiz Alavian** Department of Brain Sciences, Imperial College London

**Professor Keith Godfrey** MRC Lifecourse Epidemiology Centre, University of Southampton & NIHR Southampton Biomedical Research Centre

**Josie Gray** Institute for Life Sciences, University of Southampton

**Professor Karen Lillycrop** School of Biological Sciences, University of Southampton

**Dr Alexandra Mant** Institute for Life Sciences, University of Southampton

**Professor Peter JS Smith** Institute for Life Sciences, University of Southampton

**Professor Carolyn Greig** School of Sport, Exercise and Rehabilitation Sciences, University of Birmingham



**To cite:** Piasecki M, Alavian KN, Godfrey K, Gray J, Lillycrop KA, Mant A, Smith PJS, Greig CA (2023). A lifelong approach to muscle resilience: implications for policy and practice. Policy Brief, University of Southampton, DOI: 10.5258/SOTON/PP0035

**The authors thank The Physiological Society for advice and support in the development of MyAge and its policy work.**


## References


1. Office for National Statistics overview of the UK population January 2021.
2. Greenhaff P, Lyn-Adams C, Allport S, Harridge S, Jackson M, Kuh D, Lord J, Mitchell S, Sharma S (2019). Growing older, better. Physiology's role in meeting the UK Government's healthy ageing mission. The Physiological Society.
3. Wilkinson DJ, Piasecki M, Atherton PJ (2018). The age-related loss of skeletal muscle mass and function: Measurement and physiology of muscle fibre atrophy and muscle fibre loss in humans. Ageing Res Rev 47, 123–132.
4. Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyère O, et al. (2019). Sarcopenia: revised European consensus on definition and diagnosis. Age Ageing 48, 16-31.
5. Kalyani RR, Corriere M, Ferrucci L (2014). Age-related and disease-related muscle loss: the effect of diabetes, obesity and other diseases. Lancet Diabetes Endocrinol. 2(10), 819-29.
6. Pinedo-Villanueva R, Westbury LD, Syddall HE, Sanchez-Santos MT, Dennison EM, Robinson SM, Cooper C (2019). Health care costs associated with muscle weakness: a UK population-based estimate. Calcif Tissue Int. 104(2), 137-144.
7. Dawson A, Phillips A (2022). Understanding 'early exiters'. The case for a healthy ageing workforce strategy. The Physiological Society, Demos and The Centre for Ageing Better.
8. Pascoe M, Bailey AP, Craike M, et al. (2020). Physical activity and exercise in youth mental health promotion: a scoping review. BMJ Open Sport & Exercise Medicine 6:e000677.
9. HSE (2022) https://www.hse.gov.uk/statistics/causdis/msd.pdf
10. UK Gov't guidance (2022). Healthy ageing: applying all our health. https://www.gov.uk/government/publications/healthy-ageing/healthy-ageing-applying-all-our-health
11. Hägg S, Jylhävä J (2021). Sex differences in biological aging with a focus on human studies eLife 10:e63425.
12. Jefferis BJ, Sartini C, Lee IM et al. (2014). Adherence to physical activity guidelines in older adults, using objectively measured physical activity in a population-based study. BMC Public Health 14, 382.


**Find out more:**

Visit www.ukanet.org.uk/myage/

@MyAgeNetwork

MyAge Research Network