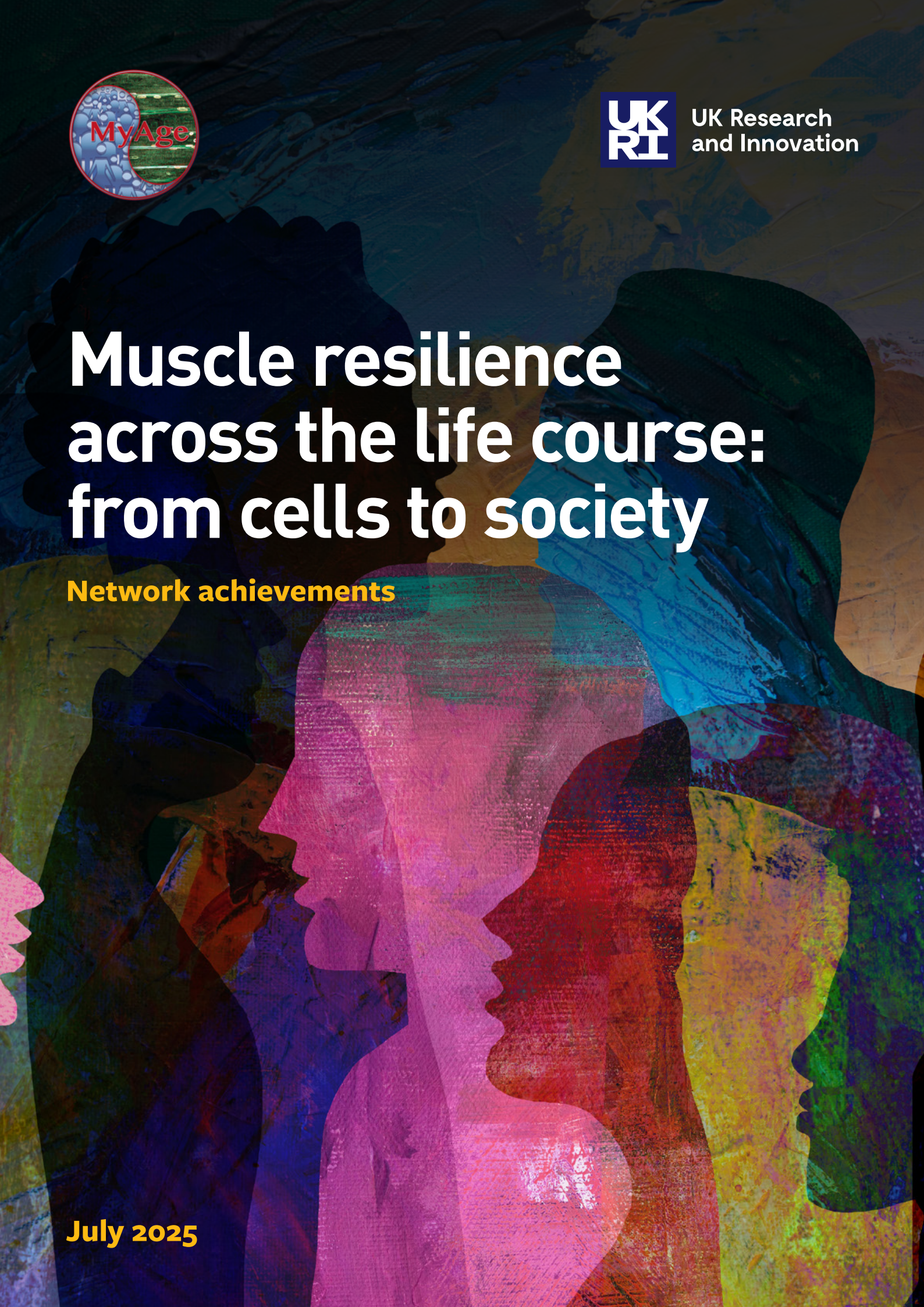


UK Research and Innovation

Muscle resilience across the life course: from cells to society

Network achievements

July 2025

What is MyAge?

MyAge is a collaborative network of researchers from across the UK, interested in the effects of muscle ageing, and how to help people live healthier lives, throughout the life course. MyAge membership also includes experts in other countries, businesses, charities, and members of the public. Its full title, *Muscle resilience across the life course: from cells to society*, reflects our approach, that we need to study all stages of life and to combine expertise from many different disciplines, to achieve healthy ageing.

What is muscle resilience and how does it affect me?

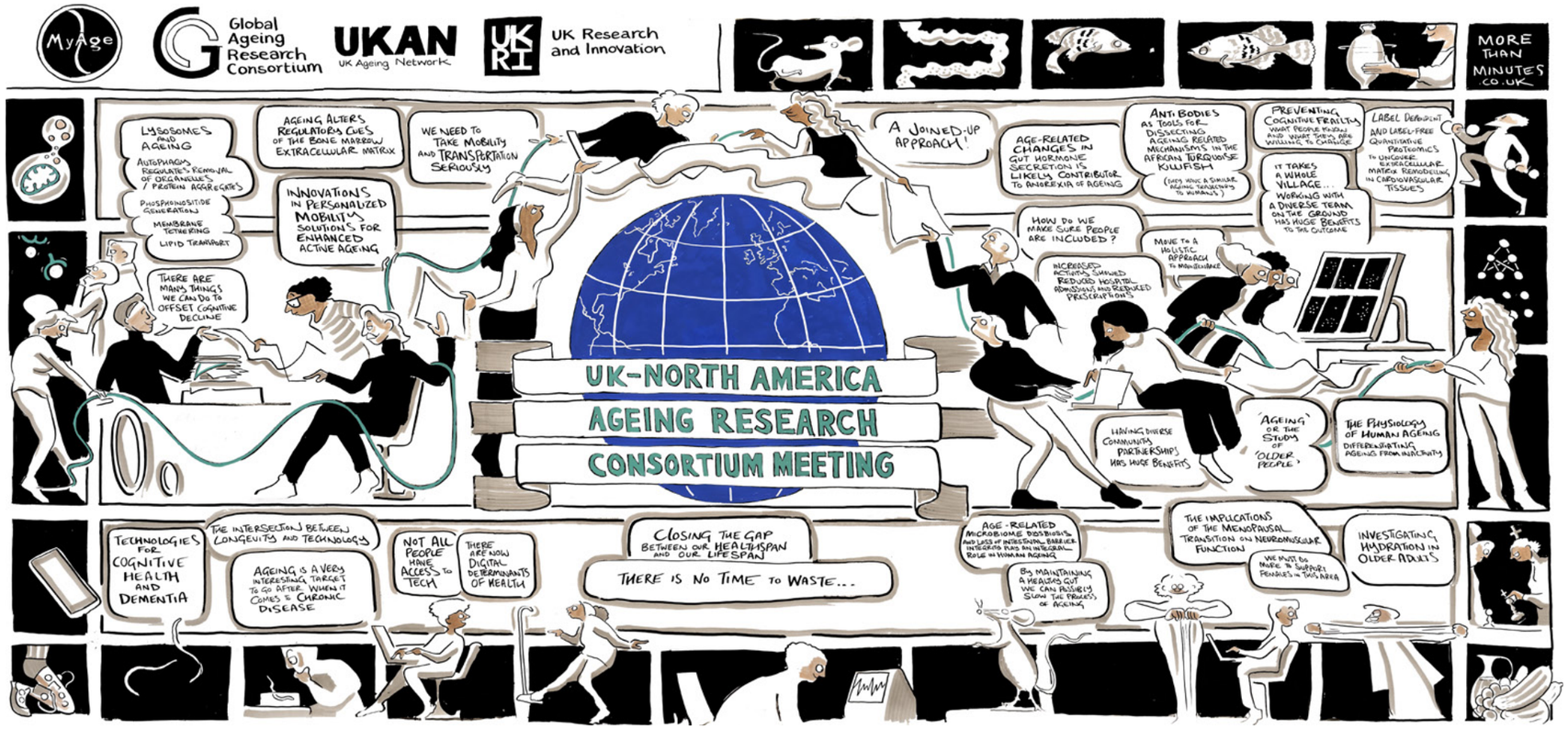
Resilience is how well our bodies, including our muscles, can cope with change and stress over time, whether that's due to ageing, or sometimes through illness, injury, poor nutrition or periods of inactivity. As we age, we lose muscle mass and function, and the ability of muscle tissue to repair and regenerate (i.e. bounce back) from adverse events, such as a period of immobility in hospital. During ageing, there is a decline in the function of muscle stem cells, which play an essential role in muscle regeneration and repair, along with a loss of mitochondria (energy sources inside cells), a decrease in the size and number of skeletal muscle fibres, and an increase in the amount of fat and fibrous tissue inside muscle. Together, these changes reduce the body's ability to build muscle in response to signals like physical activity and food intake. By the eighth decade of life, up to half of muscle mass can be lost. The biological mechanisms and inter-relationships behind the hallmarks of muscle ageing are not yet understood and not everyone experiences age-related muscle decline to the same extent. A complex interplay of inherited (genetic), environmental factors and socioeconomic influences can result in significant muscle health inequalities.

Loss of muscle mass and function can lead to falls, fractures and disability, but it is also linked with conditions such as cardiovascular disease and type 2 diabetes, in part because skeletal muscle is an important contributor to blood glucose regulation.

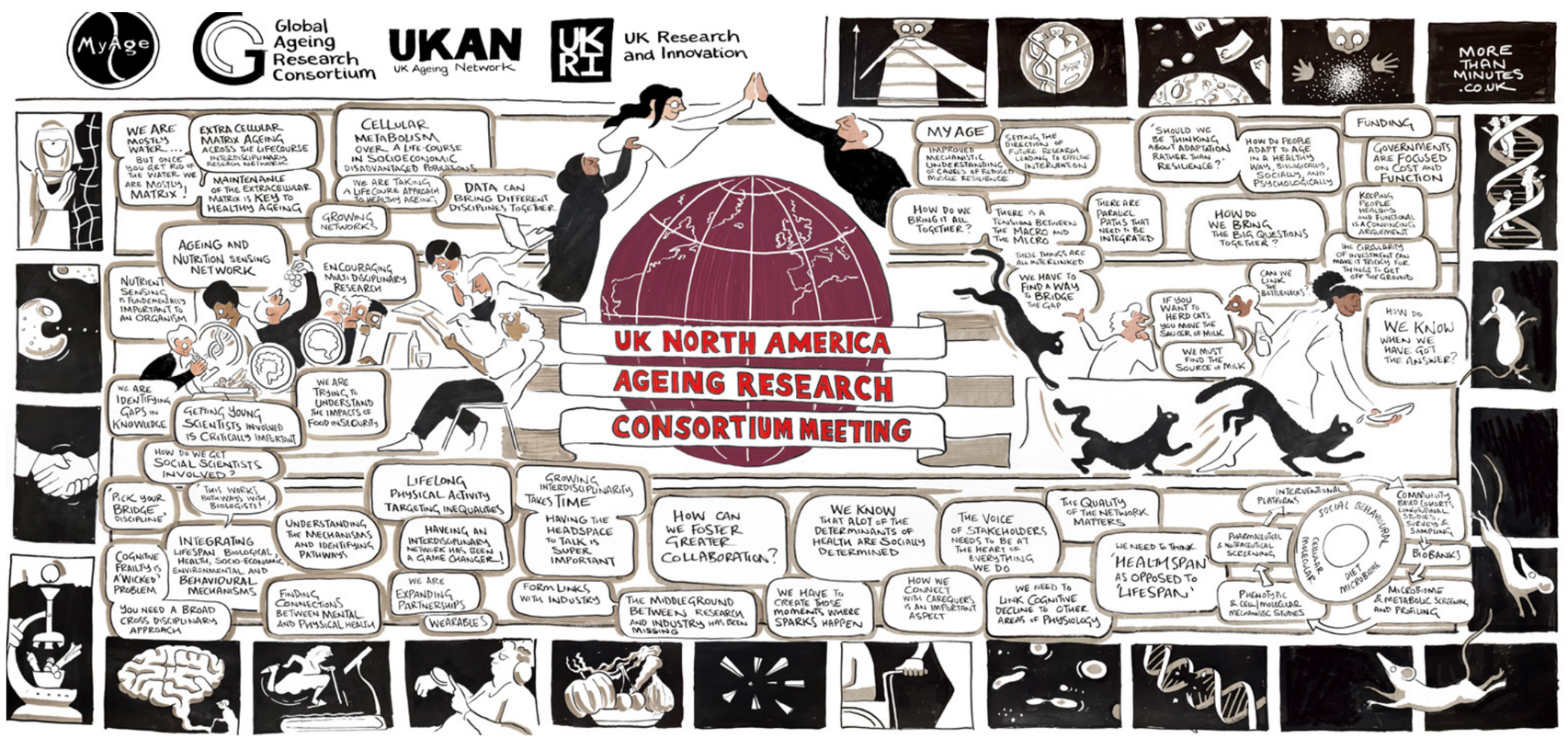
If we can better build and maintain muscle throughout all stages of life, our muscles will be more resilient to stresses and show a slower rate of age-related decline.

Why was MyAge established?

Reviews of how to enhance ageing research in the UK found that efforts were often disconnected, focusing on single aspects of ageing. To solve this, the Biotechnology and Biological Sciences Research Council (BBSRC) and Medical Research Council (MRC) co-invested about £4M between 2022-2025, creating eleven UK Ageing Networks, including MyAge. Each network was asked a) to connect experts from different disciplines to take a more holistic approach to healthy ageing and b) to deliver better understanding of the biological mechanisms of ageing and how to increase healthy lifespan.



MyAge members have been supported by UK Research and Innovation to develop international research links in the USA, Canada, Singapore and India. These drawings summarise a research showcase (upper panel) and subsequent roundtable discussions (lower panel) at the UK-North America Ageing Research Consortium meeting, held in London 9-10 December 2024, led by Dr Kambiz Alavian, Imperial College London. Images: Jonny Glover, More Than Minutes.



What did MyAge set out to achieve?

1. DEVELOP a national network of researchers with international links, across a wide range of scientific disciplines and career stages, focused on muscle resilience and ageing through the life course

155

members

46%

early career researchers

More than

1600

attendances at over 25 events & activities, including 650+ members of the public

International links developed in Europe, North America & Asia

145

responses to the MyAge survey

UK MyAge Membership

Sector

- Charity
- Defence
- Healthcare
- HEI
- Industry
- Public

Size of circle is proportional to number of members.

2. PROVIDE opportunities for secondments and training for early career researchers, technical staff and doctoral students, to encourage interdisciplinary approaches to muscle ageing

44

Early Career Researchers

Technical Staff

and Doctoral Students

received financial support for research, training and knowledge exchange in areas related to muscle resilience research

3. SUPPORT the development of new research ideas, especially by early career researchers, through network events and pilot projects

Over

£70k

invested in 18 collaborative projects and training secondments

Over

£1.25M

new research funding raised to date as a result of MyAge support

4. PUBLISH a research roadmap document for improved muscle health across the life course, by working with policy makers, funders, members of the public, and health and research experts

Over

600

downloads of MyAge reports to date

We reflected on responses to the membership survey, group discussions at events, workshops with young people and those in later life, conversations with our public contributors and with "critical friends", and created two main documents, together with versions for the lay reader and for industry:

RESEARCH ROADMAP[1]

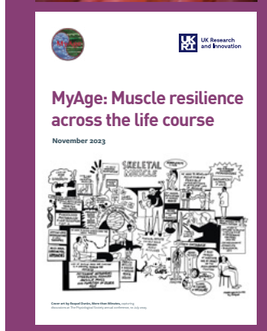
This report outlines which research questions should be a priority, and how we should conduct research studies to ensure we look at muscle resilience at different stages of life, and for different groups in society, as well as the mechanics of muscle resilience.

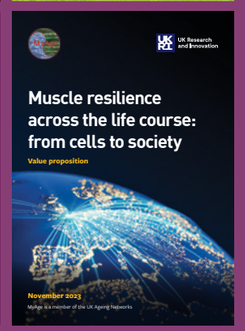
POLICY BRIEF[2]

This makes recommendations for policy makers, to help reduce health disparities and economic disadvantage, by improving muscle resilience and counteracting muscle loss at key stages throughout life.

Public Contributors

Three members of the public, **Ian Clarke, Gillian Richards** and **Elizabeth Robinson**, generously contributed their valuable insights and expertise throughout the project, including taking part in panel discussions, helping to assess applications for funding, co-producing the MyAge roadmap, helping young researchers communicate their work to the public and serving on the Steering Committee.



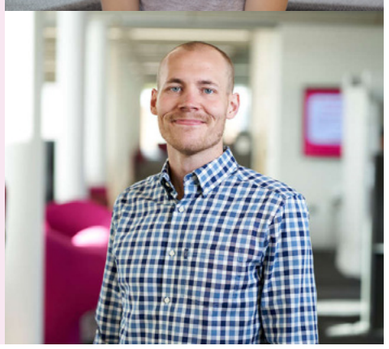


Selection of posters by a group of young people from Southampton, exploring the concept of muscle resilience and what it means to them now and in the future. The young people were recruited to a Youth Panel hosted by the University of Southampton's LifeLab: www.lifelabonline.org.

Case studies

Some exciting pilot projects supported by MyAge and led by early career researchers, are highlighted below.

1. Understanding muscle development and function at important life transitions



MyAge advocates a life course approach to healthy ageing – in other words, at key stages throughout life there are opportunities to build and maintain muscle resilience for a healthier later life. Network funding has supported several early career researchers to study neuromuscular function at key developmental stages, including the transitions through adolescence and the menopause, which are both poorly understood. Dr Ryan Williams (Nottingham Trent University) used high density electromyography (a technique to measure electrical signals as muscles contract), sex hormone analysis and measurements of brain function, to investigate the difference in muscle development between females and males. Dr Jessica Piasecki (also NTU) investigated neuromuscular function in women through the menopausal transition. Her team's findings suggest that brain plasticity is reduced in women after menopause. It is possible that these limitations may influence the ability of females to produce muscle force and help to explain why older females may experience poorer health in later life.

2. Establishing a new model for scientists to study muscle ageing in the laboratory

We don't yet fully understand the causes of age-related loss of muscle mass, strength and function (sarcopenia), and there are currently no drug treatments. It can be challenging to carry out studies of potential treatments in humans, due to safety, length of time required (i.e. waiting for people to grow older) and great expense. This means that there is a great need for human in vitro models of muscle cell ageing for identifying potential treatments. Dr Thomas Nicholson and colleagues from the University of Birmingham have studied muscle cells cultured from tissue donated as a by-product of joint replacement surgery. They have found that cultured human muscle cells keep the biological (as opposed to chronological) age characteristics of the donor, for example patients with chronic liver disease experience premature ageing of muscle tissue. This discovery means that cultured muscle cells from human donors could be used to screen for potential drugs or protective agents.

3. Insights into muscle repair at different life stages

As we grow older, our muscles can find it harder to recover from physical exercise. This may be due to failures in muscular regeneration-remodelling processes. We don't yet know why muscles regenerate less well in later life, but Dr Colleen Deane (a muscle biologist from the University of Southampton) and Dr Owen Rackham (a systems biologist, also from Southampton) have started to explore this question. They investigated differences in muscle gene expression in healthy volunteers of different age groups, who have exercised vigorously in the laboratory. Using a computational approach, the team has found molecules that are candidates for regulators of the muscle repair process and could give new insight to the age-related decline in muscle repair.

4. New light shed on the cellular processes involved in muscle ageing

Dr Mark Burton and colleagues at the University of Southampton and University Hospital Southampton have been working with Dr James Schofield (CEO of data science company, TopMD) to identify molecular signatures of age-related muscle mass strength and function (sarcopenia), analysing blood samples from healthy volunteers and those with sarcopenia. TopMD applied a mathematical technique known as topology to reveal patterns that shed new light on the cellular processes behind muscle ageing. The MyAge-funded pilot study helped Dr Burton win a prestigious research fellowship from the Vivensa Foundation, enabling him to continue this collaborative research. Longer term, the knowledge gained could help develop a tool to diagnose sarcopenia, and potential new treatments for the condition.

Stages of human growth progression.
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1. Greig CA, Alavian, KN, Godfrey K, Gray J, Lillycrop KA, Mant A, Piasecki M, Smith PJS (2023). Muscle resilience across the life course: from cells to society. A Roadmap for transformative research in healthy ageing. Report, University of Southampton. DOI: 10.5258/SOTON/P1128

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MyAge Research Network

Relevant Sustainable Development Goals: