

HEALTHY LONGEVITY GLOBAL COMPETITION

2020 Catalyst Awardees

Sponsor: UK Research and Innovation

Addressing the 'Change' in Memory. A Herbal Self-care Approach to Cognitive Problems in the Menopause Transition

Principal Investigator	Mark Moss
PI Primary Affiliation	Northumbria University
Co-Investigator(s)	Claire Hardy

PROJECT DESCRIPTION

The menopause is a natural part of the ageing process for women. It usually takes place between the ages of 45 and 55 years of age, and is a result of changes in hormone levels. Women stop having monthly periods and are no longer able to get pregnant naturally. However, this change in 'fertility status' is only the tip of the iceberg for many women. Menopause is linked to a wide range of unpleasant physical and psychological symptoms that may persist for a number of years as women go through the 'change'. This situation is perhaps not helped by the fact that menopause is a taboo subject when it comes to the workplace. During the menopause transition, many women find problems in learning and remembering new information is particularly challenging in the workplace. We want to see if help might be found in one of our most popular herbs, rosemary. It has been shown to improve memory and concentration in people who are not experiencing problems. It is not yet known if rosemary is able to reduce memory and concentration problems. The research will address this. First, we want to measure exactly what problems are being experienced. We will do this using a specialist online set of tests and questionnaires. Then we will compare two different methods of administering rosemary and what effects they might have on later completions of the same tests that participants will take over subsequent weeks. One way will be through the daily drinking of water that contains rosemary extract. The second will be through the breathing of rosemary essential oil aroma. We have previously found that both methods can aid mental performance in people without existing problems. We also know that rosemary contains natural molecules that can positively affect brain chemistry, and we think this is how it can help memory. We aim to identify if either of these methods produces better objective performance and/or more positive subjective feelings than that observed in a no treatment control group. If rosemary can reduce the problems with memory and concentration experienced during the menopause, then the women taking the treatment might feel better about work performance, and this might positively affect job satisfaction and mood. As a result, they may find their life generally is better, because they have had the stress and worry associated with the memory problems removed. It could be that nature can offer a helping hand at a time when a natural event is providing a challenge.

Characterisation of Lower Limb Loading During Sports Movements in Active Older Adults Using a 'Super Force Plate' Facility

Principal Investigator	Sharon Dixon
PI Primary Affiliation	University of Exeter
Co-Investigator(s)	James Nrownjohn

PROJECT DESCRIPTION

There is well documented evidence to show the benefits of staying active into older age on health, wellness and maintaining independence. However little is known about the movement patterns and joint loading experienced by this population during sport-specific activity. This knowledge is required to create specific support to help people to stay active for longer. This project will involve the customisation of a new state-of-the-art research facility, comprising 3.6-m square force-sensitive floor, cameras to monitor movement throughout the entire area and ability for virtual reality (vsimulators.co.uk), to recreate sports settings. Detailed information will be collected on the movement patterns of active older adults when performing sports tasks such as running, turning and stopping. The project will assess the feasibility of accurately reproducing complete sports movements, by comparing data collected in the new facility for active older adults with data collected for similar movements performed in sport settings.

A target application identified for this new facility and method will be the development of footwear specifically designed for older adults participating in sport and exercise, working in collaboration with project partner Cosyfeet (Somerset, UK). By providing new knowledge of the movement strategies of older adults performing sports tasks, results of this project will help us to understand the amount of joint loading, the level of cushioning and the amount of shoe-surface grip suitable for this population. The provision of a facility for the detailed investigation of sport-specific tasks for the active older population will transform the field of healthy ageing by ultimately allowing the provision of recommendations for safe and comfortable conditions to facilitate continued activity for this growing population, enhancing health and wellbeing and improving quality of life and longevity.

Continuous Monitoring of Vascular Age by Pulse Wave Velocity Using Wearable ECG and PPG Sensors

Principal Investigator	Christian Heiss
PI Primary Affiliation	University of Surrey
Co-Investigator(s)	Radu Sporea; Phillip Aston; David Birch; Simon Skene

PROJECT DESCRIPTION

While healthy ageing is one of the most important challenges of our time, it is difficult to monitor ageing during normal life. The ability to continuously measure ageing with low cost devices would open opportunities to test interventions that aim to slow ageing in a large number of individual people.

Progressive stiffening of the blood vessels is one of the most important features of human ageing. Importantly, arterial stiffness can be measured non-invasively as pulse wave velocity (PWV) and is viewed as the most important biomarker of vascular age, but it currently requires costly equipment and trained researchers to measure. However, personal devices like fitness bracelets and smart watches are now able to measure a variety of biological information including blood flow and electrical activity of the heart. This information could be used to calculate PWV with each heartbeat in real time and provide immediate information on the biological age of the blood vessels. More importantly, this approach would allow the identification of factors that accelerate and slow ageing in an individual person and monitor the success of “anti-ageing” therapies in an individual person. So far, no technology is available that fulfills this task.

In the current project, we wish to develop low-cost technology either using existing devices or build prototype device with available components to allow monitoring of individual “vascular age” at scale.

In the future, we hope to be able to test the continuous PWV measurements in larger and divers groups of people, potentially in collaboration with industry, NHS, and using sensor data from devices that people already own. Large data sets can then be analyzed together with other individual health related data by machine learning to identify ageing patterns and effect of healthcare interventions on trajectories of vascular ageing.

The Contribution of Physical Activity to Social Connectivity and Wellbeing in Older Adults Living with Dementia

Principal Investigator	Elizabeth Pike
PI Primary Affiliation	University of Hertfordshire
Co-Investigator(s)	Elspeth Mathie; Claire Goodman

PROJECT DESCRIPTION

This proposal aims to understand the experiences, benefits, and constraints on provision, of physical activity provision for adults living with dementia. The objectives of the study are to provide:

mapping of the existing provision of physical activity programmes in Dementia Friendly Communities (DFCs) across England

an overview of how people affected by dementia can maintain and take up physical activity and if this is a platform for other community-oriented work

evidence of what will enable the delivery of physical activity programmes for people living with dementia

a report on the experiences and subjective wellbeing of adults living with dementia who participate in physical activity programmes and how effectiveness can be measured

guidance on activities that benefit people affected by dementia from different cultural groups and at different points of the disease trajectory.

best practice recommendations, particularly to ensure that programmes and services are equitable, addressing stigma, enabling choice, and promoting social connectivity for older adults living with dementia.

There is convincing evidence of the physical, psychological, and social health benefits of engaging in physical activity for adults living with dementia (see Bangsbo et al, 2019; Pike, 2019). In particular, that physical activity can positively impact on social isolation and loneliness, and mediate the relationship between loneliness, self-rated health and wellbeing (Chen et al, 2018; Schrempft et al, 2019). For people affected by dementia there is promising evidence of the shared benefit of family carers and people living with dementia engaging together in physical activity (Lowery et al, 2014; Quinn and Toms, 2019). However, survey data indicates that older adults living with dementia find it particularly challenging to engage in many organised physical activities (Sport England, 2019). English policy has identified Dementia Friendly Communities (DFCs) as an approach to community engagement that supports people affected by dementia to live well.

Dynamic Muscle Function Monitoring in Older Adults: Development of a Novel Wearable Device to Measure Muscle Function

Principal Investigator	Annette Pantall
PI Primary Affiliation	Newcastle University
Co-Investigator(s)	Lisa Alcock; Rishad Shafik; Mathew Wlameer

PROJECT DESCRIPTION

The ageing process starts in early adulthood and affects all cells, tissues, and organs with consequential impact on function. Although age-related changes in the heart and nervous system are well recognized, effect of age on other tissues, such as skeletal muscle are less well known. Age related muscle loss and weakness, also known as sarcopenia, are present in up to 20% of adults over 65 years. This leads to reduced mobility, which is essential for a good quality of life and longevity and increases the risk of falls and fractures. Health care costs directly associated with muscle weakness and loss were estimated to be £2.5 billion in the UK and over \$40

billion in the United States. Assessing the health of the muscular system and providing appropriate interventions are therefore essential for advancing healthy ageing and longevity. Currently there is no reliable non-invasive, low-cost method of assessing muscle function. Our multidisciplinary team is designing a novel wearable device – the ‘MyoSock’ – a low cost, non-invasive smart wearable sock with embedded electronics. Special sensors measure activity of muscle and movement and we are developing software to relate these features to muscle health and sarcopenia. Part of our validation will use detailed magnetic resonance imaging which allows us to ‘look inside’ the muscle. Our goal is that the ‘MyoSock’ will form part of clinical physical health checks as well as used by the general public to monitor muscle health, similar to how the Fitbit or Apple Watch empowers individuals to record other health features. This device could transform the approach to health care of the ageing population by addressing muscle health, which is essential for healthy ageing yet currently not adequately screened for and treated.

Evaluating the Lifecurve Approach and App for Rehabilitation and Healthy Living in Later Life

Principal Investigator	Philip Rowe
PI Primary Affiliation	University of Strathclyde
Co-Investigator(s)	Susan Kelso

PROJECT DESCRIPTION

The LifeCurve™ is an expression of compressed functional decline and describes the set order of functional loss through normal ageing. There are 15 activities of daily living and instrumental activities of daily living on the LifeCurve™ all of which are required for independent living and which older people have reported as fearing the loss of more than dying.

The Scottish Government Active and Independent Living Programme which ran from 2017 to March 2020 undertook a national survey with allied health professions using the LifeCurve™ and found that when people see an AHP they broadly fall into 3 LifeCurve™ stages: 23% at precurve stage, 13% at mid curve stage and 40% at the end stages of the LifeCurve™. By linking survey results with use of health care services, it was identified that the further someone progresses on their LifeCurve™ the more health care service are used with associated increased costs. From £2,500 at precurve to £6,000 at mid curve and £10 – 12,000 at the later stages on the LifeCurve™. In terms of changing an individuals ageing trajectory, it could be said that AHPs are currently intervening too late in a persons ageing journey to make significant changes.

Evaluating and Replicating Local Accountability Platforms for Residential Care Homes and Social Care Services: Case for Support

Principal Investigator	Peter Lloyd-Sherlock
PI Primary Affiliation	University of East Anglia
Co-Investigator(s)	Nelida Redondo

PROJECT DESCRIPTION

A partnership between: University of East Anglia, Red Mayor La Plata, Fundación SIDOM and the Buenos Aires Province Chamber of Care Homes and Day Care Centres.

Developing countries already contain large numbers of older people with social care needs, leading to a rapid growth in private provision, including residential services. In 2010 Argentina’s Union of Gerontological Service Providers estimated the country already contained 6,000 residential care homes. Many of them operate on an informal, entirely unregulated basis.

We have developed an online platform for sharing information about the quality of services in care homes for the city of La Plata, Argentina. This responded to concerns about poor service quality, an absence of public information and the limited capacity of official local regulators. The site, launched in 2019, consists of a simple interactive information-sharing platform (<http://www.redmayorlaplata.com/>).

The site provides updated information about care homes and a set of service quality principles, developed in partnership with care home directors. It enables service users to provide feedback about providers. This feedback is not directly published on the site: instead, complaints are investigated and providers removed from the site if they are confirmed. The site also provides general information for service users to support the selection and assessment of social care services, and (more recently) the status of the COVID-19 pandemic in local care homes. We believe this unique intervention may have wide applicability across developing countries, where the capacity of government regulators is often limited and many care homes operate on an informal basis.

Our project will evaluate the La Plata intervention, along with new related projects by other organisations in Argentina. We will assess the feasibility and potential benefits of massively scaling up over the next three years.

Understanding Older Drivers' Behaviour and Fitness to Drive

Principal Investigator	Daniel Blackburn
PI Primary Affiliation	University of Sheffield
Co-Investigator(s)	Vitaveska Lanfranchi; Sam Chapman

PROJECT DESCRIPTION

Whilst population aged over 70 continues to increase, with associated increased multi-morbidities (especially neurological and cognitive) there is a need to assess safety of driving more accurately, and at scale so that those at high risk of driving accidents can be detected without unduly affecting the majority who remain safe to drive with very low risk of causing an accident. Finding new means to evaluate fitness to drive that are accurate, reflect real world driving conditions and are scalable is crucial. This is especially daunting in the context of an aging population in which the burden of co-morbidity and polypharmacy are growing.

Currently driving risk is assessed by self-reports or by medical reports, that take into account factors such as whether the person presents poor short-term memory, disorientation, lack of judgment, attention disorders, that do not accurately reflect safety to drive. For those with affected by cognitive impairments, detailed, time-consuming and expensive neuropsychological testing are undertaken in a minority and the usefulness of these in terms of predicting driving ability is unknown. Identifying new means of assessing driving behaviour and feeding back to drivers will provide support and foster self-management, which in turn will help keep more safe drivers on the road.

The project will conduct a stakeholder's identification and user requirement phase to elicit requirements and specifications for the identification and evaluation of driving behaviour; its relationship with fitness to drive and of potential feedback mechanisms to the drivers. The focus will be first a small population of participants as representatives of healthy drivers aged over 70 and people living with MCIs (pwMCI). Data collected from participants will then be analysed and correlated to their medical diagnosis. Specific behaviour and patterns that might indicate risk will be identified.

Integrated Technology Platform to Support Optimal Management of Ageing with Diabetes

Principal Investigator	Mohammed Benaissa
PI Primary Affiliation	University of Sheffield

Co-Investigator(s)	Tim Good, Mohammad Eissa; Zheng Hui; Hoda Nemat; Heydar Khadem; Jackie Elliott, Carla Gianfrancesco; Carolin Taylor
---------------------------	---

PROJECT DESCRIPTION

The complex relationship between diabetes, physical and cognitive decline, and ageing is not well understood (understudied) often leading to sub-optimal management of people with diabetes as they get older. This in turn results in higher risk of diabetes related complications and increased incidence of morbidity and disability in this population in later years.

The aim of this proposal is to provide a single technology platform that will implement a data-driven approach to the analysis of this complex relationship via automated machine learning (ML)-driven analytics based on the real-time remote monitoring of the key diabetes markers (Blood Glucose, Insulin, Carbohydrates) and incorporating physical activity measures, as well as cognitive assessment scores. This integrated environment will provide decision support for optimal diabetes management and service planning and provision for healthcare, social and community care. This will enable a shift from the current unsustainable, static and reactive management model, to a future-proof dynamic, intelligent proactive model.

Interaction, Dementia and Engagement in Arts for Lifelong Learning (IDEAL)

Principal Investigator	Spencer Hazel
PI Primary Affiliation	Newcastle University
Co-Investigator(s)	Adam Brandt; Christopher Leyland; Anna Goulding

PROJECT DESCRIPTION

Over the past few years, researchers, governments and social enterprises have become increasingly involved in the development of interventions to improve the quality of life for people living with dementia (PwD). Arts activities such as arts & crafts workshops and art gallery guided tours have been identified as one effective way to give PwD a creative outlet, increased agency, and a reinvigorated sense of social identity. However, for the artists and social enterprises running such interventions, there is little available training on how best to communicate with PwD in order to maximise the benefits of these interventions. The IDEAL project will address this through collaborative partnership with Equal Arts and Sunderland Culture, two UK organisations who offer creative ageing workshop programmes to support people living with dementia-related cognitive decline and resulting social isolation.

Flexible Living to Age in Place

Principal Investigator	Paul Jones
PI Primary Affiliation	Northumbria University
Co-Investigator(s)	Glenda Cook; Kay Rogage, Nic Palmarini

PROJECT DESCRIPTION

The housing industry in the UK does not respond to the challenges of growing old. It continues to build homes that are very difficult to adapt, compromising the ability of people to age in place. Digital and sensor technology- as well as adaptability innovations through Modern Methods of Construction (MMC)- have the capacity to be game changing. These technologies could enable the domestic environment to be tailored to support the particular needs of the occupant, so that they could live independent lives for as long as possible. Integration of this technology would represent a significant individual and societal financial saving for care costs and reduce the heartache and stress of a change of environment and lifestyle late in life.

The project team have been offered seven plots and funding in Seaham Garden Village- an innovative housing scheme of 1500 houses in County Durham. This high-profile development is a collaboration between private developers (IDP Partnership, Plan B, Tolent, Karbon Homes) working with Northumbria University. The ambition here is to use the catalyst grant to bring together a co-design team that is comprised of healthcare practitioners, architects, designers, building users and academics (with expertise in architecture, health, gerontology, computer science and software engineering) to design tech-enabled prototype houses, as flexible supportive environments, to support people across their life course.