

2023 Catalyst Awardees

Sponsor: UK Research and Innovation

aiKNIT: Programmable wearable devices for the treatment of musculoskeletal disorders

Principal Investigator	Ali Yetisen
PI Primary Affiliation	Imperial College London
Co-Investigator(s)	Sophie Richter

PROJECT DESCRIPTION

1.7 billion people worldwide are suffering from the pain of musculoskeletal disorders. This is more than one in four people on the entire planet. The rapid growth of an ageing population is exacerbating this problem, as an increasingly large proportion of people are at risk of living a poor quality of life. The financial burden is massive and expected to reach a global cost of over \$100 billion by the next decade.

This demands the development of novel solutions, as current devices are based on old legacy technology and haven't seen any innovation in years. My team and I at aiKNIT are inventing cutting edge material technology, to design programmable wearable devices that can change their material characteristics such as stiffness and elasticity, to support a patients recovery from musculoskeletal disorders. By designing adaptive knit structures, 3D printed kinematic attachments and an AI enhanced digital workflow, the programmable material characteristics will fit the patient's anatomical and physiological needs in a highly personalised fashion to facilitate faster and more effective healing with lesser side effects and shorter treatment times.

The first product will be a glove with adaptive functionality, which can be adjusted to the patient's condition and symptoms to provide care while retaining body functionality.

By speaking to over 20 private clinics and NHS Trusts, we identified private clinics as our beachhead market who have a strong demand for tailor-made solutions and have the financial capacity to purchase and keep devices in stock. We are planning to register the device as a Class 1 medical device and aim to market the device as a medical product for arthritis patients who seek personalised treatment with the added benefits of comfort and aesthetics. We are also planning to build strong partnerships with private clinics and NHS Trusts who, after successfully testing our device, would recommend it to their patients for self-purchase. This is common practice for clinicians and will help us have patients buy directly from our online platform.

bold (Bringing out Leaders in Dementia) An Entrepreneurial Approach

Principal Investigator	Frankie Greenwood
PI Primary Affiliation	University of Edinburgh
Co-Investigator(s)	Professor Heather Wilkinson Dawn-Claire Irvine

PROJECT DESCRIPTION

Dementia can significantly impact the lives of people who have a diagnosis. This includes stigma, social isolation and a lack of meaningful connection to their community due a lack of understanding and awareness and an unequal community culture.

There is some way to go to create an equal playing field where people living with dementia can remain active, productive, independent, and socially connected across generations for as long as possible.

Bold (Bringing out Leaders in Dementia) is an already established innovative Social Leadership project that has provided opportunities for people living with dementia across Scotland to even out that playing field as they take the lead in creating positive social change in their communities and continues to empower people living with dementia to make those changes that are so needed.

We have seen the difference that Bold makes first hand on the lives of people living with dementia and want that difference to reach out and benefit more people. However, our impact is limited to a set number of people in Scotland. We want to find innovative ways to push the boundaries, scale up our impact and be market leaders of positive social change for people living with dementia. We want to explore an entrepreneurial approach to achieving this impact. We will explore developing and marketing discretely packaged bold products, generating sufficient revenue to scale and sustain the programme whilst offering our products free of charge to those living with dementia.

Caring for carers: innovating for workplace health and wellbeing support

Principal Investigator	Wendy Loretto
PI Primary Affiliation	University of Edinburgh
Co-Investigator(s)	Dr Jakov Jandric Garrett Sprague

PROJECT DESCRIPTION

Against the backdrop of the UK's ageing population and workforce, there is widening economic and social concern about high rates of economic inactivity (early retirement) among people aged 50+. Around a fifth of those who leave work early do so because of health complications, with negative consequences for their future health and wellbeing.

Existing work through the Supporting Healthy Ageing at Work (SHAW; <https://www.shaw.business-school.ed.ac.uk/>) project has found that key barriers to addressing health support for older workers lies: firstly in their lack of understanding of the ways their health affects their work and vice versa; and secondly in being able to communicate their health needs to managers or to navigate the occupational health services that may be on offer to them.

This project brings together that empirical knowledge alongside an exciting new tech startup (Smplicare; <https://smplicare.com/>) with expertise in health data collection and modelling to develop an innovative intervention which will help individuals better understand the ways in which their health, work and wider lives interact, and will build on this understanding to offer a tool to help them more effectively navigate their health needs at work.

The research and development will be conducted in the supported housing sector, part of the social care sector that is currently facing a crisis in terms of employee commitment, attraction and retention. The responsibility to provide care is increasing because of demographic shifts. As such, timely and innovative intervention is much needed.

CHERIE: Community Health Education, screening and prEvention

Principal Investigator	Ilhem Berrou
PI Primary Affiliation	University of the West of England
Co-Investigator(s)	None

PROJECT DESCRIPTION

GP practices are the gateway to accessing healthcare, but they are inaccessible to many people who live in deprived neighbourhoods. We need to redesign health services, especially screening and prevention services, to meet the specific needs of those communities.

CHERIE (Community Health Education, scReening and prEvention) aims to establish outreach clinics delivered by organisations that are embedded within communities, to provide health education, screen people for risk factors of cardiometabolic diseases, and diagnose and manage them.

Delivering outreach via community organisations has many benefits. They are trusted by local communities; hold events and outreach activities within highly accessible venues at the heart of communities; employ and facilitate the volunteering of staff who understand the needs of the local communities (including cultural needs and local challenges); are able to offer extended time during events to discuss people's worries and concerns (unlike the 10 minutes offered to most patients attending GP appointments); and understand the local systems and are able to signpost and support people to access the services offered locally.

This model will address most of the barriers that are preventing people from accessing health screening, diagnostics and treatments.

We have been working with Caafi Health, a community organisation in Bristol to explore the feasibility and effectiveness of pilot CHERIE clinics in the most deprived areas in Bristol. The Catalyst award will help us enhance and refine the CHERIE model to increase people's access to health services. We will produce the blueprint of this model and a toolkit for social enterprises that are aiming to bid for funding to deliver services within the community.

Developing a set of digital tools to provide anticipatory care for people living with dementia

Principal Investigator	Harry Whalley
PI Primary Affiliation	University for the Creative Arts
Co-Investigator(s)	Mark Brill

PROJECT DESCRIPTION

We will develop a digital anticipatory care tool (ACT) to positively impact dementia patients by reducing clinical interventions, hospital admissions, and enhancing their quality of life. The problem sits within the broad challenges of older adult and dementia care – those of increasing costs and over-stretched resources. Hospitalisations of people living with dementia are resource intensive, with extended occupancy in hospitals due to the lack of care spaces and additional associated costs. As a non-pharmaceutical 'first line', our digital-tools will enable caregivers with a tool to fulfil better outcomes of CST and beyond such as; improved cognition, confidence, mood and relationships.

Developing an MND oral health care pathway and toolkit

Principal Investigator	Xiaochui (Helen) Chen
PI Primary Affiliation	University of Manchester

Co-Investigator(s)	Professor Anne-Marie Glenney Dr Lucy O'Malley Professor Andrea Malaspina
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PROJECT DESCRIPTION

Motor neurone disease (MND) is a rare life-shortening disease that affects motor neurones in the brain and spinal cord which control muscle movement. It affects adults especially those aged 55-79 years but not children. As messages from the brain gradually stop reaching muscles, MND patients cannot move properly, muscles become weak and get smaller causing difficulties in day-to-day life including moving hands and arms, walking, talking, eating, drinking and breathing etc which worsen rapidly.

Currently, there is no cure for MND and the multi-disciplinary healthcare team focuses on maintaining the best quality of life and mental health. Oral health is closely related to general health and quality of life through affecting oral functions and social interactions. With complex muscle weakening, oral health care is challenging for MND patients, carers and dental professionals but there is no clear pathway or toolkit.

This project aims to develop an MND oral health care pathway and toolkit providing 1) resources for MND patients, carers and dental professionals to better understand the challenges associated with MND, 2) guidance supporting self-care and carers to maintain good oral health for MND patients, 3) pathway to access dental care with a self-referral process for specialist dental service. The MND oral health care pathway and toolkit developed will provide comprehensive solutions that are not currently available. They will influence policy and practices, and are beneficial for the MND community not only in the UK but also worldwide, promoting better oral health and quality of life for MND patients.

Development of an App to engage patients at risk of osteoarthritis.

Principal Investigator	Suzanne Eldridge
PI Primary Affiliation	Queen Mary University of London
Co-Investigator(s)	Professor Francesco Dell'Accio

PROJECT DESCRIPTION

Osteoarthritis is a degenerative joint disease, characterised by cartilage loss, for which there is no cure. It causes joint pain, and it is a leading cause of disability worldwide costing ~ 1.5-2% of the GDP. The cost to society for loss of working days was £2.58billion in 2017 (Versus Arthritis data).

Analgesics reduce joint pain unsatisfactorily and physiotherapy can, at best, marginally delay the need for joint replacement. Joint replacement restores some degree of independence but not full function to the standards of an active lifestyle of an increasingly younger patient population. In 20% of the cases does not live up to patients' expectations.

A number of drugs have been developed in recent years (Sprifermin, Loricivint, LNA043) but have failed in clinical trials for either not providing pain relief or not restoring the cartilage properly, or both. Traumatic cartilage injuries lead to osteoarthritis later in life 60% of the time, but we do not understand why some patients progress and other don't.

As part of a larger study we will be following these trauma patients up by MRI scans and muscle function tests. This project would enable the

development of an App to obtain additional information about these patients during their recovery, or lack of.

This resource would be invaluable to the scientific community, clinicians and the pharmaceutical industry to provide better healthcare early on and enable healthy ageing.

Empowering Augmented Mobility of the Aging Population using Computational Musculoskeletal Simulation

Principal Investigator	Yihui Zhao
PI Primary Affiliation	University of Bristol
Co-Investigator(s)	Dr Zhiqiang Zhang

PROJECT DESCRIPTION

Nearly 6 million older people nationwide (or half of the aging population size) are physically inactive, with significance consequences on health conditions and decreased mobility. The associated demand and supply of physical support care for the aging population cost the UK £5.3 million a year.

Empowering mobility enables the aging population to preserve their physical fitness and promote health-related quality of life. Assistive robots have shown great potential for combating the mobility challenges experienced by the aging population. However, there is not currently consensus about targeted joints and assistive strategies for assisting the older people with walking. Moreover, assistive robots fail to give direct clues on the effects of the user's efforts and energy changes, which renders experimental evaluations less informative.

The project will develop a computational simulation platform to evaluate elderly people walking with assistive robots and provide quantitative scientific evidence for optimal designs and customized assistive strategies. The proposed platform will simulate an older person walking with assistive robots in a virtual environment by translating personalised characteristics of the aging population and models of assistive robots from the real world into digital forms.

By incorporating real-world walking scenarios, engineering can exploit changes in muscular efforts and energy to identify optimal robot design and customize assistive strategies. The proposed simulation platform provides a new solution to design and evaluate assistive robots for older people walking in an effective manner. It ultimately helps the aging population maintain mobility and increase life expectancy.

I-Can-Do: Developing digital accessibility for the dementia volunteer service

Principal Investigator	Kristina Niedderer
PI Primary Affiliation	Manchester Metropolitan University
Co-Investigator(s)	Dr Pui Ling Fung

PROJECT DESCRIPTION

I-Can-Do: Developing digital accessibility for the dementia volunteer service.

This project focuses on older people with a recent diagnosis of dementia. It seeks to support people in building their confidence and staying active and socially connected, which can help promote physical and cognitive health and wellbeing, and thus quality of life.

With rising numbers of cases, dementia is a key health priority. With no cure, there is a need for psychosocial interventions, especially at the early stages, to help people maintain their health, wellbeing and independence as long as possible. The challenge for supporting people at the early stages of dementia is in providing an individualised and tailored offer of activities in their local community that meets their interests and needs, that is not perceived as stigmatising, and that allows them to make a contribution for which they feel valued.

The IDoService offers such a novel and innovative programme. It supports people with a recent diagnosis of dementia in identifying, participating and contributing to social activities in their community by connecting them to local volunteer services. The Service is built around a core 3-session plan, delivered by the wellbeing mentor,

which allows people to explore their strengths and interests, get to know what is available locally and to decide what they want to do in a safe and convivial way.

We have successfully trialled the service with Age UK Salford in 2022 and propose now to develop an interactive digital version it to make is more user-friendly and easily scalable.

Improving self-management of lower back pain with a core activity detecting belt

Principal Investigator	Ravi Vaidyanathan
PI Primary Affiliation	Imperial College London
Co-Investigator(s)	Dr Paul Bentley

PROJECT DESCRIPTION

Lower back pain (LBP) is a leading cause of chronic disability and pain affecting 1 in 3 people, and is the most expensive medical condition, costing over £10Bn in UK and over £115Bn in USA per annum. Our team have created a wearable smart belt that helps motivate and guide exercise for people with LBP through detecting core activity.

Just a Minute': Assessing the potential to transform our 'Just a Minute' of bone specific activity finding into a population level intervention

Principal Investigator	Vicky Stiles
PI Primary Affiliation	University of Exeter
Co-Investigator(s)	Dr Karen Knapp Dr Samantha van Beurden

PROJECT DESCRIPTION

Osteoporosis is a bone-thinning disease that affects 50% of women and 20% of men over the age of 50 and increases their chances of experiencing painful, life-changing fractures particularly of the spine and hip. The high costs associated with osteoporosis are also expected to double in the next 50 years. Helping the population build stronger bones to help preserve bone health and prevent or delay the progression of osteoporosis will significantly help reduce the burden and cost of this disease on society. Helping people at a stage of life most at risk of osteoporosis preserve their bone strength, is key for helping individuals stay fracture-free for as long as possible.

This project aims to assess the potential to transform our findings regarding the benefits of bone-specific activity into a long-term population level intervention to help preserve bone health in mature adults and those living with osteoporosis.

Learning disability and dementia - supporting transition to a care home

Principal Investigator	Karen Watchman
PI Primary Affiliation	University of Stirling
Co-Investigator(s)	Sarudzai Mutebuka

PROJECT DESCRIPTION

People with a learning disability are at increased risk of dementia at a younger age, especially individuals with Down's syndrome. There may be occasions when it is no longer preferred or practical for a person with a learning disability to remain in their home as dementia progresses. In some instances a move to a care home may take place; however, this is often at time of crisis and is unplanned.

Two longstanding problems have become evident: 1) people with a learning disability and dementia are often moved to a care home without being supported to share information about themselves or their wishes for future accommodation needs or preferences and 2) staff in care homes for older people can be hesitant about people with a learning disability and dementia moving in. This is due to uncertainty about how to meet their needs and the perception that the support needed is too great, or too different from other residents.

This project will co-develop, pilot and refine a new resource for people with a learning disability and dementia to understand the personal outcomes that individuals want from their accommodation and support. We will also co-develop and pilot training/information with and for care home staff.

The long-term vision is that care homes throughout the UK welcome older people with a learning disability and dementia into an environment where staff are trained and confident to provide appropriate support. This will be consistent with the outcomes and goals identified by people with a learning disability themselves. It means that a move to a care home, is no longer anxiety provoking, or even a place to be feared due to previous connotations of large institutional-type settings and their role in learning disability history.

Patient Safety Research Centre: Empowering older people to avoid medication-related harm: a co-produced community pharmacy solution

Principal Investigator	Lisa Riste
PI Primary Affiliation	University of Manchester
Co-Investigator(s)	None

PROJECT DESCRIPTION

Greater Manchester NIHR *Patient Safety Translational Research Centre (PSTRC) facilitated two online co-design workshops in June & July 2021, which brought together people with vision impairments (VI) and community pharmacists to discuss medication safety. Attendees felt having /offering one-to-one consultations, to explore strategies together could help improve medication safety.

Pharmacists currently have no system in place to identify patients with VI (aside from people having a guide dog or using a long cane). Our audit in 5 Greater Manchester pharmacies, completed in Spring 2022, found 48% people with a diagnosed VI were unknown to their pharmacy. However, patients expected pharmacists had access to medical information; at the same time, pharmacists expected patients to tell them if they had a VI.

Riste suggested the need for a system to allow pharmacists to easily and accurately identify patients with VI so they can offer 1:1 consultations. She suggested displaying the shaded-eye logo commissioned for The Partially Sighted Society, as an alert to highlight people at potential increased risk of medication safety errors, would also reducing issues that up to 96% text-based pop-ups are skipped in pharmacies due to 'alert fatigue.'

After sourcing entrepreneurial funding from within University of Manchester from Masood Entrepreneurship Centres 'Flying Starter Award', and Faculty of Biology Medicine & Health 'Researcher Collaboration Fund', a team from Imago student software created FLAG-Me Vision. This is a new pharmacy alert system microservice that notifies pharmacy staff if a patient has a VI by displaying a logo on the patient's medication record. Alongside this, the FLAG-Me Vision website collates access to information and strategies to improve medication safety that pharmacists can explore with their patients during 1:1 consultations.

Proactive exercise referral pathway

Principal Investigator	Ashley Gluchowski
PI Primary Affiliation	University of Salford
Co-Investigator(s)	None

PROJECT DESCRIPTION

Physical inactivity costs the UK £7 billion each year and is responsible for 1 in every 6 deaths. Although a number of exercise programmes have aimed to address the global challenge of ageing and inactivity, there continues to be a shortage of successful programmes in real-world settings. When older adults become inactive, they lose their strength and become weak. Older adults who are weak are more likely to have a fall, become hospitalized, depressed, develop diabetes, cardiovascular disease, and cancer, and live in a care home much earlier than they should.

Providing people with an exercise programme while they are still healthy, and before they shown signs of muscle weakness can prevent these devastating outcomes. Exercise referral as a routine part of healthcare and providing all adults the opportunity and benefits of participating in exercise will also help to reduce health inequalities in later life.

Research shows that doctors don't feel confident discussing or referring exercise to their patients. While our research shows that older adults and exercise providers are unaware of exercise guidelines, the benefits of exercise participation, and where to turn to for support.

Our mission is to connect older adults with the tailored exercise programs that are proven to lower the risk of disability and disease. Our platform will be an easy-to-use tool for doctors and exercise providers to support exercise awareness, knowledge, referral, and support while its use will lead to a happier, healthier, and more active population.

Re-imagining LGBTQ+ Multigenerational Communities

Principal Investigator	Eleanor Whitcroft
PI Primary Affiliation	University of Sussex
Co-Investigator(s)	None

PROJECT DESCRIPTION

"Re-imagining LGBTQ+ Multi-generational Communities" brings together older LGBTQ+ community members and university students. It aims to build and support LGBTQ multi-generational communities through visual arts workshops, befriending schemes, and community researcher development.

Central to this project is comics: a source of nostalgia, humour, and a useful multi-generational reference point. Comics also have a longstanding history which reflect generational and social change within the LGBTQ+ community. Reading, discussing, and creating comics is one way to bring together multigenerational LGBTQ+ communities.

This project aims to develop a civic engagement model for UK universities to embed multi-generational knowledge exchange in their curriculums, as a way of tackling mental health and isolation in both older community members and university students.

Sustainable and nuTritious food Consumption for Older Adults (COAST)

Principal Investigator	Laura Wilkinson
PI Primary Affiliation	Swansea University
Co-Investigator(s)	Professor Andrea Tales

PROJECT DESCRIPTION

Our older adult community, especially those from a lower socio-economic background, are currently facing the health challenges of obesity and malnutrition, sometimes both at the same time. This results in increased risk of cardio-vascular disease and type 2 diabetes for obesity and/ or sarcopenia (muscle weakness) for malnutrition. Too often, the proposed solutions to these health challenges rely on an individual to make lifestyle changes (e.g., by following a particular diet using an app). However, sticking to such diets can be extremely challenging when we live in a food environment that encourages over-consumption of foods with little nutritional benefit. Moreover, failure to achieve health goals associated with eating and body weight can lead to the experience of 'weight stigmatisation'.

We propose a service to improve the overall eating environment for older adults and reduce stigma by avoiding placing responsibility on an individual. We will work with food producers, suppliers to care-homes and the NHS, supermarkets, and consumers to change the availability, accessibility and acceptability of products that support the health of older adults.

We have conducted research that suggests that foods can be developed with older adult health in mind and acceptability of these foods can be improved by working with older adults to optimise the presentation of these products. This service will allow manufacturers producing, in particular, sustainable and healthy foods, to access expertise and equipment to optimise their product for the older adult community (without having to invest in costly expertise and equipment themselves).

Tabletop travel

Principal Investigator	Tot Foster
PI Primary Affiliation	University of Bristol
Co-Investigator(s)	Professor Helen Manchester

PROJECT DESCRIPTION

Tabletop Travels aims to improve both the wellbeing and nutrition for older adults who are housebound or living in care settings. Tabletop Travels is an immersive dining experience focusing on diverse food cultures and places. It aims to both stimulate storytelling and widen the experiential possibilities for those with limited access to other cultures.

The project emerged from the Connecting Through Culture as We Age project, funded by the UKRI Healthy Ageing Challenge, through a process of co-design with older adults. A prototype has been built which pairs a meal kit with food stories from India through a technology-enhanced meal box containing visual, audio, and tactile interactions. We aim to further develop the concept, iterate the prototype, and develop a scalable framework for delivery within existing care services.

Talk-More: Device to monitor talking time for speech recovery after stroke

Principal Investigator	Claire Mitchell
PI Primary Affiliation	University of Manchester
Co-Investigator(s)	None

PROJECT DESCRIPTION

Claire is developing the 'Talk-More' device - a pedometer for talking. This will act as a means of monitoring talking time to motivate people to increase their talking time to improve their rehabilitation. The aim is for the device to be used by clinical speech and language therapists, researchers and stroke survivors and their families. The research will look at feedback from these end users and understand how we can improve the 'Talk-More' device.