Role of wearable activity-tracking technologies in the well-being and quality of life of older people, carers and people being cared for

In this document, after a brief introduction of our research programme on digital health wearables, we will address questions Qs 5 and 7 of the call: ‘Technology and Innovation in the NHS – Call for views’.

Introduction to the research programme

Ageing population, retaining independence of older people, support to carers, and using internet-enabled technologies to transform healthcare services are some of the national concerns. We have been conducting a research programme in collaboration with Age UK Milton Keynes (MK), Carers MK and Oxford University, and funded by Sir Halley Stewart Trust and the ESRC Impact Acceleration Award to investigate whether and how wearable activity-tracking technologies can contribute towards monitoring of activity and health by people aged over 55, carers and people they care for, and be accepted by medical professionals. Example technologies include off-the-shelf activity trackers such as from Fitbit, Garmin and Samsung, and smart watches. Typically, these devices record steps walked, sleep patterns, calories expended, and heart rate.

Although we have focused on activity trackers in our research, our underlying objective is to determine the service design requirements for the use of digital health wearables and smartphone applications (apps) by people aged over 55 years, carers, and people being cared for. Our aim is to inform the service design of these devices when they are employed in self-monitoring and self-management of health, or, for managing some specific medical conditions, such as diabetes, those related to heart and respiratory system, and during recuperation.

Rationale

Given the UK’s ageing profile and as part of the agendas of Active and Healthy Ageing and digital NHS, there is an increasing focus on maintaining health in later life and encouraging physical activity to preserve mobility and motor skills, and self-monitoring of health and medical conditions. The benefits of regular physical activity for older adults and those with chronic disease and/or mobility limitations are indisputable. Regular physical activity attenuates many of the health risks associated with obesity, cardiovascular disease, diabetes, depression and anxiety, and cognitive decline. As physical activity levels among

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2 Digital Health Wearables research programme at The Open University, UK, http://www.shaileyminoche.info/digital-health-wearables/
older adults (both with and without chronic disease) are low, facilitating an increase in activity levels is an important public health issue. Walking has been shown to improve cognitive performance in older people. Our previous research\(^5\) has shown that walking with others can help reduce social isolation and loneliness among people aged 55 and over.

**Q5: What key opportunities exist for the use of technology in health and social care over the next 10 years?**

**Evidence**

Our empirical mixed-methods research involving surveys, workshops and interviews with older people, carers, people being cared for, medical professionals, and manufacturers has shown the role activity tracking technologies can play in the health and well-being of people.

There are two ways in which activity trackers can play a role:

- for maintaining fitness - to support users to become and stay fit; in our survey for people aged 55 years or more (n=516), the two key motivations of using activity trackers were to monitor their physical activity and wanting to be fit.
- for monitoring a specific medical condition, such as with the heart, or extent of mobility while undergoing physiotherapy or recuperation after a hip or knee replacement.

The benefits of using activity trackers are:

- increased awareness and interest in one’s own health and the health of partners and other family members; taking up healthy activity routines by monitoring sleep and diet;
- an increase in their physical activity such as walking or gardening which users link to increased motivation and improved mental well-being;
- adoption of a healthy lifestyle and lifestyle changes such as reduced usage of car for local errands, attitude change towards food/diet; and
- sharing of data with GPs to diagnose non-optimal sleep patterns.

Motivation to become more active and have a healthy lifestyle is a recurrent theme in our findings, both for fitness and medical purposes usage. John, a 71-year old user with an untreatable lung condition has been using an activity tracker for the past two years to stay active. John has felt motivated over this time to increase the number of walked steps beyond the default target suggested by the manufacturers. By being physically active, John’s lung-problems have been less recurrent enabling him to be more physically active. Based on the positive effects that the device has had on his general well-being (e.g. more time spent outdoors, less respiratory infections), his medical team has recommended to him to continue using the tracker.

There is a role of digital health wearables in caring and incident reporting, and for monitoring movement and locations in conditions such as dementia and Alzheimer’s, and use of the long-term recorded data for diagnosis and medical interventions.

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\(^5\) Minocha, Shailey; Holland, Caroline; McNulty, Catherine; Banks, Duncan and Palmer, Jane (2015). *Social isolation and loneliness in people aged 55 and over in Milton Keynes*. The Open University, Milton Keynes, UK. Available from: [http://oro.open.ac.uk/43925/](http://oro.open.ac.uk/43925/)
In a 2015 survey by Trustmarque and YouGov⁶, 81 per cent of respondents said they would like wearable devices to be used in healthcare to monitor vulnerable people or patients at home; helping patients follow diet and exercise regimes or courses of medicine: “self-monitoring devices … could help the NHS save at least 60 per cent on the average cost per patient”. Monitoring during and after treatment and facilitating early hospital-discharge could address long-term occupation of hospital beds.

Further, the wearable activity tracking and monitoring technologies and smart watches have the potential to provide valuable research data for advances in healthcare by integrating widespread high-quality health data about the population. Such systems can also be used to help keep people healthy and improve care for those with chronic conditions.

The design and use of activity trackers will require close collaboration between manufacturers, health care services and the end-users so that the solutions developed can be easily adopted and used by communities to monitor their physical and mental well-being.

Q7: What are the barriers to innovation in health and social care?

In our ongoing research programme, we have come across the following barriers for: adoption of digital health wearables by patients and medical professionals, and integration of data from these devices within NHS’ IT systems and by people involved in healthcare service delivery.

Our empirical investigations have shown that despite the wide-spread use of wearable activity trackers by older people (e.g. gifts by concerned relatives) and carers, the functionality of these devices is not informed by:

- the kinds of activities that these user groups undertake;
- their digital skills;
- their data requirements and those of medical professionals, and
- data management and security.

The barriers to innovation in the adoption, usage and integration of digital health wearables in health and social care for people aged over 55, carers and people they care for, and medical professionals are:

- individualised parameter-setting for monitoring; currently, off-the-shelf devices are calibrated for physically fit (typically young active people) with unrealistic fitness targets for the older generation; matching the diversity of user needs to the diversity of activity trackers is a challenge for users (people aged over 55 years, carers and people being cared for) and medical professionals;
- usability and accessibility concerns – the need to design for age-related impairments such as vision, hearing, memory and dexterity;
- data access, management and security issues of data storage: concerns of accuracy and reliability of the data from off-the-shelf devices; lack of clear guidelines on ethical aspects of data-usage by family, carers and medical professionals; lack of guidance on

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whether and how the data from these devices can be integrated within patient records for consideration in diagnosis and in planning interventions;

- digital health literacy skills at all points of the service delivery to the patient (user) – from using the device, to data recording, storing and reporting incidents, sense-making of the data by the patient, carers, and medical staff along the service delivery chain; and

- perceptions of medical professionals on non-medically certified devices.

**Proposed solutions**

The Scottish Government should foster research into the accessibility, digital and data literacies, privacy and ethical issues of internet-of-things (IoT) and wearable ubiquitous computing for self-monitoring and self-management of health. These technologies have the potential of giving independence and improving wellbeing and quality of life.

It is vital that healthcare staff is given access to digital technology as a matter of course, rather than exception but they also have the knowledge and skills to utilise technology effectively. The Open University (OU) has long-standing experience of training and teaching healthcare staff via online technologies, which also develops their digital skills. FutureLearn is creating a unique and valuable resource for healthcare workers and patients alike, whilst simultaneously promoting the UK’s expertise in healthcare internationally.

The increased use of the Web and mobile apps to locate health information requires critical engagement with these technologies. People need to be able to navigate the vast amount of online health information including dashboards of their activity trackers and also of the people they care for in order to interpret and synthesise health information across multiple sources (i.e. websites) while also evaluating the credibility of these sources.

The Government should consider the improvement of digital health literacy of Scottish citizens. In particular, MOOCs should be designed for different population cohorts including children, elderly and other high-risk patient groups. These courses should ensure user-friendliness and involve citizens to co-design, test and implement learning modules that would help them improve their digital health literacy skills – particularly, the opportunities, risks and ethical considerations of data collection by manufacturers of wearables and mobile apps and by third-parties and the use of this data for research, marketing and insurance.

While the prospects for improving healthcare with this technology are huge, there is a potential for abuse and privacy breaches because of the personal health data being collected. Thus, gaining public trust before these technologies are deployed is crucial and is a necessary prerequisite for the effective use of this technology by the wider public.

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9 FutureLearn, courses in Health and Psychology, [https://www.futurelearn.com/courses/categories/health-and-psychology](https://www.futurelearn.com/courses/categories/health-and-psychology)
Photos to demonstrate the technology and our participatory approach of conducting research and developing an evidence-base through direct interactions with stakeholders.

Figure 1: Activity-monitoring device with its dashboard on a Tablet

Figure 2: Workshop-participants in our research programme sharing their experiences of activity monitors
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Dr Ana-Despina Tudor is a research associate in the STEM Faculty of The Open University. Her current work involves the research of users’ needs and expectations from activity trackers and for improving the design of digital health wearables for older people, carers and people being cared for, and medical professionals. She has previously carried out research in virtual reality technologies applied in education, in a project co-funded by Google and The Open University, UK.

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