

Electronic tools for healthy choices

Technology has a large role to play in helping consumers make healthier choices and delivering significant cost savings to healthcare. **Charlotte Holmes** of Campden BRI looks at the technologies being developed in this field and describes the EU PRECIOUS project.

Introduction

A recent study from the World Health Organization (WHO) noted that lifestyle-related non-communicable diseases (NCDs), such as cardiovascular diseases diabetes, chronic respiratory diseases and cancers, are the leading cause of death globally ⁽¹⁾. In 2008, NCDs accounted for almost two thirds of the 57 million deaths ⁽¹⁾. Across the European Union (EU) the impact of NCDs is even more pronounced. For example, in 2009 NCDs accounted for 87% of deaths and amounted to 70% of the overall healthcare costs in the EU region ⁽²⁾.

e-Health and m-Health

There is a clear need for interventions through lifestyle changes to reduce the risk of developing NCDs. Most NCDs are preventable through changing four behavioural risk factors: smoking, physical inactivity, excessive alcohol consumption and an unhealthy diet ⁽¹⁾. In addition to this, the effects that physiological wellbeing, environment, economics and social setting have on an individual's risk of developing an NCD are well known (see Figure 1). A wide range of approaches is being taken across the EU to tackle NCDs, including policy making, public campaigns and the reduction of inequalities in health. There is an increasing focus on these approaches being more patient centric, so that individuals can become more empowered and responsible for their own health. As part of this more patient centric approach, Information and Communications Technologies (ICTs) have a significant role to play, with a particular focus on the use

of mobile technologies. The use of ICTs in healthcare is characterised by two key definitions: i) *e-Health* is used to describe the use of ICTs in health (WHO define e-Health as the transfer of health resources and health care by electronic means ⁽³⁾) and ii) *m-Health* is used to describe the use of mobile technologies to deliver e-Health. m-Health has the potential to target large and diverse audiences and address the specific needs of individuals, because smart phones are intelligent, personal, portable and virtually always connected. With 67.6% of adults worldwide owning a mobile phone, there is a huge potential for using this technology, especially as it is already in the public domain ⁽⁴⁾. The use of mobile computing and communication technologies in health care and public health is continuously expanding and evolving ⁽⁴⁾. A recent report from the EU assessed the socio-economic impact of m-Health solutions and found

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that they offer potential for the EU to achieve a cost saving of €76 billion, with the technology assisting 54 million patients in avoiding the risk of developing a lifestyle disorder ⁽⁵⁾.

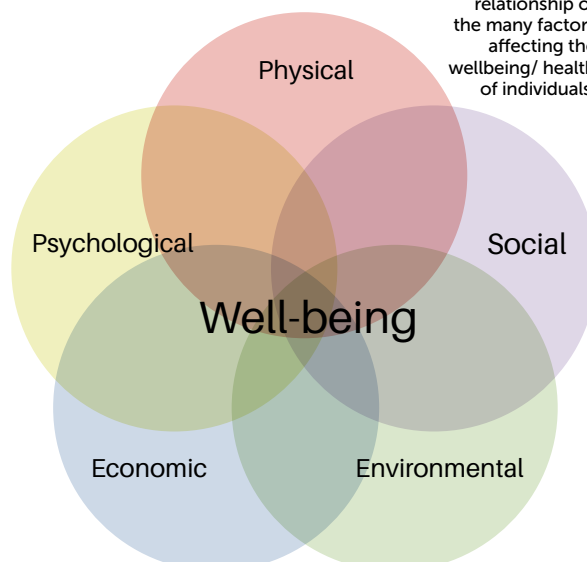
Based on this potential cost saving, there are increasing investigations into the uses and role of technology in helping consumers to make healthier choices, ranging from wearable and novel technology to apps and games.

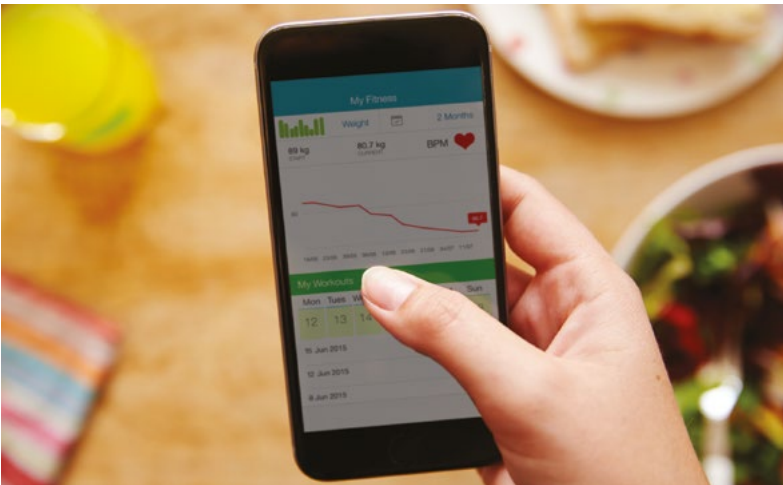
Types of technology available

Wearable technologies can range from the popular wristbands like FitBit® to sensors integrated into everyday clothing items like Hexoskin® tops. Wearable technologies use sophisticated algorithms and ubiquitous sensors to gather accurate health related data, without disrupting the individual's daily routine. This enables individuals to become more engaged and active in managing their health, by providing information and feedback on their current choices. The downside to these wearable tools is that there is still considerable variation in their accuracy; however as technology evolves there is no doubt that in the future they will play a critical role in managing the health of individuals.

A number of other technologies are being developed to help consumers monitor their diets. These include scales that connect to a smart-phone device via Bluetooth to enable the user to accurately record the weight of food they are consuming. This allows the user to more precisely log the nutritional intake. However, as the device requires the user to weigh individual dietary components, it may not be suitable for all environments

Figure 1. The interlinking relationship of the many factors affecting the wellbeing/ health of individuals.





(e.g. a restaurant). Another area currently being investigated is the use of spectroscopic analysis to determine the chemical makeup of food consumed, however there is currently limited scientific validation of this approach. An alternative approach is the HAPIfork®, which claims to help the user slow down while eating, as it tracks eating speed and alerts the user during use by shaking when eating is too quick. The down side to this is that it only controls one element of food intake providing no guidance on nutritional content. These novel technologies are, however, continuously evolving and they will have a part to play in helping consumers to manage their health in the future. It is key to ensure that the needs of the user and scientific validity are kept central to the design of such tools to maximise uptake.

m-Health has huge potential in preventative care and is being used to develop apps and games to aid individuals in making healthier choices. The choice currently available to users is wide, ranging from tools which simply provide information to tools which track food intake and physical activity and even provide suggestions for alternative healthier food choices. However, key to these apps is the feedback given; the information

needs to be personalised to the individual and educational to enable the user to understand the consequences of the feedback and be able to make informed choices.

The role of motivation

It is possible for everyone to change their choices to be healthier, however to do so most individuals need support, information and to learn new skills. To aid individuals and encourage the use of technological tools, there needs to be clear guidance and scientific validation to build trust and provide users with the right knowledge to make informed choices.

Many studies have been carried out to understand what influences a person's choices around food and it has been shown that the average person makes up to 200 food-related decisions a day. A review of over 100 studies where consumer behaviours around healthy eating were investigated, identified three main factors which influenced an individual's decisions: convenience, attractiveness and the selection of the healthier choice being the norm ⁽⁶⁾. In addition, it is important to recognise the impact of firstly, education on why certain choices are healthier and secondly, the environment in which these choices are made. Therefore, as well as

using the factors ⁽⁶⁾ identified above when encouraging healthier choices, it is critical to ensure that education is incorporated into the approach and that the behaviours learnt become longer term. This will necessitate using state of the art motivational and gaming techniques ⁽⁶⁾.

An essential challenge in preventive care is getting people truly motivated to take care of their well-being before obesity and other NCDs occur. One should note that historically humans prefer short term benefit to long term benefit ⁽²⁾. People are creatures of habit, especially when it comes to health, where the benefits are often not short term. Additionally, with the high amounts of stress experienced today, individuals easily revert back to poor health choices. Motivation is therefore a key element to successfully changing the choices of an individual for the better, especially when the process of changing can be lengthy. External interventions can help, but current health behaviour models, including those in e-health, are not very effective against the challenges of modern lifestyles because they do not account for the different needs of individuals at different times. New m-Health tools being developed will require tailored mechanisms that use real-time assessments of health behaviour and status of an individual to deliver a personalised approach to supporting them at the right time ⁽⁷⁾.

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The role of gamification

Recently, gamification, or the use of game design elements in non-game contexts, has been widely and successfully used to provide motivating experiences in a variety of situations. In general, the role of gamification is to create experiences usually linked to computer games. A game is usually composed of one or more potentially interrelated challenges, that the user attempts to complete by taking actions requiring skill and effort to reach



certain goals, with rules that affect the difficulty of achieving the goals. At the centre of these game-like experiences, is the fact that they exploit the psychological need for satisfaction and as the user achieves goals this need is met. The user then becomes motivated to achieve more goals to continue meeting this physiological need. Rewards can also be used to encourage the user to complete more challenges, either through a virtual points system or by allowing the user to gain/purchase physical rewards (e.g. Health coins). Therefore, to encourage healthier choices, the use of gamification in m-Health has great potential ⁽⁷⁾.

PRECIOUS

As part of the growing demand for solutions in healthcare, the role of technology sits high on the EU's research agenda. Campden BRI is a partner in PRECIOUS (PREventive Care Infrastructure based On Ubiquitous Sensing), an EU Seventh Framework (FP7) research, technological development and demonstration project (grant agreement no 611366) (8). The main objective of PRECIOUS is to provide a preventive health care system that will improve the health of the user and deliver cost savings in the public health sector. The project aims to use a combination of motivational interview and gamification principles to create a personalised system that adapts to the users' goals and preferences with an end goal of aiding the user to reduce their risk of developing Type 2 diabetes and

cardiovascular diseases. The system collects information about the user from a variety of devices and applications (sensors) to measure key risk factors including food intake, physical activity, stress levels, sleep patterns and environmental conditions. Links between these key lifestyle aspects will then enable the system to build an overall picture of the users' health status.

QuaLiFY

A new server platform, known as Quisper, that provides easy access to a set of web-services, bringing together data and knowledge rules for personalised dietary advice has been developed by another EU FP7 project known as QuaLiFY ⁽⁹⁾.

Data and knowledge about food and nutrition gathered by previous EU-funded projects (e.g. EuroFIR, NuGO, EURRECA, EUROGENE, Food4Me) have high scientific value and are of great interest for commercialisation, but are fragmented and lack cohesion. This data offers huge potential for cost savings across the EU. Through Quisper, the data and knowledge rules from previous projects have been unified to support nutrition research and the development of new products, according to the needs of specific groups (e.g. diabetic, obese, elderly).

Software tools can connect to Quisper via a secure Application Programming Interface (API) to retrieve data and execute knowledge rules, which can be combined to form a coherent

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service based on scientifically validated genotype-phenotype-nutrition interactions. Quisper can also host data and knowledge rules from other providers. Currently Quisper provides access to compositional data on generic and branded foods, European dietary reference values and analytical results of biomarkers as well as knowledge rules based on genotype-phenotype associations.

Summary

There are many benefits to using technology to encourage healthy choices, including ease of integration in daily life, the high level of connectivity, which allows the easy transfer of data, and portability allowing it to be used at any time in any place. As a result, it is likely that technology will continue to play a significant role in encouraging healthier choices. It is nevertheless, important to remember the role personalisation has in encouraging an individual to make healthier choices, particularly in terms of the type of feedback (e.g. numerical, diagrammatic, gamified). Therefore, any technology developed will not only need to fit into the user's life with minimal disruption, but will need to be able to carry out the the data processing required to personalise its interaction with the user. For m-Health to be really effective as a preventative care tool, it is essential that apps developed are simple to use. Areas such as banking and travel have already changed the way people use technology to manage their money and travel plans and these areas will be able to provide key learnings for those looking to develop mobile health tools ⁽¹⁰⁾.

Going forward it is hoped that Quisper's server platform alongside the PRECIOUS system using state of the art motivational and gaming techniques, will be able to provide users across the EU with an effective tool to manage their risk of developing Type 2 diabetes and cardiovascular disease.



References and article available online at:
www.fstjournal.org/features/29-4/healthy-choices



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Keywords

m-Health, mobile, healthy, technology, e-Health

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