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Digital ‘solutions’ to unhealthy lifestyle ‘problems’: the construction of social and personal risks in the development of eCoaches

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In this article, we critically interrogate the discourses used during the development of eCoaches. We draw on data from a four-phase qualitative study about the ethical, legal and social aspects of using digital technologies to encourage lifestyle changes that was conducted in the Netherlands between March 2014 and May 2015. The four phases of this study included interviews, document analysis, participant observation, interventionist workshops on legal issues and a forward-looking techno-ethical scenarios workshop. We use data from the first three phases to identify how both health-related and technology-related risks for individuals and society were constructed. There were multiple, concurrent references to risk in the programme and project documents, as well as in the various discussions we observed among designers. We discuss three major constructions of risk found in these discourses: risks to the health system, risks of developing an ineffective eCoach and new risks to the individual user. We argue that these three constructions feed particular norms and values into the design of the resultant eCoaches, whereby notions such as effectiveness, social solidarity, responsibility for health and individual autonomy (and thus, our understanding of what constitutes ‘risk’) are redefined. Understandings of risk may shift once users begin engaging with these eCoaches in practice. Future research should therefore also examine (discursive) constructions and understandings of digital risk from the perspective of the users of such technologies.

Keywords: risk; mHealth; eCoach; lifestyle; individual responsibility; social solidarity; autonomy; risk perception

Introduction

During the last 20–30 years, in high-income countries such as the Netherlands, there has been a rapid development of eHealth technologies – web-based health environments intended to improve (self-) care for individuals and populations. With recent developments in mobile technologies, these environments have expanded to include devices such as cell phones, personal digital assistants, tablets and wearable monitors such as smart watches (collectively known as consumer mHealth). Although programmes for online coaching (eCoaching), especially for lifestyle-related processes such as weight loss or smoking cessation are not new, the increased use of consumer-targeted mobile devices and their intertwining with various aspects of daily lives has led to renewed interest in this particular area of digital health. Whereas online coaching began with digital provision of (primarily text-based) information, advances in multimedia interfaces have enabled other forms of information presentation (such as pictures and graphics) and exchange, thereby

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increasing possibilities for providing personalised health information to individual users of these devices. With current and future health challenges increasingly being attributed to lifestyle-related non-communicable diseases, various stakeholders seek to capitalise on the possibilities afforded by these devices for ostensibly improving individual and population health.

eCoaches use devices and sensors to gather information about individual behaviour and transform this into targeted feedback for behavioural change. By monitoring both public and personal spaces, including the human body, these technologies contribute to what Lupton (2013, 2015) calls digital surveillance, which she has argued has opened a new field of inquiry regarding the ‘digital risk society’, whereby what is identified as ‘risky’ is increasingly configured and reproduced by digital media, devices and software. Technologies act not only as mediators of risk, but often also as sources of new concepts of risk.

In this article, we seek to contribute to the discussion on ‘digitised risk’ (Lupton, 2013) by examining how different risk discourses are configured in the *design* and *development* of lifestyle mobile app-based eCoaches that promote ‘healthy’ behaviours. Viewing materialities and discourses as inextricably intertwined (Beck & Kropp, 2011), we critically interrogate the discourses used by funders, designers and developers of these apps to identify how both health-related and technology-related risks are constructed and subsequently feed particular norms and values into the design of the resultant eCoaches.

Discursively constructing health risks and using digital technologies to govern behaviour

While there are multiple theories on risk, scholars in sociology generally identify three major perspectives: the risk society perspective, the cultural/symbolic perspective and the governmentality perspective (see, for example, Adam & van Loon, 2000; Beck, 1992; Douglas, 1990; Douglas & Wildavsky, 1983; Lupton, 1999, 2006a). In this article, we draw on the governmentality perspective that is grounded in Foucault’s work on historical shifts in social/political power relations as states grappled with retaining control over populations (Foucault, 1991; Rose, O’Malley, & Valverde, 2006). Scholars working from this perspective tend to examine how mechanisms of governance attempt to realise political programmes or social goals by exerting power at the level of individual behaviour. Using instruments such as counting, assessment, categorisation and judging/disciplining (Dean, 2000; Taylor-Gooby, 2008) places emphasis on measuring risk assessment, perception and evaluation at both the individual and societal level, and identifying those persons both *at risk* and *posing* a risk, whereby how risks are defined can serve to alter or maintain the power structure of a given society (Lupton, 1993, 2006a, 2006b).

Central to this approach is the recognition of the constructed nature of risks, whereby the notion refers to the consequences of what *might* happen following specific choices made in particular circumstances. Given specific focus on *possibilities* for averting/avoiding danger, constructions of risk are based on *predictions* about behaviour distribution and possible effects of transgression across populations (Taylor-Gooby, 2008). Moreover, risk is often used to refer to the possibility of damage, whereby what is at stake is of value to at least *some* persons (Van Asselt & Renn, 2011). Risk construction is largely a discursive practice that problematises certain phenomena in particular socio-cultural contexts and enables implementation of specific governance programmes. This is reflected, for example, in discourses arguing the benefits of ‘good health’ for both

individuals and society that are used to steer personal choices and behaviours. Representations of possible health-related risks found in policy documents or promotional items serve to advance an agenda that is centred on classical health promotion strategies and encourages specific forms of individual and collective action (Hooker, Carter, & Davey, 2009; Lupton, 1993; Singleton, 2005). Such representations frame risks not only in the negative (what might happen, such as possible detrimental effects), but also communicate positive benefits (possibilities for averting danger, such as the number of lives saved) of complying with a given strategy or policy (Hooker et al., 2009).

Understandings of risks to personal health are further influenced by the available technologies and methods for developing knowledge about health. What constitutes 'good' health-related behaviour (and who is responsible for it) fluctuates in relation to technological momentum (Adams & de Bont, 2007; Beck-Gersheim, 2000; Hooker et al., 2009). The newest iteration is found in the mHealth apps made available on smart phones and in sensors with related software that offer new ways of monitoring and measuring the human body (Lupton, 2012, 2013). With these technologies, the body is opened up to an external gaze that provides access to reflective health or medical information about the individual. While this information is promoted as helping the individual user understand his/her health, it can also be used by others to identify risky behaviours and/or at-risk individuals.

With new technologies, identifying probable health risks is based on algorithmic calculations, for example, via big data analytics, which provide a scientific (and arguably more reliable) estimation of risks (Lupton, 2006b). This calculative approach to risk identification fits the paradigms of individualised and personalised health, where health risks are considered to be manageable and controllable via self-monitoring and self-care based on personalised treatments and coaching. As Lupton has argued: 'Digital technologies have become increasingly used as a tool for public health to identify "at risk" individuals and groups' (2013, p. 14). mHealth technologies seem particularly to facilitate this turn towards personalised health by catering to individual characteristics and bodily markers (Dickenson, 2013). The increased use of such technologies thus allows for digitising health risks, with eCoaches, for example, working on the premise that especially lifestyle-related health risks can be defined before they even manifest and then mitigated through self-control and discipline.

Policies for public health promotion have suggested that mitigating or averting lifestyle-related health risks may lead to improved health outcomes and cost reduction, making health in this context simultaneously an individual task, meaningful social practice and a moral responsibility (Brown, 2013; Crawford, 2006; Singleton, 2005). 'Good' health is discursively constructed as a shared socio-cultural value and an attainable goal to which all individuals can and should aspire, evidenced in measures taken to reduce risks to their personal health, such as the appropriation of information technologies (Harris, Wyatt, & Wathen, 2010). However, encouraging individuals to follow proposed strategies for a greater social good may conflict in practice with other modern social values, including individual choice and autonomy. While there is possibility for users to resist prescribed 'good' behaviours, such as informed consumerism (Felt, Bister, Strassnig, & Wagner, 2009), this is largely discouraged in the name of good citizenship. Beck-Gersheim (2000) therefore refers to public health policies as voluntary compulsion. Singleton (2005) similarly argues that participation in programmes that govern personal and public health becomes simultaneously optional and obligatory.

For this reason, we are interested in teasing out how risks to 'good' health as constructed in the current Dutch health landscape are purportedly 'resolved' or

‘combated’ by the uptake of specific technologies, such as the mobile application-based eCoach. We follow the development of two eCoaches in order to understand how these applications become imbued with certain norms and values, such as the moral imperative to be responsible for one’s health.

Methods

In this article, we draw on data from the ‘Socially Robust eCoaching’ project, a one-year project on the ethical, legal and social (ELSA) aspects of using digital technologies to encourage ‘healthy’ lifestyle changes.

Context In 2011, a public–private partnership comprising Philips Research, the Dutch National Brain & Cognition Initiative and Technology Foundation ‘STW’ established a five-year, nationally-funded research programme, ‘Healthy Lifestyle Solutions.’ Five research teams are developing projects focused on: combining established face-to-face coaching techniques with (new) digital technologies, providing personalised, daily feedback and encouraging healthy behaviours related to exercise, diet, sleep patterns and stress reduction (STW Website, 2011). Following initial programme meetings that revealed ethical concerns about continuously monitoring individuals and using persuasive strategies for behavioural change, in 2013 the Healthy Lifestyle Solutions programme issued a call for proposals for an additional, one-year research project on social, legal and ethical aspects of eCoaching to make the programme more ‘socially robust’, which resulted in the Socially Robust eCoaching project that produced the data used in this article.

Data Collection The Socially Robust eCoaching project comprised four phases of qualitative research. Phase 1 used a literature and web review to formulate the ELSA framework, followed by document analysis and telephone interviews with project leaders for all projects. Of these projects, two were selected for deeper case study research.

During Phase 2, researchers conducted case study research by observing team meetings over a 2–3 month period ($n = 10–12$ per case), reviewing internal documents and conducting interviews, which allowed them to follow the development of two eCoaching apps. The researchers also held a two-hour workshop with each project team, whereby a legal scholar used a series of interactive exercises to identify the legal issues related to their respective eCoach. Observations were written in field notes (Bernard, 1994) and the workshops were recorded with permission and transcribed verbatim.

Data from the first two phases were used to develop techno-ethical scenarios in Phase 3. Technical-ethical scenarios are fictional narratives of possible future ethical controversies that provide a tool for anticipating interactions between new technologies and society and exploring the role that normative perspectives or moral values play in these interactions (Boenink, Swierstra, & Stemerding, 2010; Lucivero, 2013; Swierstra, Stemerding, & Boenink, 2009). Scenarios were developed following Boenink et al. (2010): gleaning field notes for dichotomous distinctions made by developers and listing these without exclusion or ranking, then categorising distinctions and noting potential tensions. Distinctions ranged from technical or practical (such as iPhone Operating System versus Android steering system, programming messages in English versus Dutch), to more socially oriented (willingness versus non-willingness to change, perceived versus actual behaviour) and medically specific terms (adherence versus nonadherence). Coupling these on the framework developed in phase one resulted in two scenarios, each of which began with a description of the current moral landscape in relation to lifestyle and mobile health

applications, followed by a short-term scenario (2014–2019) and a long-term scenario (2020–2025).

Ten respondents from four different projects and three programme representatives participated in the workshop. To increase the spontaneity of answers and ensure that members of the same development team did not coordinate their answers, participants did not receive the scenarios ahead of time, but were given time to read them during the workshop. Following traditional focus group methodology (Krueger & Casey, 2000), respondents were asked to write their initial reactions individually. These reactions were then discussed in a plenary manner. Maartje Niezen (the second author) led the discussion and Samantha Adams (the first author) noted the answers on a flip chart. The workshop was recorded and transcribed verbatim and the flip chart pages were preserved.

Phase 4 comprised semi-structured telephone interviews ($n = 9$) with relevant stakeholders from five European countries to validate the findings from an international perspective. Because only data from the first three phases is used in this article (documents, interviews, observations and workshop), we do not further address these interviews here, but note that they revealed no new insights, indicating that saturation through methodological and data triangulation was reached (Creswell, 1998; Green & Thorogood, 2004).

Data Analysis We conducted cyclical analysis through all four phases of the study. The authors independently coded the initial workshop and observation data, first through open (inductive) coding and subsequently through deductive and axial coding (Strauss & Corbin, 1990). This enabled them to compare findings with the ELSA framework that had been defined earlier in the study and cluster the open codes into themes. Each researcher made an independent topic list and then these were compared. The identified themes and codes were similar, with only small deviations. These deviations were discussed to determine uniform terminology for a coding scheme that was then used to (re-)code all data from the project.

Although this was an independent research project, it was funded by the aforementioned public–private partnership, which arguably had varied interests in the results of this project. We therefore ensured our independent position by incorporating user committees, validation interviews and both external and internal academic peer review of our analysis and interpretation of the gathered data.

For the document, interview, observational and workshop data presented here, quotes were translated from Dutch to English by Samantha Adams (the first author, a native English speaker with certified Dutch fluency) and checked by Maartje Niezen (the second author, a native Dutch speaker) for proper capture of diction and nuance. Given the small-scale nature of the study and internal programme agreements, we use numbers to refer to respondents and refrain from providing additional contextual information. This is to protect against inferences regarding identity based on presumed gender or role in the project. Where we mention developers or designers in a collective fashion, this refers to the multidisciplinary research teams (computer scientists and medical content experts) working on the two eCoaches.

Findings

From our analysis of the data collected in the first three phases, we were able to identify in participants' statements and discussions three types of risk that they were concerned about:

- risks to the health system (and thus society at large);
- the risk of developing an ineffective solution for combating the problems identified under the first point;
- the risk to personal values introduced through the development (and use) of new technologies as solutions to these problems.

As our analysis shows, each social construct contains a discursive, behavioural and material interplay, at once both positive and negative, between social norms, individual user capabilities and technological mediation.

A health system at risk

The first risk that we identified in our analysis was the threat posed to the *health system* (and thus society at large) by the *unhealthy behaviours of individuals*. For example, the title of the programme *Healthy Lifestyle Solutions* implied that (normatively defined) ‘unhealthy’ lifestyle behaviours, such as lack of exercise, too much stress, certain eating habits or lack of sleep were framed as *problems*. Additionally, the 2011 project plan that led to the eCoaching programme included the following statement:

It is expected that the number of people with chronic disease will increase dramatically in the coming years. ... Some chronic diseases have been found to be linked to *unhealthy lifestyles*, such as unhealthy eating habits, physical inactivity and stressful lives.

- During the last decade, there has been an *alarming* increase in obesity prevalence among adults and teens throughout the world, due to convenient lifestyle habits of high-fat diet and lack of exercise. Obesity has been found to increase the risk of developing diabetes, cardiovascular diseases and some cancers.
- It is estimated that between 10 and 20% of people chronically experience sleep problems. A lack of sleep is *detrimental* [to] one’s health. The functioning of the immune system is reduced while one’s stress level increases.

It is important from a societal and individual perspective that people obtain solutions that help them achieve a healthy lifestyle (emphases added).

These points framed unhealthy lifestyles as a ‘problem’ that threatens national (Dutch) well-being and systems that promote collective action to help individuals adopt healthy lifestyles as the ‘solution’ to this problem. The excerpt also stressed the urgency of taking action by using words such as *alarming* increase in specific social groups at a much greater (global) scale. This was reflected in the resulting research proposals that discussed how ‘sleep deficits are reaching epidemic proportions’ (Research Proposal Project 4) or highlighted ‘an urgent need for (cost-)effective solutions to failed attempts to lose weight’ (Research Proposal Project 5).

The programme representatives and team members of these projects embraced the idea that unhealthy lifestyles or behaviours are a major threat that needed to be addressed. For example, during the technical-ethical scenarios workshop, Respondent 4 raised the following point:

Yesterday I read that the WHO published a report in 2014 regarding non-communicable diseases. They’ve formulated a number of goals regarding healthy behaviour...no, health

goals that are related to healthy behaviour. At any rate, preventing further increase in rates of obesity and decreasing the number of cardio-pulmonary illnesses.

Respondent 4's reference to such international statements is one example of how other actors take up specific discourses to advance their own goals. In the Netherlands, this is also reflected in a long-standing debate about social solidarity and the sustainability of healthcare within the social welfare state. Policymakers emphasise the collective benefits of a healthy society and health promotion discourses increasingly, which include the additional potential social (and economic) benefits of technological developments such as eCoaching. Such arguments from a societal perspective are explicit in the various programme texts and project proposals. Not only did these documents highlight collective benefits such as the collective gain in overall health and the collective reduction in health-related expenditures, but they also categorised 'unhealthy' lifestyles and behaviours, broadly defined as a risk to solidarity in that they endangered the sustainability of the health system.

The solution to this risk was then arguably found in pinpointing groups for which digital coaching interventions might curb the unhealthy behaviours before they result in poor health or disease. For example, the call for proposals issued in 2013 stated the following:

The aim of the Healthy Lifestyle Solutions programme is to develop know-how and solutions for empowering people to adopt a lifestyle that promotes good health. ... The target population is early stage: people at risk of developing chronic medical conditions, together with people that have the aspiration to live a healthy life and would like to be supported in this.

Thus, the documents and participants depicted which types of individuals were at risk and needed the specific forms of support that the state (together with industry partners and sector professionals) could provide in order to prevent health problems before they became evident (and difficult to treat). eCoaching delivered via mobile technologies could potentially support them in a positive way, especially if they were interested in changing their behaviours but did not know how, had 'failed' in the past (Notes Programme Meeting 2013) or might 'slack off and slide into usual routines' (Research Proposal Project 4).

Developers seemed to make the (implicit) assumption that the decision to seek a coach would come from someone's personal (intrinsic) motivation to improve their health and that the eCoach would serve as additional (extrinsic) motivation to help them meet that end. They conceived of coaching techniques delivered via mobile technologies that could increase incrementally over a period of time; for example, one document suggested that, 'The coach will be the first contact in a stepped care system' (Research Proposal Project 2).

Underpinning these discussions of collective risks to the healthcare system were concerns about the *social group* (target population) for which the intervention is developed, the implied unhealthy *behaviour* and the *timing* of the intervention. Developers recognised that the technique was not failsafe: even if it reached the right group of people, it might not address the right 'unhealthy' behaviours. As the first call for projects noted, 'Part of the challenge is to observe the behaviour of coachees and classify those behaviours as desired or undesired, as healthy or unhealthy'. Moreover, if the timing was not right, the intervention would come too late to prevent the development of certain health conditions and related demands on healthcare. This latter issue reflects a progressive move

towards increasingly earlier intervention in individual health practices to pre-empt specific outcomes and prevent their (negative) effects.

An interesting aspect of one of the eCoaches-in-development was the intent not only to coach individuals, but to enrol others from (online) social networks and use social media to coach each person in relation to peers. This was partially based on early internal research outcomes that suggest social support is more important than personality traits, but was also considered to be a low-threshold approach to encouraging activity among larger groups (Observation Project 1 14 July 2014), without having to deal with barriers of time and distance. It was thus also considered to increase solidarity and shared responsibility for health. The general programme text in the first call identified the challenges of social interaction as such:

The social relation between coach and coachee that can be impoverished due to geographical distance and time restrictions is envisioned to be enhanced by increased personalisation and situational awareness. Unobtrusive monitoring of the coachee's behaviour and other bodily signals in context should contribute to a thorough understanding of the coachee's situation and facilitate creation of a sincere feeling of being understood and thoughtfully guided.

The various texts and discussions suggested that a possible breakdown of social solidarity due to the increasing demand for healthcare could be addressed by technology such as eCoaching that not only helped persons deal with their individual lifestyle and health issues but also brought people together through social networks and across perceived barriers of time and space creating solidarity in and through networks.

Calculating risk and the risk of ineffective coaching

The second risk that we identified in our analysis was the risk *developers felt* of developing an *ineffective intervention* that missed the target for a 'Healthy Lifestyle Solution'. During the Legal Workshop organised by the researchers for project 1 (see methods, data collection and Phase 2), the developers discussed the issue of effectiveness. The risk of being ineffective was partially attributed to what was *asked of the user* (that is, whether users have the right know-how and skill to input the right type of data at the right place and the right time, to ensure valid input) and partially to what was *programmed into the eCoach* (that is, the correctness of the underlying algorithm correct and its ability to generate the right advice based on input data that was adequately tailored to the needs of the individuals user). On the STW Website (2011), this was articulated in the following way:

It will require new developments in technology, such as new network and sensor technologies that will deliver the necessary data to the automated coaching programme so that it can provide coaching and guidance. (STW Website, 2011)

Developers involved in this particular aspect of the eCoaches-in-development made a distinction between 'objective' measurement and 'subjective' experience, arguing that a combination of the two was felt to be necessary in order to generate the level of personalisation that was deemed necessary to be effective. During the technical-ethical scenario workshop, Respondent 9 said:

The app is very dependent upon what the person logs, so I wrote down that the users should provide honest logs about their activities and weight. Maybe that can one day be

resolved with sensors – that you really know what it is... but for now it remains an important point.

Respondent 6 agreed:

These applications only have effects – positive effects – if people use them in a responsible manner. So, the more you have to assume that people use the apps well, the more dependent the effectiveness of your app or device is on how they behave.

Developers wrestled with the challenge of operationalising national norms within the technical algorithms to generate personalised advice. They felt they could not ask individuals directly whether they adhered to a given norm, as this would require users to be familiar with such norms. They were also concerned that people would either overestimate or underestimate their situation, which would result in invalid input values and potentially generate the wrong advice (Observation Project 1 14 July 2014). This led to many discussions regarding how to ensure that both the ‘correctness’ of the algorithm (‘objective’ data) and the personal experience (‘subjective’ data) were guaranteed in the measures taken.

Developers in Project 1 sought to resolve this dilemma by asking users for their experiences and estimates and at the same time taking an ‘objective’ measure through a wearable sensory device that interacted with the eCoach (Observation 18 August 2014). The eCoach was programmed to interpret this data in relation to the norm in question and generate a response that advised a particular behaviour, motivated users towards a short-term goal and provided information about the norm in order to sustain effects over a longer period of time. While one project specifically referred to techniques of persuasion (Research Proposal Project 2), researchers in Project 1 noted that it was not only about persuasion, but also fostering personal reflexivity about lived experience (Observation 18 December 2014).

In Project 2, the solution to this dilemma was sought in data analysis and the constraint-based approach (the eCoach was programmed to detect violations and generate dialogue action). Asserting that the user, not the eCoaching application, resolved the user’s problem, the developers created an app that provided a ‘mirror’ that makes the behavioural issue evident to the user, then aided the user in tackling this problem using the eCoach (Observation 28 October 2014). Initially, Project 2 also aimed for including sensors to confirm users’ input (non-obtrusive sensory measurement enables the obtainment of objective sleep data); however, this was not possible for practical reasons. The team focused instead on the possibility of testing and increasing the reliability of user input, including reflecting on how data was saved in the application.

The combination of techniques used for data input and generating advice took on the voluntary–compulsory/optional–obligatory nature that is familiar in health promotion (see section on Discursively Constructing Health Risks and Using Digital Technologies to Govern Behaviour). Users were given options from which they could choose, but information was presented such that it led to ‘desirable’ health-related behaviours and attitudes. That is, the choices provided by the eCoach were based on creating adherence to medical norms, under the guise of helping people recognise ‘deficits’ in their behaviour and learn to reflect on and correct them.

Developers were also concerned that the app would not be effective if the advice generated by the eCoach was not *tailored* well enough to fit the needs of each individual. Personalisation was one of the key tenets of the research programme, as stated in the project plan/first call for proposals:

Personalised intervention to strengthen healthy functions is a central point in both the NIBC and the NWO 2011–2014 strategy documents.

Many digital self-help programmes target large user groups and fail to take users' individual characteristics into account. The personalisation potential of mobile technologies (through the combination of computational ability, user input and – if connected – sensor-based monitoring), should ensure there is more attention to both personalised information and individual users' environmental factors. However, developers wrestled with finding the optimal mix between generic messages (did you know...), generic messages written with a tailored feel (try taking the stairs to your third-floor office today) and messages specific to a given person 'just in time and place', such as praise for achieving a specific goal (Observation Project 1 14 July 2014; 23 October 2014).

There was concern in both projects that users would quickly grow bored with receiving the same or similar messages, or the pattern of sending (e.g. at same time each day). As one of the developers from Project 2 observed during a regular project meeting:

You want to give feedback to someone who always chooses the longest possible amount of sleeping time. But if they don't change their behaviour, then don't keep giving the same feedback. (Observation 20 September 2014)

In Project 1, developers felt that the eCoach needed to be an 'innovative' technology. Because they were targeting young adults, part of the design focused on creating a 'hip' or 'cool' gadget that individuals would want to use and encourage others to use. The nature and delivery of messages was not only about effective timing and appropriate content, but also about broadening the reach of the eCoach to more users.

Developers in Project 2 focused on 'personalisation via negotiation', which allowed the user to set goals that deviated (within certain limits) from the eCoach's suggestions and to personalise exercise time schemes. An internal document from this project stated that:

[N]egotiation between coach and coachee about therapy properties is applied as a persuasive strategy to achieve a mutual state of commitment towards the performed exercises. (Internal document 4 June 2014)

The developers had difficulty in finding a balance between persuading the user to adhere to the optimal therapy (the calculated scheme) and allowing the user to deviate. Either too much leeway or too much steering risked diminishing the effectiveness of the therapy. Such negotiation resulted in an eCoach that provided advice with limited options, though as one developer pointed out, this meant finding the right way of phrasing the user's options was crucial:

It is difficult to find the right words, simple so everyone can understand, but also that it exactly pinpoints what you mean, and to phrase it within the margins of the mobile screens. (Observation 10 June 2014)

The developers felt that it was crucial that users understand why particular constraints were built into the programme and receive information on the most effective course of action. In their opinion, this would enhance users' adherence to therapy and minimise

their feelings of being patronised. This was evident in their discussions about how the eCoach should respond to user input, for example, in the following suggested response:

You proposed working toward not spending more than six and a half hours in bed each day. Because limiting bed time hours is a powerful tool if you use it well, I am going to propose a different option.

At the same time, this ‘personalisation via negotiation’ took place within predefined parameters, meaning that the negotiating ‘partners’ are not necessarily equal. The constraints embedded in the system shaped the type of recommendation and dialogue taking place. The developers could personalise feedback and recommendations in terms of calculated duration, start and end of exercise but not in terms of the phrasing or ordering of generic messages, which have to have the same formats regardless of the user’s characteristics. By stimulating interaction and dialogue between the eCoach and the coachee, developers believed they could set desirable targets for the individual, yet still steer behaviour to be within established norms for an effective eCoaching programme.

The idea of ‘just in time and place’ also raised the issue of the correct moment that the eCoach should intervene and with what type of message. Both projects followed Fogg’s (2002) persuasive technologies theory, which showed a relationship between ability and motivation: when motivating users to sustain their programme, timing of recommendations is essential. Project 1 wrestled with when to benchmark and when to intervene. During a regular meeting, one of the developers questioned:

If you try to motivate someone over the course of one week, what is the risk that they will stay in that phase of the system? The module to increase motivation is crucial, which is where the combination of tailoring and general information on the benefits comes in. (Observation 23 October 2014)

This was a recurring theme that came up again several weeks later, ‘Is an evaluation halfway a good idea?’ (Observation 18 December 2014)

The developers in Project 2 assumed that people would feel better just after finishing an exercise and that this was the best time to recommend starting the next exercise or propose a higher level of exercise than the one just conducted.

Even if you feel bad and choose a shorter exercise, it is good because it personalises the app. (Observations 10 June 2014)

Developers expected users to make their own decisions, which meant that even if they altered their exercise level after an eCoach notification, developers argued that it was the user (and not the eCoach) that made the decision. However, deviation from the prescribed regime required more user effort than adhering to it. The eCoach automatically resets to the new recommended regime, which is made visible in the eCoach through a dial that is set at a default level but can be turned forward or backward according to the preferences of the individual. If users want to disregard this new setting they must undertake two actions, whereby deviation requires more conscious decision and effort than following suggested actions.

Developers recognised the need to be transparent about why certain aspects within the eCoaching programme were or were not communicated. (Observation Project 2 2 September 2014) Although they preferred not to have to explain or justify the rationale behind every aspect of the eCoach, they nonetheless recognised the need for expectation

management and transparency because these factors in the design of the application needed to be tested in order to support claims regarding its effectiveness.

They were also concerned about how well the eCoach would align with the individual's daily routine and be accepted in the first place. For example, the initial call stated that:

The motto for e-coaching is 'measure, monitor and motivate'. It is important that the individual does not find the e-coaching method to be a burden and it has to be completely acceptable on an ethical level.

The Healthy Lifestyle Solutions programme encouraged designing applications that would not be too cumbersome and intrude upon an individual's daily routine, which could result in users stopping their use. The specification for the programme identifies 'unobtrusiveness' as a key characteristic of the application or device. However, unobtrusiveness is not a static attribute, but rather, a relational property in terms of experiences and expectations, that is constructed in the interaction between a technology and its users. Because intentionally designing an 'unobtrusive' technology meant it could easily overstep the line of legitimate action in monitoring individual behaviour, designers sought a model that enabled the technology to do its work, without giving users the feeling of infringement upon their daily lives. This points to a number of ethical issues that are further discussed in the next section.

New risks to the individual

The third risk that we identified in our analysis was posed *by the technology to the individual* using the coaching app. The participants in our study formulated this kind of risk in terms of autonomy, privacy, responsibility or another *ethical issue/moral value* (not always specified) to the user of the technology. The second call for research proposals (when the programme commissioned additional research on the ELSA of eCoaching) articulated this type of risk in the following way:

Coaching solutions collect a wealth of information about their coachees. In particular, unobtrusive, longitudinal monitoring can give rise to all kinds of acceptance issues and ethical concerns. Continuous monitoring can give rise to a feeling of 'big brother is watching you' and, even unintentionally, intimate information may be acquired. Therefore, long-term monitoring needs to be organised in such a way that it is acceptable to the individual as well as to society at large. eCoaching solutions should operate in a manner that is ethically responsible and acceptable for envisioned users.

In the technical-ethical scenario workshop, the participants discussed the extent to which automated coaches impacted on individual *autonomy* and, in turn, society. They suggested that an individual user's freedom to make his or her own choices might be hampered by the technology's ability to take over their motivation. Furthermore, the automation of user behaviour via the eCoach might affect both an individual's awareness of what is happening and the behavioural aspect of adherence. Although adherence is important with respect to effectiveness, the question remained whether use of the eCoach allowed the user to make wiser decisions or softly steers him or her through persuasive techniques into behaviours considered better by others.

In practice, these debates led to struggles over how to translate autonomy and intrinsic motivation into programming choices. The choice to increase or maintain a healthy

lifestyle could be facilitated via the eCoach, yet users might feel hampered by the choices offered. Despite personalisation through negotiation, Project 2's eCoach-in-development left little room for user-initiated dialogue or actions. This was evident in the following discussion during one of the team meetings:

Team Member 1: Removing, can you actually remove something? Can you explain as a user that you do not agree with something? If you do not agree, will the coach talk to you?

Team Member 2: The constraint-based approach of the eCoach means that you cannot talk with your eCoach about you not wanting to do something. You can actually not do the exercise, but you cannot state that you do not want to do this. (Observation 17 June 2014)

One week later, the designers continued this discussion and argued that users should not be allowed too much freedom (Observation 24 June 2014). For example, they argued that if the eCoach provided a facility to defer an activity, for example, by allowing the user to perform a particular task on another day, then this might result in the subsequent accumulation of tasks, leading to nonadherence over a longer term. Thus, they agreed that the eCoach should only permit rescheduling a task, such as evaluations or exercises, for another moment on the same day that it was scheduled, in order to increase adherence and effectiveness. They argued that building in user autonomy as freedom to make their choices would not necessarily contribute to the user's desired targets.

Designers were also concerned about the *responsibility* the eCoach had towards the coachees, explicating the difference between automated and face-to-face coaching. Although eCoach developers wanted people to follow the prescribed programme, they did not want to create dangers for users or their environment. Reaching more people without the constraints of time and distance also meant the trade-off of fewer face-to-face encounters. In regular therapy, a coach can warn about specific types of risks related to the programme and regularly evaluate how the coachee is feeling. However, developers doubted the ability of the eCoach to reach this same level of responsiveness using automated algorithms, even with the best programming, and therefore questioned whether (and to what extent) the eCoach or the user was responsible for avoiding such unwanted effects.

Although the eCoach generated different types of advice, including, in some cases, when to see a physician or stop using a certain technique, developers still placed responsibility on the individual user to determine when and how use of the application was appropriate to his or her situation. This led to the interesting paradox that while users were expected to follow the advice of the eCoach in the interest of compliance and effectiveness, whereby the designers limited the number of available choices, they were also seen as responsible for their own safety and that of others. This meant that they were simultaneously expected to follow the prescribed actions and question them when necessary.

As we have already noted, the programme text steered designers towards making the eCoach as unobtrusive as possible. This design goal implies a potential trade-off with individual *privacy*. eCoaches are designed to collect and store large amounts of personal and contextual data about users. Designers were aware that users had little control over what data they supplied and how this was, in turn, used in the development of coaching messages that steer their behaviour. For example, one of the developers in Project 1 noted:

Is it possible to look for other active members and invite friends from their social network – or would this lead to some sort of social information imbalance... I know about your activity but you don't know about mine? And is there an active switch to turn off when you don't want others to see? Or should it be less personal and more anonymous – you are friend 3? (Observation 14 July 2014)

Designers noted that failing to reflect upon potential personal risks related to unobtrusive data collection, processing and distribution by the eCoach might leave such risk deliberately unconstructed in favour of avoiding 'unhealthy' behaviours.

Discussion

In this article, we have examined how the development of eCoaches embeds discursive constructions of risk at both the individual and societal levels. This case shows how organisations in the Netherlands follow (and use as justification) the larger trend already recognised in sociology (see *inter alia*, Lupton, 1993; Singleton, 2005) of defining specific lifestyle choices as risky behaviours that potentially lead to development of certain diseases, but can, and should, be combated using tools and programmes made available by governments, health providers and, increasingly, third parties. Funders of the Healthy Lifestyle Solutions programme framed behaviours such as poor diet, lack of exercise and sleep deprivation as problems for which and the individual project teams could develop information technology-based solutions such as eCoaches that people could be both intrinsically and extrinsically motivated to use.

We identified multiple, concurrent references to risk in the programme and project documents, and the various discussions we observed among designers. The sources depicted individuals as being both 'at risk' of sustaining or resuming bad health habits and (thereby) 'posing a risk', through their 'unhealthy' behaviour, to the sustainability of the health system and, in turn, to social solidarity. But the documents and discussions also included references to risk that are specifically attributed to the digital technologies and these particular notions of risk may be only indirectly related to health: 'calculating risk', where 'lack of personalisation of information fed back to the user' is seen as a risk to the effectiveness of the application and the underlying goals of the programme. Individual users might also 'be at risk' of infringement on privacy or autonomy, whereby the very notion of being at risk is not only about (un)healthy behaviours or lifestyle choices, but also about relational aspects of the use of technologies such as an eCoach under the guise of personal responsibility.

Under the guise of personal improvement through coaching, potentially 'at risk' (in terms of health) individuals are encouraged to interact with an automated programme, whereby they become enrolled, together with the technology, in a complex heterogeneous network of actors who have diverse interests in the outcomes (Lupton, 2015). Because the various understandings of risk lead to embeddedness of specific norms and values embedded in these socio-technical networks, the concerns of Beck-Gersheim (2000) and Singleton (2005) regarding the voluntary–compulsory, optional–obligatory nature of public health programmes become especially relevant here.

Programmes for improving health have implications for individual autonomy. Interacting with an automated programme such as an eCoach involves (partially) delegating decisions and willpower to the technology. While the designers of the eCoach emphasise its benign objective, that is enabling individuals live healthier lifestyles, they acknowledge less benign aspects; users have to give up a degree of autonomy in terms of

relying on the eCoach for its reflections on their behaviour and selection of goals and acting on its advice and following its recommended changes. Users retain their ‘autonomy’ to act in accordance with a prescribed set of norms. Rather than demonstrating ‘reflexivity’ as the developers suggest, we argue that this delegation of willpower to digital technologies is likely to *decrease* human capacity to make autonomous choices in the long run, especially if the core values of transparency and opt-out options are not properly built into these (or other) digital health technologies.

Such technology may also undermine individuals’ autonomy in other ways. Beyond concerns about adherence, effectiveness and achieving long-term goals, eCoaches also embed understandings of risk as a fear that those who are already disadvantaged will suffer more (Douglas, 1990). In the Dutch health policy context, this is explicitly linked to the notion of solidarity: individuals engaging in unhealthy lifestyles potentially endanger the sustainability of the health system (and thus access and benefit for others) because they tend to consume more ‘health goods’ than is affordable over the longer term. In identifying individuals posing a risk to the system, those behaviours classified as ‘undesirable’ or ‘unhealthy’ tend to be framed as a break-down of self-regulation that could and should be corrected in a non-burdensome way. However, there has been little attention for the possibility that the political response of stimulating technological solutions such as consumer mHealth in order to distribute responsibility for health and promote a healthy lifestyle might actually deepen existing social divides. Hence, it raises the issue of inequalities invoked by stimuli towards incorporating more digital technologies in health promotion programmes.

Mobile app-based eCoaches reflect a possible progression from behavioural steering through established persuasive coaching techniques to unprecedented levels of behavioural monitoring (Lupton, 2015). Although we did not discuss them in depth in this article, two projects were less focused on designing an actual eCoach addressing instead issues related to cognition and intentions. These projects showed a move towards developing technologies focused on *automated cognitive restructuring*, which in some cases could make automated programmes capable (through constant monitoring of thoughts/intentions) of intervening to *prevent* undesirable behaviours. This meant that the persuasive techniques embedded in the eCoaches introduce new identifications of risky behaviour as related to ‘bad’ intentions.

Moreover, when such persuasive strategies are combined with real-time data being generated by different sensors, *the point of intervention* in people’s daily lives *shifts* to increasingly earlier points. The algorithms and calculations thus not only allow for defining potential health risks before they manifest, but also allow for ‘rewriting’ human behaviour so that it fits the social norms of healthy living as a precautionary measure. Because social norms are rapidly changing, this implies that eCoaches may come to invoke measures against predicted and probable risks before it is known whether they should be regarded as harmful in the first place.

Conclusion

The wide distribution of digital consumer technologies such as smart phones has led policymakers to encourage appropriation and use of these technologies (and their associated networked apparatuses) for public health promotion. Increasingly, they also urge non-traditional actors such as small-to-medium enterprises or mobile health start-ups to help identify possible ‘risk groups’ for whom mobile app-based ‘solutions’, such as eCoaches can be designed. Such digitisation of health-related risks enables the enrolment of individuals into programmes that encourage taking responsibility for their own health,

whereby these risks can be controlled by professionals, political bodies or other actors. This intervention in individuals' personal lives shifts to increasingly earlier points in time, challenging individual autonomy and choice.

Given the timeframe of this study (during the development of the eCoaches and strategies), it was neither possible to include users' understandings of and responses to the constructed risks and proposed solutions discussed here nor their potential discursive creation of *other* risks. Because understandings of risk may play out differently as users engage with eCoaches in practice, future research should also examine (discursive) constructions and understandings of digital risk from the perspective of the users of these technologies.

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