Ethics of E-Coaching: Implications of Employing Pervasive Computing to Promote Healthy and Sustainable Lifestyles

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***Abstract*—Many people sincerely believe that it would be good to make lifestyle choices that have a positive effect on their own health, the social viability of their communities, and the long-term quality of the environment. Yet these same people often fail to act in accordance with these intentions. In this paper, we draw attention to the fact that people's failure to maintain healthy and sustainable lifestyles can often be explained in terms of self-regulation failure. We explain that pervasive "e-coaching" technologies have the potential to support individuals in attaining and maintaining healthy and sustainable lifestyles by supporting and strengthening people's self-regulatory capacities. Finally, we discuss six social and ethical concerns that e-coaching technology can raise as a first step towards an open debate about these concerns as well as the regulation issues and design choices related to them.**

Keywords: e-coaching systems, willpower, self-regulation, societal issues, healthy and sustainable lifestyles.

I. Introduction

People frequently fall short of their goals of adopting healthier and more sustainable lifestyles. They are sincerely convinced that it would be good to make lifestyle choices that have a positive effect on their own health, the social viability of their communities, and the long-term quality of the environment, but they have trouble living in accordance with their good intentions [1]. In psychological terms, individuals are subject to self-regulation failure: they give in to temptation, or get distracted, or procrastinate about doing the right thing.

In light of this, one influential approach to promoting healthy and sustainable lifestyles is to employ pervasive computing in such a way as to bypass the weakest link, in this case, people's limited willpower. By making products 'smarter' (e.g., smart wearable systems for health management [2], or smart lighting [3]) or finding ways to steer or 'nudge' behavior, pervasive computing can get people to 'do the right thing' *automatically* (e.g., [4]).

In this paper, we explore the prospects for a different strategy, one that centers on using pervasive computing, in the form of "e-coaching" applications, to support and strengthen individuals' capacities for self-regulation. We believe that these e-coaching systems — persuasive systems that unobtrusively monitor behavior and provide intelligent, tailored feedback and decision support to achieve lasting behavior change — have the potential to prop up individuals' flagging willpower by enhancing individuals' ability to exercise self-restraint and to pursue more effectively their goals of leading a life that accords with their values of sustainability and health. At the same time, the prospect of widespread use and heavy reliance on e-coaching technology raises a range of important social and ethical issues. We begin this paper by explaining how self-regulation failure undermines good intentions regarding healthy and sustainable living. We then outline some of the ways in which e-coaching technology can contribute to healthy and sustainable living by supporting individuals' choices. Next, we turn to six sets of concerns that could be raised regarding this technology: concerns with privacy, autonomy, liberty, fairness, responsibility and authenticity. We conclude that, although these concerns deserve serious attention, there are grounds for optimism about the future of e-coaching technology.

II. Self-Regulation Failure as a Key Threat to Healthy and Sustainable Living

As we noted at the outset, many people lead their lives in ways that are much less healthy and sustainable than they could be and than they would like their lives to be. Despite aiming to lead healthier and more sustainable lives, they succumb to temptation or inertia. In some cases, this may be explained by the fact that the desired lifestyle is too costly (consider for example the high initial costs of solar panels or the price of healthy foods [5]) or otherwise unfeasible (e.g., because of limited access to healthy foods [6]). In other cases, however, it is not that circumstances conspire against people but simply that they are not able to stick to and realize their plans. This is known in the psychological literature as "self-regulation failure" and it is our focus here.

Two leading researchers in the field of self-regulation psychology define the phenomenon as follows:

> "Self-regulation refers to the capacity of organisms (here, human beings) to override and alter their responses. It is the process by which people attempt to constrain unwanted

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> urges in order to gain control of the incipient response. Regulation means change, especially change to bring behavior (or other states) into line with some standard such as an ideal or goal." [7]

Self-regulation failure poses a real barrier to developing and maintaining lifestyles that require overcoming old habits and resisting temptations of convenience and indulgence in the pursuit of goals. One might wonder how pervasive computing could help here. Indeed, as long as self-regulation is conceptualized narrowly, as a matter of a person's sheer willpower at the moment of acting, this will be hard to see. But self-regulation can usefully be conceptualized in broader terms.

To begin with, one can think of what we term "temporally extended self-regulation". This occurs in situations in which agents take measures *in advance* of anticipated situations in which they will need to make an effort to stay on course. In this way, people can strengthen their ability to self-regulate by planning in advance. Recent research has demonstrated that one particularly effective way to strengthen self-regulatory capacities involves forming very specific plans, known as "implementation intentions" [8]. Implementation intentions are if-then plans "that link anticipated critical situations to goal-directed responses" [9]. They have been shown to promote goal attainment in a wide variety of domains relating to health (e.g., stimulating vitamin C intake [10] and improving dietary quality [11]) and sustainability (e.g., shopping in a bio-shop [12] or recycling plastics [13]).

The problem is that people often do not form these implementation intentions [14], or that they do not take steps to make sure that the cues that trigger their behavior appear at the appropriate moment. Moreover, even if people do make implementation intentions, people sometimes choose cues that are suboptimal for their goal pursuit [15]. This is one place where pervasive e-coaching systems can potentially help by identifying optimal cues in the environment and by coaching people to make specific plans that lead to automatic healthy and sustainable behavior.

That said, with the pervasive and continuous use of e-coaching systems also comes a risk that people become dependent on the technology, or at least think that they are. With 24/7 monitoring, feedback and persuasive nudging by an authority that is external to the self, yet seamlessly integrated into the environment and one's daily routines, it may become difficult to distinguish between 'true, authentic actions' and steered behavior. This, then, highlights a need for a convincing account of what authentic behavior actually is, especially in light of these recent developments. Moreover, there is a risk of *'deskilling'*: just as people no longer remember phone numbers or agenda items without their mobile phones present, so too might e-coaching technologies remove the need to train 'the willpower muscle' [16].

One possible way of dealing with this apparent problem is by thinking of self-regulation as something that is not restricted to the single agent. Self-regulation can also be conceptualized as a capacity that can be distributed, in the sense that the system that brings about self-regulation may extend outside of the agent to the environment (including other human and computerized agents) (cf. [17]). Understood in this way, it becomes much easier to envision how e-coaching systems might strengthen individuals' capacity for self-regulation, because the e-coaching system will no longer have to be considered as merely an external construct that executes whatever self-regulating processes the individual is too weak to do. In a narrow view of self-regulation, the more one offloads onto an external system, the greater the risk of deskilling becomes. However, by conceptualizing self-regulation broadly, the possibility is left open that distributing self-regulation does not necessarily lead to deskilling because the extended self-regulating system's capacities remain the same, or are even enhanced. This view therefore allows for the possibility that the use of e-coaching systems might contribute to healthy and sustainable living without raising these concerns.

III. Examples of e-coaching systems that can facilitate self-regulation

Intelligent e-coaching technology is still in its infancy. Presently, only a small number of fully developed, evidence-based e-coaching systems exist that deliver just-in-time behavior interventions [18]. The ones that do exist are predominantly focused on the health domain because of the promise of low-cost, preventive healthcare. However, we are convinced that e-coaching systems also hold great promise for other (everyday life) domains, such as maintaining a sustainable lifestyle. We will therefore examine one existing e-coaching system in the health domain before sketching the possibilities of similar (future) systems for sustainability.

A good example of the current state-of-the-art with regard to intelligent e-coaching is the eMate system: eMate analyzes why a user is not changing behavior in accordance with the user's goals and sends automatically generated, tailored persuasive messages to a mobile phone app to improve people's medication intake, therapy adherence, exercise and healthy food intake [19]. In addition, it uses that same app to ask the user questions in order to monitor behavior and to keep its user model up-to-date. Moreover, eMate can unobtrusively measure medicine intake with the use of an electronic pillbox. Though of course eMate also has its limitations — for example, there is currently no integration with a pedometer — it serves our purposes here as a prototypical example of the type of systems we are considering.

With regard to sustainability, recent studies show that persuasive techniques can also improve people's awareness with regard to water and energy conservation (e.g., persuasive appliances with integrated energy feedback [20], adaptive cruise control systems that can persuade users (through goal sharing) to adopt an energy-efficient driving style [21], or ambient light feedback on space heating energy consumption [22]). In addition, subtle persuasive cues have been proposed as a way to decrease environmental pollution within urban areas [4]. While these products and techniques can stand by themselves, it is easy to see how they could be even more

effective when integrated into a broader e-coaching system that supports people in making sustainable lifestyle choices. As Kaptein et al. [23] note, many persuasive systems rely on one or two "persuasive tricks," but that might have counter-intuitive effects in the long run [23]. An e-coaching system, however, could adapt intervention strategies on the basis of intervention effects to prevent diminished sensitivity or even frustration. It could change the tone of feedback on an individual basis, perhaps even based on mood measurements. It could also assess when to make a particularly invasive interruption (e.g., an irritating sound when a recyclable container is thrown into the regular trash), and when to take another approach (e.g., send an email explaining the importance of recycling), depending on the state of behavior change the user is in.

What is particularly interesting about e-coaching technology is that it focuses not just on lowering thresholds for certain actions by using smart products and subtle nudge-like cues (that trigger more-or-less automatic behavior) but that it also engages the user to reflect on his or her behavior and how that relates to his or her goals. In other words, it attempts to create a situation in which people not only (semi-automatically) maintain a healthy and sustainable lifestyle, but also fully and authentically *endorse* the lifestyle.

A variety of different strategies can be envisaged that e-coaching systems can use to stimulate healthy and sustainable living. In the previous section, we have seen the possible benefits of making implementation intentions for healthy and sustainable lifestyles. Surprisingly, as of yet, the strategy of making implementation intentions has hardly been explored, let alone deployed in e-coaching settings. Possible exceptions are a study that used implementation intentions and sms/text messages to stimulate brisk walking [24] and an application called the 'ii-app' that can be used for a) prompting people to make implementation intentions about when to stop gaming, b) monitoring computer use, and c) giving people feedback about their computer-related behavior [25]. However, neither of these involves intelligent, automated coaching. We believe that this strategy in particular could prove to be effective for overcoming problems for healthy and sustainable living that are concerned with self-regulation failure, because implementation intentions help bridge the gap between intentions and actual effective goal pursuit in a way that engages the agent (conscious planning) but leads to (semi-)automatic behavior.

IV. Six ethical and social concerns that stem from the distinctive character of e-coaching

We turn now to six sets of concerns that e-coaching technology can raise, concerns that are prominent in public debates as well as the ethics literature. Our aim here is to provide an initial inventory of key issues that arise from the distinctive character of e-coaching, as a first step towards an open debate about these concerns as well as the regulation issues and design choices related to them. We can divide the concerns into three groups. First, there are concerns about the potential for direct violation of the integrity and dignity of the person, which motivate calls for legal regulations. Second, there are social-political concerns, related to the social, economic, and cultural dynamics set in motion especially by the widespread use of pervasive computing for e-coaching. Third, there is a range of subtler concerns regarding how using e-coaching technologies may transform users' subjective experience and self-understanding. In the following subsections, we will discuss two examples of each group, in this order. In each of the sections we will introduce the general nature of the concern, explain the distinctive issues that arise with e-coaching and discuss regulation issues and design choices that relate to this particular concern.

A. Privacy concerns

We begin with the issue of privacy, which has been discussed extensively in ethical debates about pervasive and ambient systems (e.g., [26] [27]). The Charter of Fundamental Rights of the European Union (2000/C 364/01) states that "Everyone has the right to the protection of personal data concerning him or her" and that "[s]uch data must be processed fairly for specified purposes and on the basis of the consent of the person [...]" (art. 8). The continuous, 24/7 monitoring necessary for effective e-coaching generates massive amounts of data that needs to be collected, processed and stored. The collected data can be sensitive, personal data (especially in health-related domains), and this raises ethical concerns about the protection of such data. With e-coaching systems, there are additional concerns about protecting the conclusions that e-coaching systems draw from connecting and drawing inferences from various data streams. Though it may be argued that many conclusions are already implicit in the data on which the e-coaching system bases itself (e.g., the mean walking distance per day is implicit in a stream of data points about walking over time), the relationships about which e-coaching systems have knowledge can generate additional information that needs to be protected. For example, the mean walking distance per day may well be a neutral measure, but by taking into account a person's goals, an e-coaching system could yield conclusions such 'this man never achieves the walking targets he sets for himself,' which can easily be interpreted as revealing a 'lack of conscientiousness'. For this reason, it is important that the e-coaching systems are designed to deal carefully with both the data they process and the interpretations they suggest.

B. Autonomy concerns

Respect for the autonomy of individuals is of paramount importance in designing ethically acceptable technology. Central to the idea of respect for autonomy is the recognition that individuals are not treated as mere objects to be manipulated but rather as having their own perspective on matters and therefore having a say in how they are treated. In this sense, having one's autonomy respected does not mean that one's freedom is unlimited or that one is not subject to various influences. The key point is that any intentional influences on the person are authorized by the person, on the basis of a genuine opportunity to assess those influences and, if needed,

to put an end to them (as argued for in [28]). Relatedly, respect for autonomy also precludes acting in a way that expresses a patronizing attitude, that is, of treating competent individuals as if they were unable to judge what is best for them.

Respect for autonomy is a central concern with all forms of coaching, insofar as there is a potential for manipulation, coercion, and patronizing disregard, as well as possibilities for losing control as a result of becoming dependent on or overly deferential to a coach. But there are special concerns having to do with e-coaching technologies, two of which are worth mentioning in particular (but see also [29]).

Consider, first, the development of ubiquitous and unobtrusive e-coaching technologies that can frame [30] how users approach choice situations, on the model of various 'nudge' policies designed to steer people towards healthier, greener and more social behavior [31]. Creating a seamless and fluid user experience promises to reduce aggravation with the computer, enhancing both the subjective experience and objective effectiveness of the coaching system. Indeed, automated e-coaches have the potential to become more inconspicuous than human coaches could ever be. To the extent to which they operate 'under the radar' (both in monitoring and presenting feedback [32]), there are fewer natural moments for securing, on an ongoing basis, the consent of the user. From a precautionary point of view, ethical design therefore should include building in moments in which there are real opportunities for users to reconsider their continued reliance on the e-coaching system.

Second, there is the issue of how individuals can retain autonomous control when the e-coaching system has a dramatically higher level of expertise. Of course, human coaches are also relied on for their expertise, so an increase in expertise would have numerous advantages. However, there is a point at which users are no longer in a position to assess for themselves the reliability of the expert advice or whether it reflects their best interests. Addressing this concern calls for mechanisms that can ensure that the basis for the expert advice remains in principle accessible to users.

C. Liberty concerns

Ethical concerns with individual liberty are closely related to concerns with autonomy, but the distinctive concern with liberty has to do with the value associated with having a range of options available over which to exercise one's capacities for autonomous choice. The point to which we wish to call attention here relates to the effects of the widespread adoption of e-coaching strategies in the context of public policy, especially if they involve "incentivization".

In many domains, public policies have been implemented to encourage healthier and more sustainable behavior by offering incentives to citizens (e.g., monetary incentives for reducing the amount of trash collected [33]). Along similar lines, insurance companies offer lower rates for individuals who demonstrably reduce their unhealthy habits (alcohol and tobacco use; diet and exercise; etc.). There are signs of the emergence of what one might call "micro-underwriting," in which insurance companies provide ever more fine-grained options for individuals to limit insurance costs — on the condition that they do, in fact, abide by the commitments they undertake in opting for these discounted premiums. As health-care costs (and insurance premiums) continue to rise dramatically, citizens in countries with insurance-based health care systems may well find themselves under increased pressure to choose one of these "restrictive-conditions" insurance policies.

The relevance of this for the ethics of e-coaching — and liberty in particular — is the following. At some point, many citizens may have no other option but to adopt these restrictive-conditions policies, as nothing else will be affordable. Of course, if insurance companies cannot reasonably expect users to realize the necessary self-regulation and cannot accurately monitor compliance, then they will have little reason to make a large-scale shift to this type of micro-underwriting. And this is currently the case. But the widespread adoption of e-coaching systems could change this significantly. If individuals are able to benefit more and more from "volitional scaffolding" through e-coaching, they could come to be expected to "keep up" and meet rising expectations. And given the monitoring and data collection typical of e-coaching technologies, compliance becomes more enforceable.

The ethical issues raised by these speculations are vexed. In a sense, it is an expansion of liberty to offer more insurance options for those making healthy and sustainable choices. Moreover, to some, there will seem to be little that is objectionable about eliminating options when those options are at odds with ideals of health and sustainability. However, the pressures involved here are real, and any potential for diminished effective liberty needs to be examined carefully.

D. Fairness and equality concerns

The previous discussion emphasized the potential implications that the widespread availability of e-coaching might have on expectations being made on individuals. But it is quite likely that access to these e-coaching technologies will be not be equally available to all. And in contexts in which the improved self-regulation delivers a competitive advantage to individuals, concerns with fairness and equality emerge.

Currently available human-to-human coaching is expensive and therefore reserved for people with high incomes. An increasing use of e-coaching systems for self-management has been proposed as a way to decrease the cost of health-care services and lighten the work load of medical professionals [34]. Because of their relatively low costs compared to regular coaching or health care, e-coaching systems have the potential to help a great many people to develop a lifestyle that is more in line with their health and sustainability goals. However, though they are cheaper, e-coaching products (including sensor systems, smartphones, etc.) are not free. Therefore there is a real risk that a more significant gap will be created between those who can and those who cannot afford e-coaching products, unless access to them becomes an entitlement. This political issue will have to be addressed if the widespread adoption of e-coaching is to be ethically appropriate and socially acceptable.

E. Responsibility concerns

Responsibility is a term that plays a central role in the ethical evaluation of both coaching relations and technology. It has numerous meanings and dimensions, and it is helpful to distinguish "responsibility as authorship" from "responsibility as obligation" [35], depending on whether one is concerned with determining *who's responsible* for what happens or with the legitimate expectations that agents must live up to if they are not to count as *irresponsible*. In the present context, there are two issues that are particularly relevant: the assignment of blame in cases of self-regulation failure (authorship) and "responsibility for self" (obligation). Each of these can be affected by the nature of a coaching relationship and each of these are engaged in distinctive ways by e-coaching situations.

Questions of blame and accountability quickly become complicated and contested when individuals' actions are guided by coaches or assisted with technology. In sports — even individual sports — coaches are often seen as partly to blame for poor performance. Similarly, when people miss an appointment because their calendar apps failed to sync properly, it is not obviously disingenuous to blame the software (or, by extension, the software designers). With the emergence of pervasive and persuasive computing, particularly in the context of e-coaching, there are significantly more possibilities for misunderstandings and disagreements related to how the responsibility is distributed. Sometimes it *is* disingenuous to blame the e-coach, and sometimes it is dishonest for those behind e-coaching systems to dodge their responsibility for failures or misleading promises. How do we decide? It is unlikely that this issue will be resolved on the basis of discoveries about when individuals are "really" responsible [36]. These are intrinsically normative and contested terms. The key ethical issue is to ensure that there are fair, democratic, and open procedures by which regulatory, judicial, and cultural standpoints on these issues are determined.

Second, there are concerns about possible effects of e-coaching on users' willingness to acknowledge their obligations to act responsibly. Just as one might assume that a given technology or a coach will just "take care of things," extensive reliance on e-coaching can lead to passivity and, as a result, to further deskilling (see Section 2). These are legitimate concerns, but more research is needed to determine, on a case-by-case basis, how great the threat of deskilling actually is. Moreover, the ethical principle of taking responsibility for oneself could also be seen as generating an ethical obligation to adopt e-coaching, under certain circumstances. If one has good reason to believe, for example, that the probability that one will adopt a particular aspect of a healthy and sustainable lifestyle would shift from being 20% to being 80% as a result of deploying an e-coaching system, then is it arguably a form of reckless negligence to refuse e-coaching (cf. [37]).

F. Authenticity concerns

A final concern is with the value of authenticity, something that is frequently overlooked in discussions of ethics, but which is a central concern for many, at least as it is reflected in cultural engagements with assistive technology and in the philosophical literature on "enhancement" [38] [39]. This is ultimately a concern about the way in which the transformative potential of coaching and technology may leave people feeling alienated from themselves. There are two principal ways in which this can occur. Individuals may become alienated from the results of their actions or from what motivates them to act.

First, there is a dimension of authenticity that involves the personally significant sense of accomplishment that comes with being able to consider oneself, appropriately, to be the agent of one's success in meeting goals. Given the importance of self-esteem and self-efficacy for well-being and effective goal pursuit [40] [41], anything that diminishes one's sense of accomplishment and thus one's self-efficacy, would raise concerns. With regard to e-coaching, the concern here would be that gains in performance and goal attainment could be undermined by the sense that they reflect accomplishments that are not really one's own, but actually the accomplishments of the e-coaching system. And it would, indeed, be odd to take much credit for remembering the birthdays of all one's friends and relatives if this is the result of receiving reminders from one's smartphone. Here again, any potential negative effects on individuals' sense of accomplishment will depend on essentially contestable, historically changeable, and culturally diverse understandings of how one's use of technology diminishes one's ownership of the resulting goal attainment or not, and this calls for sustained further reflection.

Second, there is the issue of whether one is, as it were, the author of one's actions in the sense that it stems from oneself. The core value here has to do with one's actions being one's own, as it relates to "being one's own person, to be directed by considerations, desires, conditions, and characteristics that are not simply imposed externally upon one" [42]. The risk here is of alienation, if one finds oneself acting, feeling, thinking, responding, etc. in a way that does not accord with who one feels one is. One way in which this can occur, which relates to autonomy, is when goals or attitudes are *imposed* on persons that are not congruent with what they genuinely care about. But alienation and inauthenticity can also be the result, more broadly, of a failure to clarify one's values, and here the specific concern about e-coaching is that, by strengthening resolve, volitional scaffolding may block important sources of insight. After all, flagging motivation is sometimes an indication that one's priorities have genuinely shifted. These are not, we believe, wholly new or insurmountable concerns. But careful attention needs to be paid to ensuring that users of e-coaching systems will still have warranted confidence that they are the ones giving direction to their lives.

V. Conclusion

In this paper we have explained that when it comes to healthy and sustainable living, one of the major challenges is people's lack of willpower. We have shown how e-coaching systems has the potential to support people in this respect but that e-coaching technologies raise some specific societal and ethical issues. We have surveyed six

concerns explicitly, concerns regarding privacy, autonomy, liberty, equality, responsibility and authenticity. Though these concerns deserve serious attention, we view them neither as insurmountable nor as grounds for abandoning the promising development of e-coaching for healthy and sustainable living.

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