Why Won’t You Do What’s Good for You? Using Intelligent Support for Behavior Change

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Abstract. Human health depends to a large extent on their behavior. Adopting a healthy lifestyle often requires behavior change. This paper presents a computational model of behavior change that describes formal relations between the determinants of behavior change, based on existing psychological theories. This model is developed to function as the core of a reasoning mechanism of an intelligent support system that is able to create theory-based intervention messages. The system first tries to determine the reason of the occurrence of the unwanted behavior by asking short questions via a mobile phone application and by gathering information from an online lifestyle diary. The system then attempts to influence the user using tailored information and persuasive motivational messages.

1 Introduction

A good health requires a healthy lifestyle. However, it is not easy to find (and keep) the optimal balance between work, a social life and, for example, a healthy diet or medicine schedule. Moreover, people with a chronic disease have extra barriers to overcome, such as physical discomforts and side-effects of medicine intake. In short, people have lots of reasons not to do what’s good for them. As a consequence, the amount of people that have obesity or a chronic disease such as diabetes type 2 has increased considerably over the past years [28].

It has been shown that patient engagement and empowerment could improve patient therapy adherence and consequently their health condition [18]. This engagement and empowerment is often referred to as self-management: the individual’s ability to monitor one’s condition (symptoms, treatment) and to effect the cognitive, behavioral and emotional responses necessary to maintain a satisfactory quality of life [4]. But how can we get patients to increase their self-management? The use of computers to support people with their self-management has proven to be an effective approach [33,17]. These systems are able to provide personalized (tailored) interventions at low costs [8] and at home [27]. Interventions that are closely tailored to the individual’s convictions and motivations have shown to be more likely to be read and remembered [29].

Although intelligent persuasive assistants are increasing popularity for the use of behavior interventions, those assistants are rarely based on formal models of behavior change. In their 2008 article, Michie, Johnston, Francis, Hardeman and...
Eccles stated that: “Ideally, researchers designing interventions would choose a small number of the theoretical frameworks based on empirical evidence of their predictive and intervention value, i.e., there should be evidence that the theory can predict the behaviour and that interventions which change these determinants achieve change in behavior.” In literature however, very few works can be found that provide a model based on formal theories. One notable exception is the the iChange model, which describes the factors that influence behavior change, but fails to explicate how these factors interact. Yet in order to design an effective support system, it is necessary to take a closer look at the underlying mechanisms of behavior change and how the they can be influenced to establish the desired behavior. The current paper addresses this and presents a computational model based on theoretical frameworks of behavior change. It is used by an intelligent support system to understand human behavior and to detect the cause of unhealthy behavior, which enables the system to provide users both tailored information and persuasive motivational messages on how to improve their behavior.

An overview of approaches for intelligent support systems is provided in Section 2. In Section 3 a model that formalizes the interaction between the different determinants of behavior change is presented. Section 4 demonstrates how this model can function as the basis of an intelligent system that is able to provide support for individuals with a health condition (such as diabetes, HIV or obesity) by stimulating their self-management. Section 5 concludes the paper and gives some implications for further research.

2 Approaches for Intelligent Coaching and Mobile Persuasion

In order to point out the differences between the proposed system and other approaches, this section provides a brief overview of existing approaches for intelligent coaching. The main component of many contemporary approaches is the mobile phone, as they are easily available to the user and support both user and system initiated interactions. Also, information provided by the mobile phone can be personalized and can even be designed to persuade or manipulate. Because of these capabilities, the mobile phone is an ideal platform to provide us with the power to induce behavior change. Mobile phones and web-based interfaces have proven to be very effective in similar approaches.

The simplest of the approaches to induce behavior change are ‘reminder systems’, which do not use complex persuasive techniques but instead use simple messages to remind the patient of the desired behavior (e.g., CARDS). For example, CARDS (Computerized Automated Reminder Diabetes System) sends diabetic patients SMS messages and e-mails with reminders about blood monitoring, without further medical advice from a healthcare team. Under this category fall also the popular mobile phone and web-based applications that help patients keep track of data such as calorie intake, blood monitoring and exercise by means of an online mobile dairy.