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Happy: cancer prevention using smartphones

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Abstract

Tobacco and alcohol consumption, excessive sun exposure and lack of physical exercise are important risk factors for cancer. In fact, more than half of cancer cases are due to wrong behavioural options; if everyone adopted a healthier lifestyle, cancer incidence would fall dramatically. Information campaigns are critical to raise cancer awareness but they simply are not enough to promote behaviour change.

The main purpose of the work presented in this paper is to develop a smartphone app, capable of inducing behaviour changes on individuals. A cancer prevention app called Happy was designed and is currently being tested. Preliminary results from a feasibility study show that Happy might be an effective health promotion app, capable of persuading users to change their behaviour towards cancer prevention.

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Keywords: Mobile devices; Smartphones; Cancer prevention; Behaviour change

1. Background

Estimates show that, by the year 2030, cancer will affect more than 26 million people worldwide and over 17 million will die from the disease [1,2]. Behaviours like smoking, drinking alcohol, physical inactivity, inadequate sun

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exposure and a poor diet can seriously increase the risk of cancer. In fact, it is estimated that more than half of all cancers are due to wrong lifestyle choices [3–6]. The European Code Against Cancer [7] states that many aspects of general health can be improved and many cancer deaths would be prevented if we adopted a healthier lifestyle. Individually, everyone should follow these cancer prevention guidelines to reduce their personal cancer risk. People have generally favorable attitudes towards healthy behaviours and might even consider following these guidelines; however, they often lack the skills needed to maintain it as part of their daily routine [8]. Behaviour change is a very challenging process.

Smartphones can be helpful tools to induce behaviour change. Like all mobile phones, they are personal, portable and always connected. Smartphones are also becoming ubiquitous, allowing extended interventions with relatively low implementation costs [9]. Using the various built-in sensors, they can "sense" time, location and even physical context in real time and tailor messages to the users' behaviour needs. Several studies have suggested that behaviour change is possible using smartphones. They have been used successfully in several interventions ranging from smoking cessation, to weight loss and disease management [9–12]. However, the large majority of these interventions rely on basic communication technology such as short message services (SMS). Smartphones have several embedded sensors that offer more complex and powerful capabilities. The potential of smartphones in behaviour change interventions hasn't yet been fully explored [11].

2. Happy: Health Awareness and Prevention Personalized for You

Happy is a cancer prevention smartphone app that aims to persuade users to change their behaviour, making healthier choices, thus reducing their personal risk of developing several types of cancer.

Happy uses the Fogg Behavior Model [13–15] as a theoretical framework, focusing on the persuasive power of triggers. It also uses several strategies based on different behaviour change techniques such as barrier identification, prompting, social support, social comparison, and behaviour modeling [16].

2.1. Target population

The target population of this app is composed of healthy Portuguese young adults, with ages between 18 and 35 years old. The choice of a young population is due to two different reasons: (1) Cancer prevention should start at an early stage of life (due to the effect of long exposure to risk factors) [3]; (2) Almost all individuals included in this population own at least one mobile device [17].

2.2. App features

Happy is based on the principle of tailoring, i.e., using information on a given individual/profile to determine what specific content he or she will receive [18]. Thus, when users access Happy for the first time they are required to answer a behaviour assessment questionnaire. The data collected allows the definition of the user profile and determines the current level of cancer prevention, called HappyScore (Fig. 1-A). HappyScore is represented on the landing page allowing the users to self-monitor their behaviour in a glanceable way. This strategy as proven to be effective in influencing health behaviours in other contexts [19]. HappyScore is calculated using weighted values for different cancer behavioural risk factors (Table 1). The resulting score ranges from 0 to 150: the highest the displayed number, the better the overall behaviour is in terms of cancer prevention. The user profile is also used to tailor health messages to each individual. Tailored messages (Fig. 1-B) are expected to be the triggers of behaviour change. The messages are tailored accordingly to the users profile, influenced by users previous behaviour and take into account users context (location, time of day, week and month, weather conditions). The effort of tailoring messages to the users profile and context has been proven successful in other behaviour change interventions [20,21] and is, therefore, a core feature of Happy. Messages target specific behaviours and follow the European Code Against Cancer guidelines [7].

Happy also allows behaviour tracking. Users can track their behaviour by answering behaviour questions that are sent to them periodically by the app or by deliberately entering behaviour data. These behaviour assessments are used to recalculate the users HappyScore and change the user profile over time, allowing the tailoring to occur