



Guidelines for a cancer prevention smartphone application: A mixed-methods study



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ABSTRACT

Objectives: This study sought to explore the views and experiences of healthy young adults concerning the fundamental features of a cancer prevention smartphone app that seeks behaviour change.

Methods: Three focus groups were conducted with 16 healthy young adults that explored prior experiences, points of view and opinions about currently available health-related smartphone apps. Then, an online questionnaire was designed and applied to a larger sample of healthy young adults. Focus group and online questionnaire data were analysed and confronted.

Results: Study results identified behaviour tracking, goal setting, tailored information and use of reminders as the most desired features in a cancer prevention app. Participants highlighted the importance of privacy and were reluctant to share personal health information with other users. The results also point out important dimensions to be considered for long-term use of health promotion apps related with usability and perceived usefulness. Participants didn't consider gamification features as important dimensions for long-term use of apps.

Conclusions: This study allowed the definition of a guideline set for the development of a cancer prevention app.

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1. Introduction

1.1. The importance of cancer prevention

It is estimated that, by the year 2030, cancer will affect more than 26 million people worldwide and over 17 million will die from this disease [1,2]. Tobacco and alcohol consumption, excessive exposure to the sun and lack of physical exercise are important risk factors for cancer [3–6]. In fact, more than half of cancer cases are due to wrong behavioural options [6]; if everyone adopted a healthier lifestyle, cancer incidence would fall dramatically [6,7].

Research has shown that there is a link between knowledge and the adoption of healthy behaviours [8–10]. Still, exceptions remain being smokers the most paradigmatic example: despite all the warnings and campaigns designed to promote smoking cessation,

many people continue to smoke [11]. Information campaigns are needed to raise cancer awareness but they simply are not enough to promote behaviour change.

1.2. Smartphones and behaviour change

According to Fogg [12–14], behavioural changes occur when three elements converge in a given moment: Motivation, Ability and Trigger. If one of these three elements is missing, the change will not occur. This model clearly points out that motivation alone is not enough to induce a new behaviour; the target behaviour has to be simple enough to be performed by that person and a trigger has to be present to remind that person to perform that behaviour. Fogg defines trigger as “something that tells people to perform a behaviour now” [12]. An effective trigger will remind and instigate people to perform the target behaviour.

Mobile phones can be very useful in this sense: with mobile phones it is possible to persuade individuals to change their behaviour by delivering the right trigger in the right moment. The use of mobile phones to persuade individuals has many advantages

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[15]: 1) almost everyone has a mobile phone; 2) mobile phones are portable devices and people carry them everywhere; 3) people tend to create personal relationships with their phones; 4) the advanced features of smartphones enable context awareness of the phone user. Context awareness could be very important in behaviour change as it may provide the opportunity for situated learning, i.e., the opportunity to provide users with the knowledge needed to perform a new behaviour in a specific context that is meaningful to them [16].

There are many cancer smartphone applications (or “apps”) available on the market today but they lack accountability and reliability and are mainly focused on general information about the disease [17]. In order to design a cancer prevention app focused on behaviour change, we have to carefully balance the persuasiveness of the app and its lightness of use because we want the user to use the app willingly for a long period of time. This implies the need to create a specific set of guidelines that will allow the conception of a cancer prevention smartphone app that can effectively lead users to change their behaviour, thus preventing cancer.

1.3. Similar studies

There are several studies that have explored the use of health-related smartphone apps and even personal experiences and points of view about them [18–22]. Although these studies are very useful, pointing out directions and guidelines for generic health-related smartphone apps, the specificity of cancer prevention requires a more in-depth analysis in order to identify opportunities and possible obstacles to the success of such a smartphone app.

1.4. Current study

This study sought to explore the views and experiences of healthy Portuguese young adults concerning the essential features a cancer prevention smartphone app that seeks behaviour change should have.

The study was conducted in two sequential steps: as a first step, we conducted three focus groups with healthy young adults that explored: 1) prior experiences with health-related apps, 2) points of view concerning currently available health-related apps, 3) points of view concerning desired features in a health promotion app and 4) opinions on what influences long term usage of health promotion apps. The second step was based on the focus groups analysis and led to the design and application of an online questionnaire to a larger sample of healthy Portuguese young adults. The results from the two steps were confronted and resulted on a guideline set that will be used to design a cancer prevention app.

2. Materials and methods

2.1. Participants

2.1.1. Focus groups participants

Participants were recruited via e-mail. Two mailing lists were used: one from University of Aveiro and another from Ipatimup. Two hundred and twelve volunteers responded to the e-mail. The selection criteria included: a) being a smartphone user; b) age between 18 and 35 years old; and c) availability to participate on focus group time schedule. Sixteen participants met the above criteria. All participants provided informed consent to participate in the study.

2.1.2. Online survey respondents

Respondents were recruited via e-mail and through the social network Facebook®. The same mailing lists were used, but the e-mails of the focus groups participants were excluded. The e-mail

receivers were encouraged to forward the e-mail to all personal contacts and the Facebook® followers were encouraged to share the post to reach a larger number of people. The e-mail/Facebook® post had a direct link to the online survey. The questionnaire was open access and was available online during March 2014. A total of 1,693 questionnaires were collected and filtered using the same selection criteria as above (smartphone users with age between 18 and 35 years old), resulting in 798 valid questionnaires. All participants provided informed consent to participate in the study.

2.2. Procedure

2.2.1. Focus groups

Three focus groups (with 6, 5 and 5 participants, respectively) were conducted between December 2013 and January 2014. The same interview schedule was used in all focus group (Supplementary file 1). The discussion began with a more general question to get participants talking about previous experiences (if any) with health-related apps. In order to encourage discussion and opinions, a series of slides illustrating different health-related apps was used. The apps were organized according to the following features: 1) tailored information, 2) behaviour tracking, 3) on-the-go information, 4) reminder use, 5) health goal setting, 6) graphic depiction of health indicators, 7) motivation, 8) social sharing, and 9) contextual information acquisition. The participants were encouraged to express their opinion highlighting which apps would they use and why, what problems did they envision and what features were lacking in these examples.

The focus groups were 70–90 min long. Two researchers were present in all groups. One assumed the moderator role, facilitating the discussion and presenting the materials, and the other the assistant role, taking field notes.

2.2.2. Online survey

The online survey was made available during March 2014, in a dedicated website and all respondents reached the website by clicking in a link in the received e-mail or in Facebook® post. The online survey had a total of 24 questions distributed in four different pages (6 items per page) and took 10–15 min to complete.

2.3. Data analysis

2.3.1. Focus groups

The focus groups were filmed and the content was transcribed. The transcripts were then analysed using inductive thematic analysis [23,24]. After initial coding, highlighting relevant discussion themes, all text segments were iteratively analysed. Themes were added or merged until they effectively represented all text segments and captured the essence of every focus group discussion. The transcript analysis and coding was done using the program WebQDA [25].

2.3.2. Online survey

The data from the online survey was analysed using IBM SPSS Statistics, version 21. Data distribution was strongly asymmetrical (significantly different from a normal distribution), thus an *Independent Samples Mann-Whitney U Test* was used to test differences between genders. All p-values are presented with Holm-Bonferroni correction.

3. Results

3.1. Participants

Before entering this study, all participants answered a small survey concerning health and lifestyle and smartphone user experi-

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