Designing User Interfaces for a Wellbeing Persuasive App

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ABSTRACT

Wellbeing and prevention are a daily target for an increasing number of people. Food and exercise are the two most important elements contributing to personal wellbeing and disease prevention. This paper describes the participative design process for creating the interfaces of an app designed to help shape healthy behavior in adults with pathologies, highlighting the principles driving the design choices.

CCS CONCEPTS

Human-centered computing → Interaction design → Interaction design process and methods → Interface design prototyping

KEYWORDS

Participative design, Wellbeing, User Interfaces, Behavior Change

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1 Introduction

The spread of the Internet and the pervasiveness of mobile devices has changed the interaction between man and machine, making it more natural and ubiquitous. Mobile devices and the use of persuasive user interfaces can shape a person's behavior, encouraging a process of change and supporting it over time. Apps oriented to the individual are a powerful tool for empowering a person, since they are able to provide active coaching to achieve goals and promote a healthy lifestyle, anywhere and anytime [1].

Persuasion aims to model, reinforce or modify a person's behavior in a specific context. The technology becomes persuasive if it has features designed to increase the likelihood of changing the user's behavior. A persuasive interface supports and conducts the user towards a process of change using principles of psychology and sociology and implementing a set of static criteria and dynamic steps that the user has to take [2].

The Cycle of Change [3] describes six phases through which individuals must move to achieve a stable change: precontemplation, contemplation, preparation, action, maintenance, and relapse (or behavior extinction). In each phase of change, various intervention strategies are the most effective for motivating the person to move on to the next phase and thus follow the model to reach the target behavior [4].

Technology can complement clinical support by constantly following the person, stimulating his/her motivation and eliciting determination [5], by implementing a digital personal coach. One of the challenges with this personal assistant is making it adaptive by tuning the interaction level according to user preferences, for instance by not being too verbose (boring or time consuming) while being efficient enough to be persuasive. In this field, efficiency refers to the ability to create dynamic suggestions useful for the user in this specific context.

Change starts from motivation, the probability that a person begins, continues and maintains over time a strategy of change [6]. Clear suggestions, small steps, and initial easy-to-reach goals are mandatory to increase the likelihood of success and encourage the person to enter and stay in the cycle. A persuasive system must profile the person at an early stage and then also periodically, to personalize the intervention according to personal needs and characteristics, since a persuasive suggestion for one individual might not be effective for another [7]).

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A review of 204 apps for wellbeing and prevention shows that 43% of analyzed apps include a food diary [8], provide focused feedback to the user, and personalize the suggestions. Nowadays, there are many apps for mobile devices designed to empower personal health, but users often stop using them after a short time, dislike them or are not even aware of their existence [9]. Among the causes of definitively quitting an app after a short period are the lack of time, the excessive effort required for use, and lack of motivation. It has been shown [10] that a system for customizing the app's features as well as a "reinforcement" system, such as personalized goals and self-monitoring, can help motivate the user to continue using the app until they achieve the final objectives. It has also been shown that many users appreciate the path tracking function and the progress made because this type of self-monitoring increases their awareness, and the observation of progress is a stimulus for personal improvement [9].

2 User Interface Design

A popular design approach within Pervasive Health and HCI is participatory design, which enables end-users to be directly involved in the decision-making process of product conception and advocate their ideas in a creative environment [11]. Participatory design involves all stakeholders from the earliest phases of the design process in order to meet users' needs and maximize the app's usability. The Mensana app has these objectives:

- Self-monitoring, increased self-awareness and control over one's food choices, primary prevention
- Improved health status, increased well-being.

A multidisciplinary team comprising a cardiologist, two nutritionists, a chemist expert in statistics, four computer scientists, and a graphic designer worked together over a 3-month period in order to define the functions and features of the Mensana app, with numerous face-to-face meetings and interaction via email and Skype calls. Besides, following the Rogers person-centered vision [12], a counselor was part of the team to act as a mediator between the design team and the actual users during the conceptualization process, introducing learning strategies, favoring personal empowerment, and dealing with issues of an individual's resistance to change. This interaction is fundamental for collecting user requirements and receiving early feedback. All four clinicians use nutrition apps, and six of the team's components own a smart watch and/or intelligent tracker, to monitor parameters such as movement, sleep and heart rate. Since prospective users of this app are patients, every non-clinician member of the team can answer the design questions by playing a double role as both designer and potential (advanced) end user. In our opinion this synergy could produce good results since the obstacles sometimes experienced in participatory design (due to different languages and word meaning interpretations, etc.) are overcome in this way. This hypothesis needs to be investigated in future studies.

Once the user and functional requirements were collected, a smaller team (consisting of one researcher in the health field, one computer scientist, and one graphic designer and communication expert) was set up to design the graphic UI and define the logical data flow. Here we focus on this work.

Two components of this team are advanced users in the app domain since they have owned wearable devices (trackers, smart watches) for more than 5 years, and are thoroughly familiar with most popular user interfaces such as Fitbit and Samsung Health; they also use a commercial nutrition app.

A 3-step approach was applied to design the interfaces:

1. First, a number of meetings were scheduled with the design team members. Interfaces were drawn using paper icons and interfaces, drawing with colors, and defining the flow of information and the generated feedback (wireframes). Next, pictures of interfaces were shared between members exploiting Google Drive, to further reflect and detect potential updates and optimization. Other interactions followed via email or Skype, when necessary, to offer suggestions to refine the prototype.
2. Next, the prototype was refined and functionally defined in each path, and the interfaces were submitted to a large audience including doctors, nutrition experts and engineers, to collect additional feedback and suggestions.
3. Once a consensus was reached, the prototype was modified accordingly for the final version and put in digital format.

The graphic components have a strong impact on the usability of the application because the images and graphs are able to provide compact information relative to time intervals, in a quick and effective way. The designed interface has the following features:

- Minimal & Intuitive
- Simple interaction
- Rapid (minimum number of clicks and actions in general)
- Graphic design (maximizing pleasantness)
- Notification (Reinforcement) when the user reaches a goal (to increase the probability of positive behavior)
- Notification (Alert) if the user performs behaviors outside the guidelines
- Help (interface user guide)
- Information on the app's objectives (to motivate the user)
- Possibility of sharing results (positive target achievements) on social media
- Compliant with accessibility guidelines

After collecting user and functional requirements, early in the development process paper wireframes were drawn. Figures 1a and 1b show examples of the wireframes, created to define the structure and functions of the Mensana app, showing in the bottom of the interface the uploading menu in two different versions (closed or expanded) for input parameters: food, exercise, hydration, weight (if not imported automatically by apps or smart devices). The experts select the explicit version, in

order to save a click and considering that a selection on a popup menu could be difficult for (elderly) people with tremors.

A preliminary report with a detailed description of wireframes was shared to the whole team to receive feedback, and refine them accordingly. The group of expert professionals evaluated the app by functional tasks. Once the full consensus was reached, the next phase was the mockup definition.

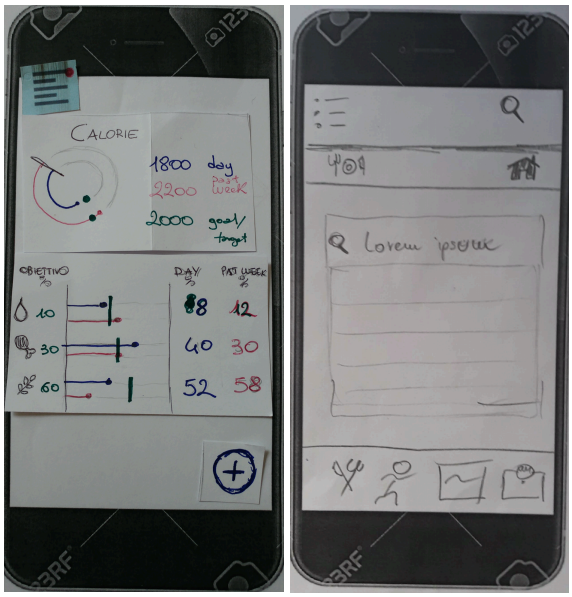

Fig. 1. Paper prototype User Interface a) Calorie intake summary including fat, protein & carb details b) Searching dishes

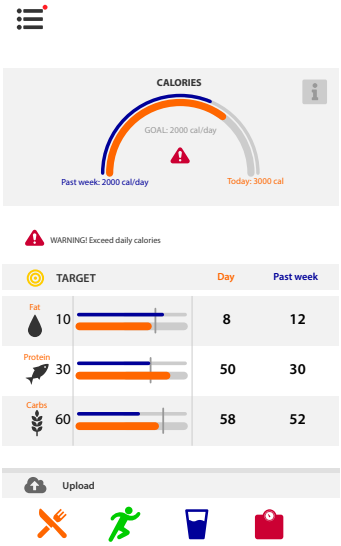

Fig. 2. Calorie intake summary interface including fat, protein & carb details

Figures 2, 3, 4, 5 and 6 show the user interface mockups. In order to maximize ease of use, the app relies on the visual channel In order to rapidly deliver meaning to novice learners, a logical association links the visual icons to their meaning (for instance a flame for calories burned, glass and bottle for water intake). Text labels supplement the visual information. Progress-meter items show at a glance how close the user is to reaching his/her daily goals, comparing with last week's progress (the thin item). Visibility of progress aims at stimulating the user to improve his/her personal health goals. In case of negative performance a triangle icon alerts the user and a text warning explains the cause.

A toggle button enables users to specify whether food intake refers to home (left side) or work (right side) as shown in Fig. 3.

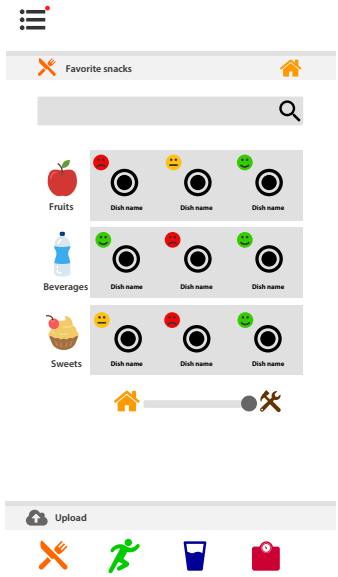

Fig. 3. Searching dishes interface: by text or categories. The most commonly consumed foods are shown at the top

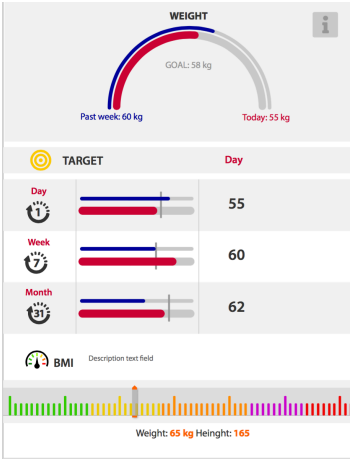

Fig. 4. Uploading weight data (via the scrollable meter)

To make the data upload simple and rapid a scrollable meter (Fig. 4) and an icon measuring system (Fig.5) have been introduced, which are very familiar for the users (in Europe).

In order to provide personalized suggestions to users, the nutrition experts catalogue the various dishes according to the user's pathology, using a three-item scale: recommended – moderate use -- not recommended. The appropriate suggestion is dynamically linked to the user. To deliver this concept, three emoticons have been used to immediately deliver the emotional feeling linked to the dish (Fig. 3).

Fig. 5. Uploading water intake data

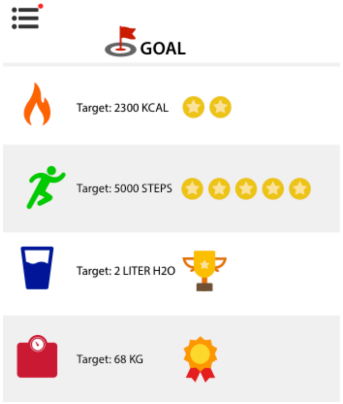

Fig. 6. Goals and Reinforcements

3 Discussion

Many components impact on the pleasantness and the frequency of use of a wellbeing application.

First, the objectives should be easily attainable with a modest effort, especially at the beginning, in order to start reinforcing the user. Moreover, notifications, the degree of invasiveness of the application, its speed and its general usability are crucial and extremely important components of the application.

In order to guide the user to the desired change, it is necessary to show understanding and indicate an active direction in the assistance path. Using user resources can:

1. increase the desire to change one's lifestyle
2. raise awareness of education for a healthy lifestyle when there is low motivation or awareness of psychophysical protection
3. educate, facilitating the perception of risk and the activation of behaviors congruent with the prevention objective.

Thanks to mobile devices and the pervasiveness of the network, technology supports us in the process of persuasion and personalization, key factors in encouraging change. Participatory design has shown great potential in reducing application development times, and is crucial to the design of applications in the health sector [13].

Furthermore, the social component is very important for sharing challenges and successes, especially in the younger population, who make intense use of technology and social networks. To date, although the younger population is at risk of obesity, hypertension, diabetes, and other diseases, few apps are specifically designed for these population groups [14].

The Mensana app is now under development to be tested with a large sample of adults in order to verify its persuasive effectiveness.

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