

It's LiFe!: A Monitoring- and Feedback Tool to Stimulate Physical Activity, Embedded in Primary Care

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Introduction

Physical activity improves the long-term prognosis and quality of life of people with a chronic disease like COPD or type 2 diabetes. Therefore, care standards state that stimulating physical activity is a central element in the treatment of those patients in primary care [1,2]. Although there are many initiatives to increase the level of physical activity, few patients manage to be sufficiently active. This may be because care standards also state that the practice nurses and/or GPs see these patients only one to four times a year. Consequently, the level of success regarding this element depends for the greater part on the degree in which patients succeed to execute their self-management role. Therefore, primary care providers should involve patients in self-management decisions and seek together with the patient for lifestyle interventions that fit with the motivation, needs and capabilities of the patient [3,4]. In addition to the support of the care provider, persuasive technology might play an important role in accomplishing the behaviour change, adherence to the new behaviour and the self-management role. A big advantage of persuasion by technology over human persuasion is that technology is more persistent and can go where humans cannot [5]. Through this, personalised feedback can be given on individual performance in relation to goal setting. Self-monitoring of physical activity using a pedometer or an accelerometer has been identified as an effective approach towards behaviour change [6,7]. If embedded in primary care, the combination of human persuasion and persuasive technology could complement and reinforce each other, especially when the two are aligned carefully. In the current project It's LiFe! an innovative monitoring- and feedback tool is being developed and tested, which will be embedded in a Self-management Support Program that is being developed together with this technology. As a prerequisite for useful technology and a successful intervention that meets the requirements and preferences of the end-users, it is important to involve the end users in the design process at an early stage.

In the present study, potential end-users were interviewed in order to answer the following research questions: 1. How the tool could be designed in order to be attractive, easy to use and suitable to wear on a daily basis; 2. Which feedback patients need to optimally support them in their self-management; 3. How this feedback should be presented; 4. How the use of the monitoring and feedback tool could be integrated in a Self-management Support Program (SSP) that is based on the principles of patient involvement, shared decision making and current insights into disease management and the chronic care model. This paper describes the designed intervention and the user-centred design process, which has led to this intervention.

Methods

A user-centred design method was applied to develop the monitoring- and feedback tool and the SSP. The procedure of this method is depicted in Figure 1. Defining the user requirements (phase A) was an iterative process starting with user and context identification (stage 1). Subsequently, the conceptual idea was developed in collaboration with several experts and business partners. The conceptual idea was described in a use case from the perspective of a patient with COPD, a patient with diabetes and a practice nurse (stage 2). A use case is a description of steps or actions between a user and a software system [8]. In stage 3 user requirements were elicited in seven open interviews with patients and semi-structured interviews with seven patients and fifteen health care professionals (general practitioners, physiotherapists, nurse specialists in diabetic and pulmonary care and practice nurses). Patients were asked where they wanted to wear the activity monitor and what other

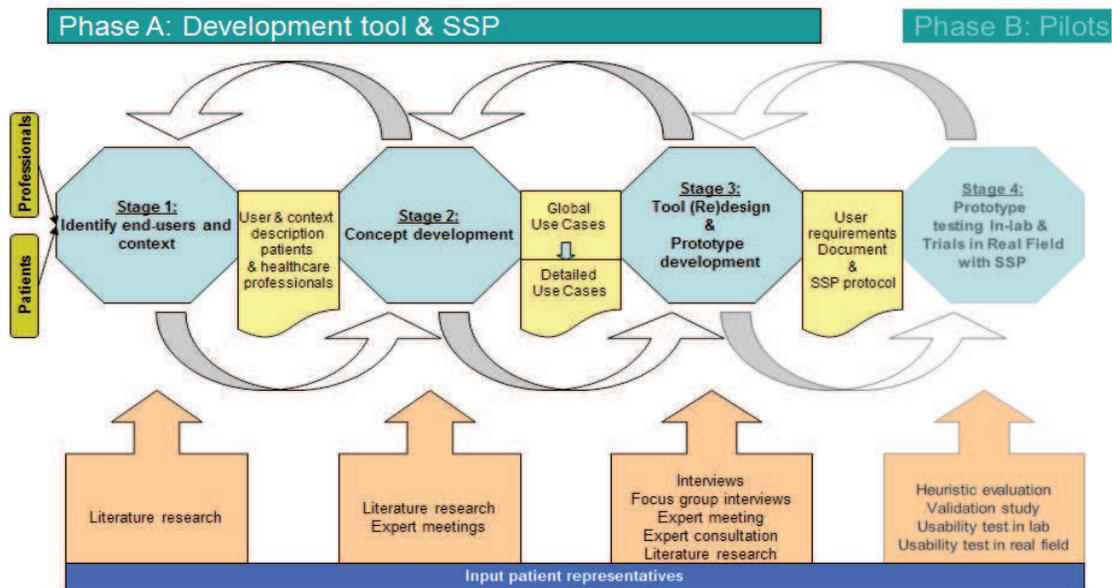


Figure 1. Methodological model.

requirements they had for the activity monitor. Also, on what device they want to see their activity data, in what unit and format and how the care professional could be involved. Care professionals were asked which data they needed to support the patients in their self-management and in what format they wanted to receive this. In the patient group, two focus group discussions were used to complement and confirm the gathered data. In the care professionals group experts from different fields were asked to comment on the care program developed. Patients were included until data saturation was reached. During the whole process two patient representatives were present at most research meetings to represent their patient group and there was continuous collaboration with the engineering team. The technological development took place in collaboration with two companies: Maastricht Instruments Ltd and Sananet Care Ltd. The research team of Maastricht University conducted the research and 'fed' the engineering team with information about user requirements for the tool, so that gradually the elements of the technology evolved.

Results

The development process has led to an innovative monitoring- and feedback tool and a SSP, which meets the requirements of the end-users. The requirements from the end-users where determining factors in the design of the devices for activity monitoring and feedback, the feedback strategy and the number of consultations with the practice nurse.

Tool design

The It's LiFe! tool consists of three different elements:

1. a 3D accelerometer worn on the hip;
2. an application (app) on a Smartphone;
3. a web application and server called 'It's LiFe! Online' (powered by Sananet).

The transmission of data from the accelerometer towards the app is via a Bluetooth connection. Every 15 minutes the Smartphone will connect with the accelerometer, provided that the accelerometer is within a 5 meter distance of the Smartphone. The transmission of data from the Smartphone towards the It's LiFe! server is via an internet connection.

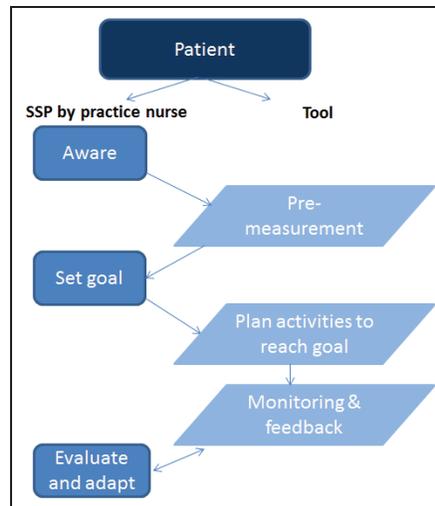


Figure 2. The intervention; Tool integrated in the Self-management Support Program.

Embedding of the tool in the Self-management Support Program

The whole intervention is an embedding of the tool in the SSP (see Figure 2).

To influence patients' motivation for behaviour change, the intervention starts by increasing patients' awareness about the risks of inactivity in a consultation with the practice nurse. Practice nurses indicated that they want to do this in a positive way. Next, the patients are given insight into their own activity pattern by a two-weeks pre-measurement. In the pre-measurement, the activity level of the patient is measured each day and dialogue sessions are sent to reveal which activities the patient does, likes, can do, with whom and which barriers he/she has to overcome. After two weeks, an activity profile is made available on the server which the practice nurse can discuss with the patient in order to set an appropriate goal in minutes a day. The patients and the care professionals indicated that they preferred a pre-measurement and to set a goal in collaboration with each other to make sure that the goal is realistic, challenging, and tailored to the individual preferences and abilities of the patient.

The goal will be set in the server, which is connected to the app. The patient receives a dialogue session in which he/she can plan activities to reach the goal. Planning this goal in more detail such as when, with whom and where you will be active, will narrow the gap between intention and behaviour and makes it more likely that the patient will reach his or her personal goal. If the plan is set, the monitoring and feedback period starts.

Manner and content of the feedback

In the monitoring and feedback period the patient gets three types of feedback:

1. Simple statistics about the amount of physical activity in relation to an activity goal in minutes per day divided in moderate-intense and intense activities (real-time);
2. Motivational messages based on activity results;
3. Responses of the practice nurse based on activity results during consultations.

On the Smartphone, the patient can see information about his or her activity level such as the intensity during a day, a week and a month. The activity monitor does not have a display since the patients indicated that a screen on the monitor would be too small and not easily accessible. Based on the activity, data messages will be sent. There are several types of messages, such as tips, encouragement, positive trend, rewards, barriers, facilitators

and suggestions to adjust the goals/target value. Users will receive such messages when they reach or do not reach their goal after 3, 5 and 14 days. In some cases the goals have to be reached for 100% and other rules are based on 80%. Participants will also get messages on positive trends. All messages are written in a positive way. After two to three months, the patient will have a consultation with the practice nurse again to evaluate the results and discuss barriers and facilitators. After the consultation, the monitoring and feedback period can be extended. In between consultations the practice nurse can see the activity results as well and is free to choose whether to react on them or not.

Discussion and future work

According to Fogg, an intervention to change people's behaviour should not only focus on ability and motivation, but should also include a trigger to change [5]. This project provides motivation and ability through self-monitoring of behaviour and the Self-management Support Program that is unfolded by the practice nurse. Supplementary, it provides a trigger by delivering feedback on physical activity on a timely base and in an actionable format, namely related to concrete, personal goals.

Having followed a user-centred design, it is expected that the usability and acceptability of the tool and the SSP are increased. The usability will be tested in a heuristic evaluation and by patients in a lab environment. In addition, the tool and the SSP will be evaluated by looking at technical performance, user experience and acceptance in a pilot in two general practices with 10 patients each. The tool and the SSP will be adjusted based on the findings of the pilot. The effects of the tool embedded in the SSP, will be evaluated in a Randomized Controlled Trial. This will be a trial with three branches, each with 80 patients from eight different general practices: one group will receive "care as usual", one group will receive only the care described in the SSP, and one group will receive the complete intervention with both the SSP and the tool. Primary outcome measure will be physical activity, measured with an accelerometer different from the one developed in this project. Secondary outcome measures will be self-efficacy and quality of life, both measured with questionnaires. This project focuses on patients with COPD or diabetes who are treated in primary care, but in case of proven effectiveness, patients with other chronic conditions could also use the tool and the model. Furthermore, the activity monitor may be extended by measuring other parameters.

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