
Some design challenges for self-experimentation apps

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Abstract

In this paper we outline several design challenges relevant to the creation of self-experimentation apps: (1) operationalization of experimental design, (2) data collection, (3) fostering appropriate engagement, (4) weak relationships with users, (5) ethical and privacy issues. These challenges are based on experiences in the creation and evaluation of apps for self-monitoring and behaviour change

Introduction

Recently we have created and deployed two self-monitoring apps that are relevant for consideration in the context of self-experimentation. They are outlined below.

Quped

Quped is a pedometer-based app. The app is freely available via the Apple app store and has gained several hundred users.

The app is designed to encourage people to walk more. The app sets a personalised weekly goal and enables social comparison with other users bracketed by age group and gender. Baseline data is collected via Apple Health/Core Motion. Further information about the app is given in [1][2].

This app operationalizes a single case design approach. Single case designs are research designs where the subject serves as their own control. This requires frequent, repeated measurement of behaviour across a baseline control phase and a treatment phase (or phases). We specifically chose a multiple baseline single case design approach for this app.

RosApp

RosApp is a prototype developed by Davis Buls for a project at the University of Glasgow. The app was given a limited release for use by the general public in summer 2016.

RosApp was created for self-management of a chronic skin condition called Rosacea. The app is designed for recording potential triggers and identifying possible correlations with flare ups of the condition. The app is described in [3].

The prototype focused primarily on self-tracking of food and comparison of food items with rosacea levels. Future versions of this app would benefit from operationalizing self-experimentation procedures, particularly a single case design approach.

Design challenges

In creating these apps, a number of design challenges emerged, including:

1: Operationalization of experimental design

Of particular relevance to self-experimentation are single case designs and n=1 approaches. These are designs where the individual serves as their own control. They require continuous data collection across

a baseline phase and then an intervention phase or phases.

Our experience is that single case design procedures cannot be applied to just any app design. Apps must be designed specifically to operationalize necessary quality criteria [4][5]. Where an app is to be released for use by the general public this requires careful balancing of experimental design with user experience design.

In designing Quped, we decided to use a multiple baseline approach over alternative types of single case design. Although reversal designs can produce 'stronger' inferences (i.e. increase the validity of any claims about behavioural effectiveness), they require features to be withdrawn, which could negatively impact user experience. Changing criterion designs would require app use and engagement over a longer time period, which we assumed would be difficult to achieve in an app store release. Further design issues surrounded the acceptability of the baseline phase. Overall, we were required to introduce multiple phases as part of a coherent user experience.

2: Data collection

Reliable data collection is crucial to the end user and to us as researchers in order to evaluate whether an intervention is effective.

For RosApp, where the intention is to collect and integrate various data about an individual's day-to-day life, the problem has been with acquiring heterogeneous data from a variety of sources (e.g. food data, weather, medications, exercise, etc.). This is not necessarily a major technical challenge, but it needs to be supported in a straightforward and easy to achieve

way for general users. For Quped, which more simply queries Apple devices for step data (which is collected as standard on newer devices), there are still problems with measurement accuracy and reliability, and with missing data.

The design problems here are not just technical, but are associated with 'usable logging' and making it clear to users when there is missing data and what to do about it.

3: Fostering appropriate engagement

For apps released to the general public, it is difficult to get people to follow necessary procedures. Beyond the lab and incentivised research studies, people are free to use and abandon apps as they choose.

Challenges for RosApp and Quped have included acquiring and retaining users. For this style of app, it is difficult or impossible to demonstrate the full range of features from the beginning (which may be a baseline phase, and may be a point where no data is available). It is also problematic to ensure exposure to phases. The challenge then is how to lead users through a set of phases in a meaningful and engaging way.

4: Weak relationships with users

For software releases where there is little or no direct contact with users, often it is just log data that can be used to understand whether and how an app is being used. Without contact, important information such as whether someone intends to make changes, whether they are using other apps or whether other factors are affecting their life become difficult to know.

From a user perspective, without a researcher to explain the purpose and functionality of an app, they must make their own sense of it. Self-experimentation apps are generally more complex to understand than most other apps. Both Quped and RosApp had to be designed in deliberately simple ways.

5: Ethics

A key challenge with both apps has been in gaining informed consent from users. Because the apps have been released for use by the general public, in-app mechanisms have had to be designed for gaining consent and supporting withdrawal, and to increase social validity. Apple also have a range of regulations relating to privacy which needed to be navigated.

Discussion

Neither Quped or RosApp are specifically self-experimentation apps, but they have relevancy to this area.

We suggest that in the creation of self-experimentation apps, there are important *design* challenges. As research in this area grows, I suggest it will be valuable to draw out these challenge and discuss how they are or can be addressed in practical ways.

The key design challenge is operationalization: the embedding of experimental design within coherent, understandable and engaging app design.

References

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