Making Online Behavioural Interventions Mobile

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ABSTRACT

Online behavioural interventions have provided well articulated benefits both for those participating in the interventions and those conducting research using them. Efficacy has been demonstrated in interventions ranging from smoking cessation to weight loss, and digital interventions can provide mechanisms to capture engagement and behaviour.

Increasingly users are engaging with the Web through SmartPhones and this presents both challenges and new affordances for those developing and researching behaviour change interventions. Participants may choose to interact with interactions more frequently, in more flexible ways, and possibly for more variable periods. Researchers may have access to far more contextual information with which to tailor interventions more appropriately to participants. How tools might be constructed for researchers to author such adaptive mobile behavioural interventions will be discussed in this paper, and an early prototype presented.

1. INTRODUCTION

There are clear benefits to the delivery of behavioural interventions over the Internet [2]. They are by nature not as resource intensive as offline interventions from therapists, they can be tailored to individuals [5] and the can be available for use at any time and for different periods time. The LifeGuide system has successfully provided an authoring tool for Web based online interventions [3]. Researchers are able to construct their own on-line interventions and run trials to evaluate effectiveness both qualitatively and through the use of randomised controlled trials[10].

But increasingly, many participants will want to engage with interventions from mobile devices, and many interventions would benefit from being available on mobile devices. Mobile devices have been used to look at implementing online behavioural interventions in a range of settings from adults with mental health diagnoses [4] to childhood obesity [9]. Although there exist many apps for mobile phones in the market place that claim to implement effective behavioural interventions, more evidence is needed of efficacy [1].

2. SMARTPHONES, AWARENESS AND AFFORDANCES

Mobile applications bring a collection of advantages and affordances to digital interventions. First, and perhaps foremost, is that the device is carried by the user. As such it is accessible everywhere [6] (so long as there is a connection). This allows on demand access to the intervention services at the convenience of the participant, ensuring the participant has access in vulnerable moments when they might need it most and at times that might be more convenient than a prearranged session. Combined with appropriate use of notifications [8] a user's attention can be called to the intervention when their context dictates it would be most useful. Current notification mechanisms in systems such as the LifeGuide might include email and SMS however if the intervention itself isn't available on the mobile device this notification can only direct them to logon to their desktop.

The wide variety of contextual information available to mobile devices, particularly smart phones, enables an additional level of tailoring not possible in traditional digital interventions. Sensors on a phone are able to record a range of data, the user's location, whether the user is in motion, audio picked up from the microphone, connectivity to BlueTooth or Wireless etc. This data can be used to infer a wide range of contextual information about the participant such as whether they are at home or work, whether they are alone or in company, whether they are exercising or relaxing, or even whether their speech suggests they are in a bad mood [7]. Intervention tailoring can be made richer through the use of such contextual data and take advantage of a mobile platform for delivery of interventions.

3. UBHAVE AND THE POWER APP

The recently funded UBhave project is investigating what effects using mobile phones would have on the delivery of digital behaviour change interventions and how tools can be created to allow the authoring of interventions by researchers without the need for direct programming support. Initially this will include an exploration of the affordances and constraints of smartphones as a platform for intervention delivery, as well as the development of an app for a particular intervention that can be used to explore these factors. Eventually one aim of this project will be to develop an extended version of the LifeGuide system allowing Psychology researchers to create their own custom apps to further explore the use of mobile online interventions for a wide range of behaviour change applications.

POWeR (Positive Online Weight Reduction) is a digital behavioural intervention developed at the University of Southampton using LifeGuide. It aims to assist participants in healthy weight loss through managed diet and physical activity. Over the course of a number of sessions participants make goals, and plans to reach those goals. The intervention enables them to keep a record of their progress and received tailored motivational feedback based on their progress.

As part of the initial work on the UBhave project an android app has been developed to support the POWeR intervention. The app is designed to support the viewing of goals and plans, updating of progress in achieving those goals, the recording of food and activity diaries, and the reading of supporting material such as appropriate food lists and specific guidance. A web service has been developed for the LifeGuide server to allow the app to directly access and post data to the intervention server. This is necessary to allow the integration of the existing web based intervention and the mobile app. This allows user to set their goals on the PC using the more traditional web interface and then check and revise their goals on the mobile device at a later point.

This form of what we are terming hybrid intervention use is part of our investigation into the nature of mobile intervention use. On the app itself, users can set reminders on their phone for their goal updates which utilise notifications to take the users directly to the app each day. Users are free to view their goals, and supporting material, as well as make updates and diary entries on their progress. A set of evaluation questionnaires are included with the app, which participants will be encouraged to fill out to aid in evaluation of the intervention. Some screen shots of the application can be seen in figure 1.

4. CHALLENGES

By moving digital interventions to a mobile platform and through our co-design development activities we have identified a range of new challenges as well as affordances. While these challenges are broad in nature we highlight four main challenges which our current trials point to being important in the construction of hybrid online mobile behavioural interventions.

- How to move from a session based conceptualisation to a more responsive / interrupt driven model.

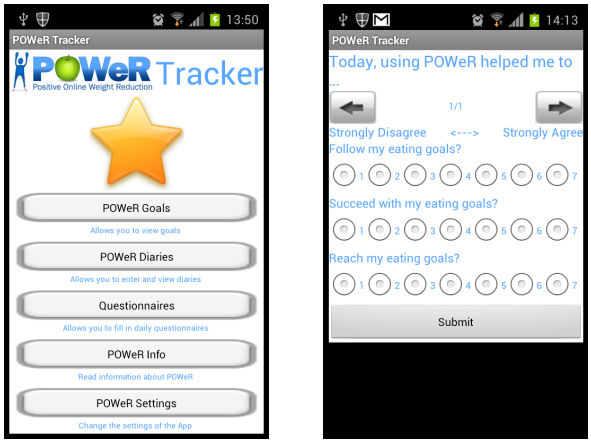

Figure 1: The POWeR App.

- How best to capture contextual information from users.
- How best to present materials on a small screen resource.
- Tackling the ethical challenges of more pervasive interventions.

Many online interventions draw on offline intervention setups, often using a session based approach to structure participant activities. On a weekly basis, participants will log on and carry out a series of tasks, be asked to update their progress and receive tailored feedback. With mobile delivery there is more flexibility for the user to be able to access interventions on the fly, as is the case with other apps [8], rather than sit down and work at a predetermined time. Existing interventions need to be modified to provide this more responsive form of content delivery modelled around an event (when the user chooses to interact with the intervention) rather than a session (when the user engages in a prearranged set of interactions). Appropriate use of features such as notifications further allows an intervention to take advantage of the persistently accessible nature of a mobile app. Key aspects of this challenge include how best to structure interventions and intervention activities to allow their use at different times and for different periods, and also how best to trigger such events without being invasive. Our current studies are investigating how contextual information derived passively from the device might provide clues as to the most appropriate times to intervene with participants.

In gathering this contextual information, mobile interventions can benefit from a variety of technology existing as part of the device or attached to it. Particularly with more modern smartphones the range of sensors available mean a wide variety of contextual information can be recorded. This information includes (but is not limited to) the devices position, orientation, motion, usage (including calls made), and recordings using the microphone and camera. This can allow for even richer tailoring to be made to interventions where content might be adapted to fit any number of user features such whether they are at home or if their voice indicates a certain mood. However, these sensors are often costly to device battery (one aspect of invasiveness) and

can also be of questionable accuracy, particularly when used as a proxy for activity. Granularity of information may be an important consideration, as for tailoring it may be that the requirement is to identify named locations (home, work) rather than a desire to know precise longitude and latitude from GPS. Both the accuracy and level of invasiveness are important factors to consider in any use of a sensor.

While digital interventions have enjoyed the presentational affordances of any modern website, mobile interventions are much more constrained. Smaller screen size and more limited controls mean that the presentation of large quantities of material or large scale interactions (such as long questionnaires) has to be reconsidered. These features require either breaking down into small components, condensing, removal, or at least consideration of the effect on the user of having to navigate around larger material given the phone. One of the advantages of a mixed approach of both phone and desktop is that materials can be delivered to the device that most suits the needs of the interactions. These hybrid approaches also go some way to solving problems of the previous two challenges where only non-session based content can be exposed on the app and web based content can benefit from tailoring enabled by previously captured contextual data from the phone.

Finally, as with many ubiquitous computing challenges, it is important to consider the ethical issues arising with mobile interventions. The persistent nature of the user's connection to the intervention means the user is potentially less in control of the ways in which they interact with the intervention, particularly if notifications are being used. Also data recorded by sensors will often be considered personal raising new concerns about how it is handled, transmitted to servers, and stored.

5. CONCLUSIONS AND FUTURE WORK

This paper has presented the initial findings of the co-design process for the construction of a mobile behavioural intervention app designed to assist in weight loss. The process has involved the adaption of an existing web-based app and highlighted both the affordances presented by delivery through mobile devices and the challenges presented in moving an existing, session based, information and interaction rich intervention onto the phone.

We are currently in the process of running n-of-1 trials to better understand how the POWeR intervention has translated to use through a mobile device and to begin to investigate the nature of intrusion in some apps and whether it is possible to provide psychology researchers with tools that will enable to them to better understand when is a good time to interrupt a participant with an intervention component.

The POWeR app developed is a bespoke app albeit tied into the existing LifeGuide system architecture. Having been through this initial co-design process we are now well placed to begin to construct an authoring system that will enable psychology researchers to construct their own apps to enable ongoing research on mobile interventions without the requirement for explicit technical construction. This approach has proved to be very effective with the current LifeGuide system, which has been downloaded over 500 times and has a large active research community researching online interventions. Our ambition is to move forward towards constructing a similar system for the authoring of, and research into, mobile interventions.

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