Looking for bright spots: a bottom-up approach to encouraging urban exercise

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Many journeys in urban environments are short and could be conveniently carried out on foot or by bike. However, a lot of people use public transport or cars for short journeys and this places pressure on urban transport infrastructures. Motivating people to change their transport habits is a wicked problem and challenging to address. We outline our current approach that involves a long term study of Fitbit users to identify the 'bright spots': the factors that enable some people to successfully change their transportation habits in the long term.

Human powered transport. Long term behaviour change. Bright spots. Wicked problems.

1. INTRODUCTION

The populations of most cities are increasing and one of the challenges faced in an urban environment is how best to manage the transport infrastructure as greater demands are put upon it. Increased human-powered transportation, such as walking and cycling, offers a potential solution to this problem, along with a number of other benefits for both individuals and society: better health, financial savings, potentially shorter journey times, less congestion and pollution, and increased social interactions (Pucher & Buehler, 2011).

Currently, many people choose not to walk or cycle in urban environments, choosing instead to use public transport or cars. Although many people are happy with their current transport choices, there is potential for more walking and cycling, as many short journeys (less than two miles) that are currently made by car or public transport could conveniently be made using human power. However, convenience is clearly not a sufficient motivator to change people's habits because in London fewer than 2% of journeys are made by bicycle and only around 20% are made on foot (Transport for London, 2012).

Motivating people to change their mode of transport can be characterised as a societal-scale 'wicked problem' (Rittel & Webber, 1973), "[a] public-policy problem…that defies resolution because of the enormous interdependencies, uncertainties, circularities, and conflicting stakeholders implicated by any effort to develop a solution" (Lazarus, 2009).

One way to address this sort of challenging problem is to focus on 'bright spots' (Heath and Heath, 2010). This involves finding examples of things that do work and building from those. For example, Heath and Heath report a study in Vietnam that aimed to ameliorate a wicked problem: child malnutrition. Researchers weighed lots of children from similarly poor backgrounds. They found the ones who didn't have malnutrition and identified what their mothers did that was different. It turned out they fed their children smaller but more frequent meals, added sweet potato greens, shrimp and crab to their diet and also fed them when they were ill. Local people then ran cooking groups where they learnt these techniques. Within 6 months 65% of the local children were better nourished and the approach spread across Vietnam.

Our approach involves not only looking for existing bright spots, but exploring how they can be facilitated: we are using novel sensor-based technologies to encourage people to change their transport habits. This builds on previous Ubicomp research that has recorded and represented users' activity (e.g, Consolvo, et al. 2008) and an increasing number of commercial systems for measuring and encouraging physical exercise (e.g., Fitbit, Strava, Nike+). While short term changes in behaviour have been demonstrated in multiple studies, there is little understanding of how effective these systems are at maintaining habitual activity over a longer time (Brynjarsdottir et al. 2012).

2. MOTIVATING WALKING AND CYCLING

In this section we describe in more detail two distinctive features of our approach to motivating people to walk and cycle.

2.1 Why we need to find bright spots

Behaviour change interventions and theory can be described as belonging to one of two approaches: those that use a 'nudge' (Thaler & Sunstein, 2008) to change behaviour and those that rely upon a person's conscious decision to change. These two methods to change behaviour target the two separate brain systems proposed by Kahneman (2011): system 1 is fast, automatic and largely unconscious and system 2 is considered, slow and conscious.

Both of these approaches have been used in projects that aim to change transport behaviour or encourage exercise. However, each comprises myriad techniques and it is not generally clear which would be most appropriate for effecting a desired behaviour change. For example, if we want to encourage more human powered transportation, what scale should we intervene at: the personal, (e.g. motivating individuals by setting them goals); the social (e.g. showing individuals how the distances they walk compares to a social norm); emotional (e.g. monitoring body movement and physiological signals and relaying this information); or the environmental (e.g. building more cycle routes, which requires a policy level focus)? Scale is not the only consideration when trying to identify key facilitators that lead to successful behaviour change. Other key factors may be, for example, historical (e.g. the person cycled when they lived in a different location) or economic (e.g. walking and cycling to save money).

Our contention is that identifying the bright spots where new habits have been successfully established will provide insights into the key factors of successful long term behaviour change. At the outset it is not clear what these will be and therefore it is necessary to have a broad analytical focus.

One result of our proposed study might be that interventions using a combination of different behaviour change techniques may be more successful in supporting new physical activity habits.

2.2 Why studies should be over a longer period

The literature suggests that interventions that aim to increase physical activity are often unsuccessful, with relapse rates of approximately 50%, perhaps because of the amount of effort required to adhere to them (Castro & King, 2002). Furthermore, while several Ubicomp studies have successfully increased physical activity in the short term, there is little understanding of how effective these systems are at maintaining habitual activity over a longer period; the initial successes of this work could therefore potentially be due to the novelty effect of using a new technology.

There is some evidence that the length of time required to develop a habit depends on the behaviour being changed. In a study of 96 participants who were forming new eating, drinking or activity habits, Lally (2010) found that a new activity becomes habitual after, on average, 66 days. This is in keeping with Brynjarsdottir et al. (2012) who reviewed a number of HCI papers related to sustainability and behaviour change and found, "*[l]ittle evidence for long-term behavioural change*" and that *"[t]he typical duration of a field study is 3-4 weeks, which is likely not long enough".*

Figure 1: *Fitbit Zip smart activity tracker*

Even the longest running behaviour change studies in HCI tend to be quite short in comparison with studies carried out in other academic fields. For example, two of the longer HCI studies include evaluations of the *UbiFit* system, which was trialled for three months (Consolvo et al., 2008), and of *Clouds and Lights*, two connected ambient displays to encourage stair usage in a UK university, which was lasted for six months (Rogers et al., 2010).

However, even these longer HCI studies do not meet the recommendation that interventions that target physical activity should last for at least 24 months, as forming new exercise habits is a long-term process: Prochaska et al. (1998) concluded that some activities need to be sustained for several years in order to be established as habits. An extreme example of this is smoking cessation, which has been subject to a number of studies. Conclusions drawn from these studies show that after an entire year without smoking there is a 43% chance of relapse and after 5 years without a cigarette there is still a 7% chance of relapse (US Department of health and human sciences, 1990).

3. CURRENT STUDY

Walkerbit is a study into the effect and usage of the Fitbit Zip (Figure 1) smart activity tracker. This device records the number of steps that the wearer takes each day. The device was chosen because of its cost effectiveness; the ease with which data can be downloaded from the device using an API; long battery life (up to 6 months with normal usage); its wireless connectivity; ability to store data without needing synchronisation. The Fitbit Zip device and system embodies a number of different behaviour change techniques, including offering users badges, challenges, goal-setting and social influences with the option to share step-data in groups and over other social networks. We are investigating the effectiveness of usage of the Fitbit with these techniques and if any changes in behaviour are sustained over a longer time period.

In addition to this we are interested in people's daily transport and physical activity habits. During the study we hope to gain insight into which transport methods people use each day and the factors, both external and related to the Fitbit system, that affect their choice of transport method.

Fifty participants have been given a Fitbit Zip device, which they will be wearing for a total of 28 weeks each. For the first four weeks of the study we recorded the baseline activity of all participants, without giving them with access to the system or providing feedback about how many steps they had taken. After this period 25 of the participants were able to use the system and see the data collected about their activity. The other 25 continued to receive no feedback for a further 12 weeks, as a control condition. After this period all participants have full access to the Fitbit system.

Throughout the study we keep a record of every participants' step-count, as recorded by the device, along with obtaining qualitative data in a number of different ways. Each day participants complete a short diary entry in a workbook provided (Figure 2), we conduct regular interviews with them throughout the study and we monitor online discussion groups,

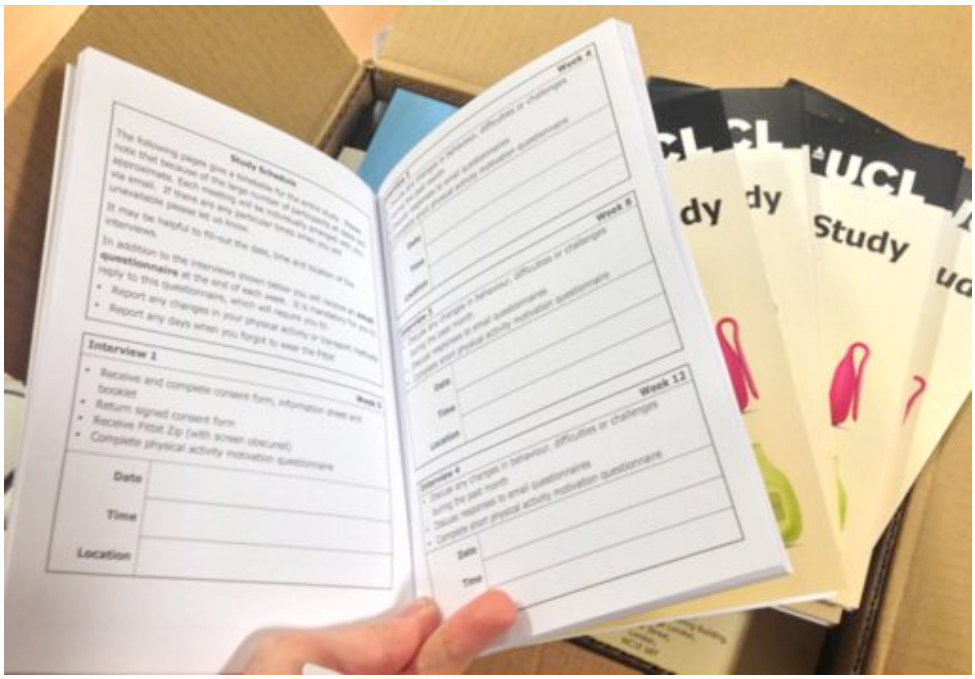

Figure 2: *Study participant workbook*

through which they may communicate with one another and share their activity data. We also use a standardised questionnaire to score participants motivation to exercise at four key points of the study, to allow further comparison of the effect of the device.

From this data we will be able to see which factors affect their transport and physical activity decisions, which will give us informed information about how we can design future inventions to better support behaviour change.

4. SUMMARY

Motivating people to change their habits in the long term is challenging. Most HCI behaviour change studies are limited for two reasons. First, they take a top-down approach where theoretical considerations lead to a narrow focus which results in the efficacy of a small number of intervention techniques being tested. Second, the duration of the experiments is typically very short and any changes may be due to novelty effects. We have proposed a bottom-up approach where we look for the bright spots: factors that enable successful, long term habit formation. We are currently testing the effectiveness of this approach by carrying out a seven month study that is studying how people use and appropriate the Fitbit activity tracker and system.

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