
Designing for Health Behavior Change: HCI Research Alone Is Not Enough

Katarzyna Stawarz

UCL Interaction Centre
Gower Street
London, WC1E 6BT, UK
k.stawarz@cs.ucl.ac.uk

Anna L. Cox

UCL Interaction Centre
Gower Street
London, WC1E 6BT, UK
anna.cox@ucl.ac.uk

Abstract

Recent advances in technology and the proliferation of smartphones have made managing one's health behavior easier. As a field, HCI is in a position to drive the development of these new health and wellbeing technologies, and to ensure the solutions available to users are usable, meet their needs and help them change their behavior for the better. However, HCI research tends to focus on usability and user engagement, and often does not consider the efficacy or long-term effects. Despite recent research arguing that evaluation of efficacy is beyond the scope of HCI, in this paper we debate this point and argue the importance of designing for efficacy of health and wellness technologies. We contend that moving beyond HCI literature and drawing from other fields can help us keep efficacy in mind and design personal health and wellbeing technologies that meet users' needs and help them effectively change their behavior.

Author Keywords

Health and wellbeing; smartphone apps; behavior change; multidisciplinary research

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction

Advances in technology have resulted in the proliferation of personal devices and smartphone apps, which have made managing one's health easier. With thousands of health-related apps available to download [7], users have access to technology that helps them monitor their health and change their behavior. However, many apps designed to support health behavior change are not grounded in theory [2, 13], and as a result can provide functionality that often fails to adequately support user needs [11, 12].

HCI research provides methods and approaches required for designing and building technologies that meet users' needs. However, HCI literature alone is not enough in the context of behavior change technologies. When designing for health and wellbeing, we need to remember that the ultimate goal is to provide solutions that help people change their behavior. They not only need to be usable and meaningful, but also effective. In this paper, we argue that if we are to contribute to the development of effective behavior change technologies, HCI for health needs to consider existing research and theories from other fields.

Designing and Evaluating Technologies for Health Behavior Change

When designing technologies that help people change their behavior, we need to keep in mind these following questions:

1. Can users use it? (Is it usable?)
2. Do users use it? (Does it meet their needs?)
3. Does it actually work? (Is it effective?)

HCI studies tend to focus on the first two questions: assessing usability of behavior change technologies ("can users use it?") and user engagement ("do users use it?"). They hardly ever consider the efficacy of the solution and its long-term effects ("does it actually work?"). Yet, to ensure that the technology provides any benefits to the users, the focus should not only be on its proximal effects that occur within days or weeks of implementing the solution, but also on effects that occur over several months (intermediate effects) and even longer time periods (distal results) [10].

The effectiveness question is often treated as optional, as within HCI it means something different than for health researchers. Klasnja et al. [6] argue that we can still make worthwhile contributions to HCI without considering efficacy, as usability and user engagement are more important at this point. They suggest tailored interventions that focus on a single behavior change element, which allows to measure if technology could facilitate change. However, in the context of behavior change technologies, this focus is too narrow. Developing and evaluating usable and engaging technology that stands little chance of being effective in supporting long-term change can be counterproductive.

Efficacy should always be considered during the design process, even if it will be evaluated in a small tailored evaluation. Even if we are aware that measuring distal effects will not be possible, *"design thinking and evaluation should still aim to inform our understanding of the scope, limits and potential for the realization of distal benefits to health and well-being"* ([10], pp. 4). One way to ensure that it is taken into the account is to base the design of the intervention on a solid theoretical grounding that goes beyond HCI literature.

Learning from Other Fields

The main goal of behavior change technologies is to help users change their behavior for the better. To design apps that meet this goal, we need to understand the mechanisms of behavior change [6]. However, while HCI literature provides resources that can help us design for behavior change, they are too limited. For example, Fogg's *Persuasive Technology* [3] is seen as an important resource as it presents seven types of persuasive strategies that can be used when designing behavior change technologies (reduction, tunneling, tailoring, suggesting at the right time, self-monitoring, surveillance, and conditioning). This is a very narrow list: health psychology literature recognizes at least 93 different behavior change techniques [9]; instructions on how to use them and tools to help select the most relevant ones are widely available (e.g. [1, 8, 9]). As technology is often used in behavior change interventions (e.g. see [4] for an overview of interventions using mobile technologies), health psychology and epidemiology research also provide insights into what works and what does not, which can help inform the HCI research.

Limitations of HCI literature and available tools not only influence the design of behavior change technologies, but also their evaluations. One of the measures often used to evaluate the efficacy of a new technology is the frequency of a behavior, even though increased frequency does not indicate that the behavior has changed for good [6]. Behavior change research suggests that the presence of a habit can increase the likelihood that the new behavior will be repeated and therefore the automaticity of behavior representing habit strength might be a more relevant measure [5].

Understanding the theory drawn from other fields can also suggest new approaches to well-known issues. For example, many behavior change apps provide reminders to help users repeat their behavior, however, they are not always the best solution. Stawarz et al. [11] show that grounding research in findings from other fields (in this case prospective memory and habit formation literature) can spark new ideas and lead to alternative designs. If such research was grounded only in the HCI literature, the proposed solution would be yet another time-based reminder, even though reminders teach users to rely on technology [11] and their presence can hinder the process of habit formation [12]. Instead, the authors suggest a novel approach based on changing users' behavior to make taking medications an integral part of a daily routine.

Conclusions

Evaluating the effectiveness and efficiency of behavior change technologies is a challenge and has previously been seen as outside of HCI research's scope. However, such technologies are not being used in a vacuum. Even though we cannot always measure the health outcomes, we have to keep them in mind at all times. HCI research should always be grounded in theories from other relevant fields. By being open to health research, we invite new theories, frameworks and opportunities that can expand our knowledge, provide new tools and enrich the technologies we design. HCI for health needs to embed theories from other fields because focusing just on usability and user engagement is not enough. If we focus purely on usability, engagement and tailored interventions testing individual aspects of behavior change, we risk alienating ourselves from other eHealth disciplines that could benefit from our research, for whom effectiveness

of the technology in supporting long-term change is its most important aspect.

References

- [1] BCT Taxonomy. (2014). Behaviour Change Technique Taxonomy. <http://www.bct-taxonomy.com/>
- [2] Cowan, L.T., Van Wageningen, S.A., Brown, B.A., Hedin, R.J., Seino-Stephan, Y., Hall, P.C., and West, J.H. Apps of steel: are exercise apps providing consumers with realistic expectations? A content analysis of exercise apps for presence of behavior change theory. *Health Education & Behavior*, 40, 2 (2013), 133–139.
- [3] Fogg, B.J. *Persuasive Technology: Using Computers to Change What We Think and Do*. Morgan Kaufmann, New York, 2003.
- [4] Free, C., Phillips, G., Watson, L., Galli, L., Felix, L., Edwards, P., ... Haines, A. The effectiveness of mobile-health technologies to improve health care service delivery processes: a systematic review and meta-analysis. *PLoS Medicine*, 10, 1 (2013), 1–26
- [5] Gardner, B., Abraham, C., Lally, P., & de Bruijn, G.-J. Towards parsimony in habit measurement: testing the convergent and predictive validity of an automaticity subscale of the Self-Report Habit Index. *The International Journal of Behavioral Nutrition and Physical Activity*, 9, 1 (2012), 102.
- [6] Klasnja, P., Consolvo, S., and Pratt, W. How to evaluate technologies for health behavior change in HCI research. In *Proc. CHI 2011*, ACM Press (2011), 3063–3072.
- [7] Laird, S. (2012). *How smartphones are changing healthcare*. Retrieved 12/18/2014, from <http://mashable.com/2012/09/26/smartphones-health-care-infographic/>
- [8] Michie, S., van Stralen, M.M., & West, R. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6, 1 (2011), 42.
- [9] Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., ... Wood, C.E. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Annals of Behavioral Medicine: A Publication of the Society of Behavioral Medicine*, 46, 1 (2013), 81–95.
- [10] Smith, G., Wadley, S., Webber, S., Ploderer, B., Lederman, R. Unbounding the Interaction Design Problem: the Contribution of HCI in Three Interventions for Well-being. In *Proc. OzCHI 2014*, ACM Press (2014).
- [11] Stawarz, K.M., Cox, A.L., Blandford, A. Don't forget your pill!: Designing effective medication reminder apps that support users' daily routines. In *Proc. CHI 2014*, ACM Press (2014), 2269–2278.
- [12] Stawarz, K.M., Cox, A.L., Blandford, A. Beyond Self-Tracking and Reminders: Designing Smartphone Apps That Support Habit Formation. In *Proc. CHI 2015*, ACM Press (2015).
- [13] West, J.H., Hall, P.C., Hanson, C.L., Barnes, M.D., Giraud-Carrier, C., and Barrett, J. There's an app for that: content analysis of paid health and fitness apps. *Journal of Medical Internet Research*, 14, 3 (2012), e72.