# Pervasive, Persuasive Health: Some Challenges

Sean A. Munson
School of Information, University of Michigan
Ann Arbor, Michigan, USA
samunson@umich.edu

***Abstract*—As we consider the next set of challenges for pervasive heath, what are the issues that our current expertise may not sufficiently address? What might we have overlooked that should be on our research agenda as we go forward? In this brief paper, I argue that we would benefit from knowing more about how to design persuasive systems for single use situations (e.g., the decision to get a screening or vaccination) and that people can "graduate" from while maintaining healthy routines and habits they have developed.**

***Keywords- health, wellness, persuasion, single-use, one-time, tapering, weaning, post-intervention, development, habit***

## I. INTRODUCTION

As a community, or perhaps more accurately, as communities, we have made considerable progress on understanding the opportunities, challenges, and some best practices for designing technology to support health and wellness. There is an incredibly rich stream of current and past research, as well as commercially available applications to support a variety of health behaviors, and, from a glance at the titles of accepted papers, we will hear much about this at the conference.

During the workshop, I hope that we will be able to explore some possibly under-researched challenges, with a focus on whether our existing knowledge and research directions sufficiently address these challenges, and if not, what else we should be including in our research discussions and plans. In particular, are doing enough to study one-time interventions and the process for tapering, weaning, or graduating people off of the interventions we build and deploy.

## II. ONE-TIME BEHAVIORS

Our field has been made great strides in addressing recurring, day-to-day behaviors and challenges: exercising more, regular medication adherence, applications for mood tracking and improvement, smoking-cessation, and managing diet. The same might generally be said for persuasive technology, where the focus has often been on starting and then maintaining behaviors on a regular basis, such as in helping people make day to day greener living choices through eco-feedback technology.

Are the lessons we have learned up to or appropriate for the challenge of motivating or promoting one-time, infrequent, or rare behaviors? Is a focus on reflection, regular monitoring, and objective feedback going to teach us lessons that help us make the best use (or non-use [2]) of technology to promote behaviors such as health screenings or immunization? Indeed, with affordances such as ubiquitous, context-aware objective monitoring and the ability to deliver rich, tailored feedback at the right time and place, mobile computing may much more to offer for everyday behavior change and maintenance.

The answer may be mixed; many of the lessons and affordances may apply. Mobile and context aware systems can still help us deliver tailored messaging, at the right time and right place (*kairos)* [7]. Various forms of monitoring may identify people who would most benefit from a screening or from a vaccination. Knowledge of social networks and social messaging can help messages carry greater weight with the recipients.

But these problems may present unique challenges for which we, as a research and professional community, have developed less expertise. What are the right engagement points for one-time messaging, when people are not installing applications and interacting with them on a day-to-day basis?

Just as the public health community prefers some health behavior change models for day-day behavior change (e.g., Theory of Reasoned Action [6] & Theory of Planned Behavior, [1]) and others for screening or other infrequent behaviors (e.g., the Health Belief Model [16]), the pervasive heath and persuasive technology communities may benefit from developing a different set of guidelines and best practices for this different category of behaviors.

This difference is recognized in models and frameworks such as the Fogg Behavior Grid,[1] which recognizes trying to do a new or familiar behavior one time as a behavior change challenges. The recommended strategies, however, seem represent assumptions that all behavior change of this type is hindered by the same set of barriers. For one-time, new behaviors ("green dot behaviors"), the guide argues:

> *"the main challenge that we face while triggering a Green Dot behavior is a lack of ability. Since Dot behaviors occur only once, the subject must have enough knowledge to successfully complete the action on the first attempt. Otherwise, frustration, and quitting, may occur."*

before moving on to note that motivation and triggers also matter. And for one time, familiar behaviors ("blue dot behaviors"), the recommendation is:

> *"Blue Dot Behaviors are among the easiest to achieve. That's because the person, by definition, is already familiar with the behavior. They know how to perform it (such as exercise,*

[1] http://www.behaviorwizard.org/wp/behavior-grid/

PervasiveHealth 2012, May 21-24, San Diego, United States
Copyright © 2012 ICST
DOI 10.4108/icst.pervasivehealth.2012.248712

*plant a tree, buy a book). In addition, they already have a sense of the costs and benefits for the behavior… With Blue Dot Behaviors, people do not require reassurance (enhancing motivation) or step-by-step instructions (increasing ability). Instead, the challenge is on timing: One must find a way to deliver a Trigger at a moment when the person is already Motivated and Able. This timing issue is well known: "Timing is everything."'*

These recommendations and guidelines strike me as overly simplistic. It seems incorrect to assume that someone exercise necessarily sees it as beneficial or is able to exercise properly. Someone might be very able to start a new behavior – a doctor might be recommending a brief screening that is fully covered by an individual's insurance, but if the individual feels there may be discomfort associated or not understand or believe in the benefits, he or she may still opt out. If these suggestions accurately represent the sum of what we know about persuasive technology for getting people to do one-time behaviors, we have considerably more work to do.

Consider, for example, the challenge of adult immunization, as I recently had an opportunity to do. Timing certainly is a barrier, as might be some aspects of ability (having adequate medical insurance or finances to cover it, or knowledge of how to get it for free, for example). But at least some studies find that these are not the most common barriers, with common barriers including misconceptions about vaccines' costs and benefits – including the belief that because they are healthy, vaccination is unnecessary, or that vaccination has common and negative side effects [10]. Even if the person has received vaccinations before, they may have misconceptions that leave them unmotivated. Or they may have once been able but had their circumstances change – such as by losing access to insurance or a shift in their social network to one that disapproves of vaccinations, or a doctor that is less inclined to remind patients about them.

A framework, then, that errantly, or over-generally, assumes and emphasizes certain barriers and not others may miss more effective opportunities for intervention, interventions that only work with people for whom it has accurately described the barriers. For the vaccination challenge, focusing on changing social norms, and making pro-vaccination norms visible, may be more effective in some communities.

There are also questions about how to deliver technical interventions for one-off activities (or if/when technical interventions are even well-suited). When the challenge *is* a trigger, getting a patient to install a reminder application that will trigger at an appropriate time (when the seasonal flu shot is available, for example) and context (when in a pharmacy that accepts their insurance). Even then, an individual might not see the benefits to keeping a single-purpose application around and delete it, or may witch phones, in the meantime, making the reminder less effective. Would bundling many one-time behavioral interventions into a single application, perhaps with day-to-day interventions as well, work? For vaccinations, an application to manage a patient's interactions with a caregiver (including scheduling, billing, suggested vaccinations and screenings, access to health records, and so on), might be optimal. *Text4Baby*[2] bundles many one-time health tips into a stream of health advice that is timed with expectant and new mothers' needs; are there other such opportunities?

Furthermore, for health conditions that are more stigmatizing, some traditional techniques to increase motivation may be problematic. Despite the effectiveness of seeing celebrities or friends pursing a health behavior (e.g., the "Katie Couric effect" for colonoscopies [5]), social messages about who in your network has received a screening or vaccine may sometimes disclose more than is appropriate. I applaud efforts, such as Hansen and Johnson's work on "veiled viral marketing" [8], to develop social triggers that work but are also appropriate for sensitive health behaviors. In their test of veiled viral marketing, individuals could send a social message to someone in their network recommending that they learn about the HPV vaccine – and the recipient would learn that a friend recommended this content, but not *which* friend, thus preserving the saliency of a social message while still affording some privacy to the sender.

For other situations, technology – such as social network data, precise knowledge about communities and attitudes, and electronic health records – might be better used to tailor messages that are delivered through various media, rather than delivering specific triggers. A Facebook app indicating "I was vaccinated," with numbers and friends (possibly just a count in the case of stigmatizing conditions) – much like the experiment conducted during the US 2008 Presidential Election and 2010 midterm elections – might add social proof and pressure, while messaging that highlights people in one's network who *you* could be protecting by getting vaccinated might increase perceived benefits or feelings of responsibility.

It is also possible that some techniques will be better suited for one-time use than ongoing, day-to-day use. Social comparison data has been shown to be effective in yielding higher contributions to public radio [19], reducing energy use (particularly when combined with injunctive norms [17]), and increasing ratings in an online movie community [2]. I would speculate, though, that in at least some long-term, discretionary use applications, some individuals would prefer to avoid sites that regularly present them with aversive comparisons.

## III. Designing for Cessation of Use – of the Intervention

A second area that has received too little attention is whether we, as designers, intend for people to stop using everyday health and wellness systems, and if so, what the optimal process for that is. In my own work (e.g., [12, 13]), I have focused largely on systems that people might use indefinitely, potentially for the rest of their lives. In doing so, I have focused on making applications that are simple and fast to use, so that people would have an easier time starting and continuing to use them. Given common issues and challenges with adoption and initial adherence, as well as reduced use after the novelty effect wears off, it is no wonder that this particular challenge has thus far received little attention. More cynically, another barrier to this issue receiving much attention is the competing interest of the individual and commercial

[2] http://www.text4baby.org/

application/system providers: an individual may prefer to some day no longer need an application, but it is potentially much more lucrative for companies to have a customer for life.

It is, nevertheless, important. First, there may be times when designing systems to support temporary use may actually help some of the initial adoption and adherence problems: people might be willing to put up with a tedious process or a somewhat intrusive device if an application promises to teach them new skills and then be gone from their lives. Second, if we consider what it is like to live with persuasive systems, how many of us would want people to have lives that are carefully regulated and nudged by a myriad of systems, until the day we die [15]? And finally, might some persuasive health systems create an effect of learned helplessness in which applications, assuming the role of determining and recommending the most appropriate choices, actually *reduce* individuals' competency to make these decisions in the absence of that support?

Anecdotally, many researchers have described high recidivism rates after the conclusion of an intervention, when the fitness sensor or diary, or the calorie counting tool, is no longer available to the former subjects (I note that this has been observed with other types of interventions as well [9]). Why are these applications not helping individuals to develop good, robust fitness habits or competencies for health eating and at least keeping approximate track of calories? Would a study actually find *worse* post-intervention health habits among some participants?[3]

To help imagine what we might build if we had a better understanding of how to create temporary health and wellness interventions, consider Schwanda et al's study of the *Wii Fit* [18]. Some stopped using the system when it no longer fit into their household arrangement or routine, others when they had unlocked all of the content and its activities became boring or repetitive, and others stopped using it because they switched to another, often more serious, fitness routine. From a fitness perspective, the first two reasons might be considered failures: the system was not robust to changes in life priorities or in living space, or it suffered a novelty effect. The third, though, is a fitness success (though possibly not a success for Nintendo, if the hope is that they would go on to buy the latest/greatest gaming product): participants "graduated" to other activities that potentially were more fulfilling or had still better health and wellness effects. Imagine if the design of the system had helped more users to graduate to these other activities before they became bored with it or before it no longer fit into their daily lives.

Returning to the examples of exercise and calorie diaries, what changes might make them better at instilling healthy habits? In the case of a pedometer application, could it start hiding activity data until participants guessed how many steps that had taking that day? Would such an interface change help people learn to better be aware of their activity level *without* a device's constant feedback? What if, after some period of use, users of calorie counters started not getting feedback on the calories they had consumed per food until they end of the day? Would such activities support development of individuals' health competencies better than tools that offer both ubiquitous sensing and feedback? How would such changes affect the locus of control and sense of self-efficacy of applications' users?

These are some rough ideas – the medical community, perhaps because of a focus on controlling costs and/or lower ability to integrate the interventions they design into daily life, has more history of evaluating interventions for the post-intervention efficacy (e.g., [3], [11]). Other communities have deeper understanding of what it takes to develop habit (e.g., [14], [20]) or to promote development. What does the HCI community stand to learn from these studies?

## IV. Conclusion

These are two areas where I believe the agenda for pervasive, persuasive health and wellness research could be stronger. I have highlighted some exemplary work in these spaces, as well as places where we, as a community, may often make poor assumptions. You may disagree with me, and I would love more examples of work in this space that prove me wrong, to hear arguments for why our community should *not* be doing more work or trying to design for these problems, or to hear arguments why other issues I have overlooked are more pressing or important for us to address, and I look forward to the discussion at the workshop.


## Acknowledgments

My opinions on this topic have been shaped during research with Paul Resnick, Mark W. Newman, Sunny Consolvo, Margaret Morris, and Debra Lauterbach, as well as conversations with Eric Baumer, Dan Cosley, Jason Zietz, Andrew Miller, Erika Shehan Poole, Brook Sattler, participants in the Adult Immunization Toolkit Workshop, and members of Wellness Innovation and Interaction lab at CU-Boulder.


## References


[1] Ajzen I. 1991. The theory of planned behavior, *Organizational Behavior and Human Decision Processes* 50(2): 179–211.

[2] Baumer EPS, Silberman MS. 2011. When the Implication is Not to Design (Technology), *Proceedings of CHI 2011.*

[3] Bock BC, Marcus BH, Pinto BM, Forsyth LH. 2001. Maintenance of physical activity following an individualized motivationally tailored intervention, *Annals of Behavioral Medicine* 23(2): 79-87.

[4] Chen Y, Harper F Maxwell, Konstan J, Li, Sheri Xin. 2010. Social Comparisons and Contributions to Online Communities: A Field Experiment on MovieLens. *American Economic Review* 100(4): 1358-98.

[5] Cram P, Fenrick AM, Inadomi J, Cowen ME, Vijan S. 2003. The impact of a celebrity promotional campaign on the use of colon cancer screening: the Katie Couric effect, *Archives of Internal Medicine* 163(13):1601-5.

[6] Fishbein M. and Ajzen I. 1975. *Belief, attitude, intention, and behavior: An introduction to theory and research.* Reading, MA: Addison-Wesley.

[7] Fogg BJ. 2002. *Persuasive Technology: Using Computers to Change What We Think and Do.* Morgan Kaufmann.

[8] Hansen D and Johnson C. 2012. Veiled Viral Marketing: Disseminating Information on Stigmatized Illnesses via Social Networking Sites,


[3] Despite hearing this from several researchers, I haven't been able to find a diary study that has good post-intervention data (i.e., not measurements immediately after the intervention but measurements with follow ups a year or more later). I feel like this should exist, so if anyone has any pointers, I'd be most grateful.

*Proceedings of the 2nd ACM SIGHIT International Health Informatics Symposium*.

[9] Harland J, White M, Drinkwater C, Chinn D, Farr L, Howel D. 1999. The Newcastle exercise project: a randomised controlled trial of methods to promote physical activity in primary care, *BMJ* 319: 829-832.

[10] Johnson DR, Nichol KL, Lipczynski K. 2008. Barriers to Adult Immunization, *American Journal of Medicine* 121(7B): 528-535.

[11] Moore SM, Charvat JM, Gordon NH, Roberts BL, Pashkow F, Ribisl P, Rocco M. 2006. Effects of a CHANGE intervention to increase exercise maintenance following cardiac events, *Annals of Behavioral Medicine* 31(1): 53-62.

[12] Munson SA, Consolvo S. 2012. Exploring Goal-setting, Rewards, Self-monitoring, and Sharing to Motivate Physical Activity, *Pervasive Health* 2012.

[13] Munson SA, Lauterbach D, Newman MW, Resnick P. 2010. Happier Together: Integrating a Wellness Application Into a Social Network Site, *Persuasive* 2010.

[14] Rothman AJ, Sheeran P, Wood W. 2009. Reflective and Automatic Processes in the Initiation and Maintenance of Dietary Change, *Annals of Behavioral Medicine* 38(S1): S4-S17.

[15] Purpura S, Schwanda V, Williams K, Stubler W, Sengers P. 2011. it4Life: The Design of a Persuasive Technology Promoting Healthy Behavior and Ideal Weight, *Proceedings of ACM CHI 2011.*

[16] Rosenstock IM. 1966. Why people use health services, *Milbank Memorial Fund Quarterly* 44 (3): 94–127.

[17] Schultz PW, Nolan JM, Cialdini RB, Goldstein NJ, Griskevicius V. 2007. The Constructive, Destructive, and Reconstructive Power of Social Norms, *Psychological Science* 18(5): 429-434.

[18] Schwanda V, Ibara S, Reynolds L, Cosley D. 2011. Side effects and 'gateway' tools: advocating a broader look at evaluating persuasive systems, *Proceedings of the ACM Conference on Human Factors in Computing Systems*.

[19] Sheng J, Croson R. 2009. A Field Experiment in Charitable Contribution: The Impact of Social Information on the Voluntary Provision of Public Goods, *The Economic Journal* 119(540): 1422-1439.

[20] Verplanken B. 2010. Beyond Frequency: Habit as Mental Construct, *British Journal of Social Psychology* 45(3): 639-656.