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SYMPOSIUM

Celebratory Health Technology

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Abstract

There are numerous everyday health technologies (applications designed for people to use in their daily lives) that promote healthy eating habits. From educational games to monitoring applications, these systems often take a corrective approach in that they are designed to fix the problematic aspects of people's interactions with, and thoughts about, food. We propose a complementary approach, termed *celebratory health technology* design, in which systems promote healthy eating by highlighting positive food interactions, meanings, and values. We present a case study from our research to show the benefit and feasibility of designing celebratory health applications. Our goal is to encourage a more comprehensive approach to everyday health technology design, one that encompasses not only corrective systems, but celebratory applications as well.

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Introduction

The relationship between people and food is multifaceted. Food brings friends and families together and helps form bonds among work colleagues, but it is often also the source of health problems. Researchers have shown that information and communication technologies (ICTs) can productively encourage a range of positive health behaviors.[1–4] Indeed, a growing number of *everyday health technologies* (ICTs designed for people to use in their daily lives) are being developed commercially, in research laboratories, and as a part of national campaigns.[1–4] Interventions leveraging such technologies have improved users' dietary behaviors, for example, increasing their fruit, vegetable, and water intake.[3,5] Everyday health technologies are useful because, for example, they have a unique ability to present information in a way that is engaging and even entertaining.[5] Furthermore, computational platforms such as cell phones, laptops, and digital displays are becoming pervasive.[6] Leveraging these ubiquitous devices is a particularly effective way of providing users with timely, contextually relevant support to engage in healthy behaviors and decision making.[7] The uptake in health system development leads us to argue that now is the time to ensure that everyday health technologies reflect the breadth and depth of human experiences around food.

In this article, we examine one genre of such technologies: those that encourage healthy eating habits. What we find is that many applications are *corrective technologies* that encourage wellness by attempting to fix users' diet-

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related behaviors, attitudes, and thinking. While this has been an effective approach,[3,8,9] we suggest that the design of *celebratory health technologies*—applications that explicitly focus on the positive aspects of individuals' thoughts, actions, and values around food—is a complementary approach worth examining because of the unique opportunities it affords for engaging users and providing support for healthy eating.

We begin by describing previous work focused on corrective health technology and then discuss the concept of celebratory health technology. We then present a case study for designing celebratory ICTs from our own research and conclude with recommendations for an everyday health technology research agenda that embraces both corrective and celebratory systems.

Corrective Health Technology

Rates of diet-related health issues such as obesity are on the rise.[10] Accordingly, researchers have advocated interventions that improve the dietary practices of the general population as well as specific subpopulations, such as children and cultural groups, that are experiencing disproportionate health problems.[11,12] Consequently, many researchers have designed corrective health technologies that seek to improve individuals' eating habits by exposing or fixing problems with nutrition behaviors or attitudes.[13] Many of these systems fall into one of three classes: games, applications that support reflection, and applications that provide feedback to users about their current behaviors.

Educational health games facilitate learning through role playing and simulation (e.g., allowing players to explore behavioral alternatives and their consequences[14]) or more directly through trivia-based designs.[4,15,16] Many games have been targeted at children, teaching general nutrition facts and focusing on topics such as the importance of calcium consumption and diabetes management.[5,8,15,17] In clinical trials, researchers have shown that educational health games can improve important outcomes such as players' self-management of their disease, self-efficacy, and fruit and vegetable intake.[5,8] These games address a problem —a lack of healthy eating knowledge—and take a corrective approach by disseminating information through game play.

Other applications monitor nutrition-related behaviors to help people reflect on their current practices and identify areas for improvement. For example, electronic food journals provide databases of nutrition information that individuals can use to complete online logs (e.g., Reference 18). Other systems allow people to maintain food journals by using their personal digital assistant to scan the barcodes of foods.[19] The Mahi system (composed of a networked camera-enabled cell phone and blood glucose meter) helps diabetes patients manage their disease more effectively by reflecting on glucose readings and photos of meals.[3] Indeed, Mamykina and colleagues[3] found that this system helped improve the user's locus of control with respect to their disease. Other exploratory research has taken initial steps to augment dining room tables, cutting boards, kitchen knives, and even people's bodies to detect and record the foods that they prepare and consume.[20–22] All of these monitoring systems are based on the premise that people currently engage in suboptimal behaviors. Increasing awareness of those problematic choices, it is assumed, will help individuals make appropriate changes.

Other monitoring applications not only support reflection but also provide a critique of individuals' eating behaviors. For example, the Personal Nutrition Assistant and HyperFit systems are Web-based electronic food journals that provide nutritional breakdowns of each recorded meal and an indication of how a user is progressing toward their goals.[23,24] Mankoff and associates[25] developed an application that uses grocery store receipts to determine a user's purchases and provide recommendations for healthier future selections. Chi and coworkers[26] used sensors to detect what users were cooking (e.g., chopping bacon) and provide nutrient information about the ingredients to encourage better choices (e.g., reducing the fat content by using less bacon). These applications attempt to correct behavior by providing assessments of current practices and alternate suggestions for the future.

Corrective technologies play an important role in health promotion, as there are many eating practices that are not ideal. However, by taking a primarily corrective approach, designers run the risk of neglecting many other positive food experiences and subsequently passing over a range of potential system design concepts. This is an important consequence to consider, because such concepts may uniquely engage users by celebrating the aspects of food (and interactions with and around it) that people enjoy, value, and cherish.

Celebratory Health Technology

Researchers have found that, when addressing nutrition-related issues, it is critical to understand the ways in which people find value and meaning in food.[27,28] In this

section, we first discuss some of the positive meanings of food and its associated practices. Next, we introduce the concept of celebratory health technology.

Positive Food Practices, Meanings, and Values

Social science studies of eating provide insight into the positive aspects of people's relationship with food, including the way in which it helps people establish and convey their identity and the way it stimulates emotional responses. For example, some people express their identity as a creative person by exploring exotic tastes and ingredients.[29] In addition to being creative endeavors, meals are also one way in which people build up what it means to be a part of a family.[30] Families often have established eating patterns (e.g., when and what meals are eaten), and these norms help define their identity. Furthermore, by establishing traditions and routines and determining what foods are eaten and valued, families distinguish themselves from one another.

Touching, tasting, preparing, and smelling foods can evoke positive emotional responses such as feelings of relaxation, pleasure, and nostalgia.[29] For example, the physical actions that go into preparing meals, such as the motion of kneading dough or chopping vegetables, are part of what can make cooking relaxing.[31] Intimate conversations with friends and family while preparing meals can further diffuse the stresses of the day.[31] By embodying past experiences, foods can also be symbolically meaningful. When one smells the aroma of a familiar dish, memories of childhood experiences can come to mind quickly; for example, the smell of a particular dish may remind someone of cooking with their family as a child. These memories can engender warm feelings of nostalgia. Much of the food that people value from their past is some form of *comfort food*, delicacies that stir up positive, soothing emotions.[31] Features of the physical environment and the nature of the social interaction that surrounds the eating process can further contribute to feelings of pleasure.[32]

These are just a few ways that food and associated activities have a positive place in people's lives. Only since the 1990s have social science researchers fully appreciated the complexity and richness of people's relationship with food. This is partly because food was considered a mundane and routine part of people's lives.[33] Yet the way in which food often fades into the background is in itself an interesting phenomenon to examine. It is in many of these unconscious routines that people exhibit their ability to negotiate food selection, preparation, and consumption with ease. Because food decisions often go forward without much consideration, many researchers have developed personal technologies that support reflection on eating habits. These tools typically help people identify when they are engaging in negative behaviors.[3,25] Yet we argue that sometimes people's routines also contain practices that are positive and that it may be beneficial for systems to focus more intently on bringing those positive behaviors to light.

Defining Celebratory Health Technology

Identifying the unproblematic aspects of individuals' interactions with food comes from examining successes in action and the ways in which current practices are valued. What would it mean to focus the design of everyday health applications on some of these successes and values? Health technologies should, of course, always focus on helping people achieve increased wellness. However, we distinguish celebratory health technology as applications that promote wellness by providing functionality that highlights the positive aspects of people's interactions with food, as well as the meaningful emotions, thoughts, and experiences that people have with and through food. Thus the technology designer must go out of his or her way to identify the positive food-related values and practices of potential end users. In so doing, the goals of the system turn from being about fixing, ameliorating, and reversing to facilitating, emphasizing, and augmenting behaviors and values (see **Figure 1**). Celebratory health technologies should spur users onto healthier lifestyles as they provide new ways of experiencing valued behaviors and expressing valued attitudes.

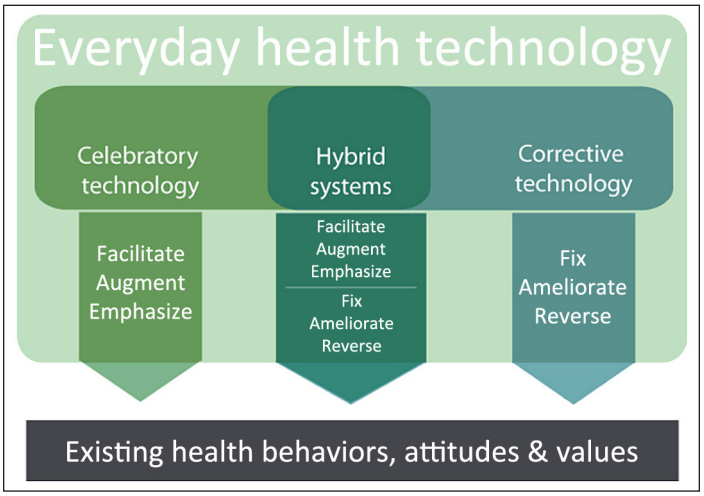

Figure 1. Everyday health technology design encompasses corrective, celebratory, and hybrid approaches. Each approach differs in how it treats existing health behaviors, attitudes, and values, but all share the goal of helping users move toward increased wellness.

Positive psychology provides further motivation for a celebratory health technology research agenda. This area of psychological study urges, when trying to characterize or explain human behavior, a focus on human virtues and strengths rather than taking a simply problem-focused approach. Psychologists assert that this is a critical endeavor because such positive characteristics are a fundamental and beneficial part of human life.[34] Indeed, positive emotions can help people develop a valuable collection of psychological, social, and intellectual resources.[35] For example, take the positive feelings of joy and pride. Joy has been shown to lead to increased feelings of creativity, and pride helps people to imagine having greater achievements in the future.[35] If a person were to feel joy in their experience of shopping in the supermarket, this could lead them to feel more adventurous in their preparation of healthy dishes. Pride in the successful preparation of that dish may increase the person's self-efficacy, giving him confidence in his ability to prepare healthy foods in the future. Technologies that focus in on those positive emotions and experiences, and help users to see their value, have the opportunity to encourage healthy behaviors in ways that are fundamentally different than when taking a corrective approach. It follows then that, when designing technologies that people will use to manage a foundational aspect of their lives (food), it is critical to understand and incorporate into system design an appreciation for such positive emotions and behaviors. Doing so may help users gain an important set of resources for managing their health.

Medical research has also documented the importance of understanding the positive aspects of food, including its personal, familial, and cultural significance.[28] As health technology designers, we must further understand this significance because it can affect how people will respond to an application that attempts to modify how and what they eat. Systems that mesh with food-related values may better engage users, because the system functionality will resonate with the things they enjoy about food. By targeting this enjoyment, designers can create health promotion systems that are more appealing to end users and consequently used more. Indeed, understanding human desires and values is a critical aspect of designing effective ICTs in general.[36]

Furthermore, because people express their identity through their food-related practices, understanding this process of identity construction is critical for the success of future applications. This is especially true because everyday health technologies become embedded into people's lives through their use, and as such, they will inevitably interact with users' values and notions of identity. A mismatch between system functionality and the user's conception of their food-related identity may reduce the likelihood of system use and acceptance. For example, a female user who perceives herself as creative because of the exotic dishes that she dreams up, may not respond well to a corrective system that critiques her eating behaviors and suggests healthier recipes that are mainstream or unimaginative. Instead, such a user may respond more favorably to a system that acknowledges her creativity and encourages her to eat healthier by presenting a list of healthy, yet adventurous ingredients that can form the basis of a healthy meal that she develops herself.

Case Study: EatWell

We now describe how we explored the design of celebratory health technologies through the development and evaluation of the EatWell system, which addresses diet-related health disparities in low-income African American communities.[37–39] In low-income communities, there are numerous barriers to eating well, including an abundance of fast food restaurants and limited access to quality, inexpensive groceries.[40] EatWell allows members of local communities to share stories describing how they have tried to eat healthfully. As such, users are encouraged to make healthier decisions by learning from the experiences of others.

The system works as follows. People use their cell phones to dial the EatWell phone number. They are then connected to our system, which plays an audio prompt inviting them to record short audio clips describing how they have tried to eat well in their community (e.g., at local restaurants and grocery stores). People can also listen to the clips created by other users. The EatWell design was motivated by our formative work in which we found that, while there are healthy eating challenges in low-income communities, people often have effective strategies in spite of these obstacles. Thus EatWell is celebratory because it acknowledges that people have positive stories to tell about how they have been successful at eating nutritious foods. Furthermore, EatWell's functionality celebrates the community's success by providing a platform through which people can share their stories, making the stories accessible to a broader audience and thereby magnifying their potential impact.

We conducted an in-depth, 3-week pilot study with 12 participants to gain an initial sense of EatWell's impact

on people living in Atlanta, GA.[38] Our participants shared stories about a range of experiences. For example, a young man described his excitement about a healthier option that he tried at a local fast food restaurant (a veggie burger), and a mother recounted how she successfully prepared a new vegetarian dish that was a hit with her daughter. We found that participants enjoyed using EatWell and were happy to have a platform to share their ideas and experiences. Users learned new healthy eating ideas, and listening to the EatWell stories led some to try new foods. Interestingly, we also found that EatWell helped participants gain a sense of empowerment and encouragement, as they saw that there were other community members who were eating healthfully. In an underprivileged community that is often characterized in terms of its health challenges, this celebratory application provided a sense of hope. Thus, by highlighting the positive ways in which people were managing their dietary habits and allowing users to share their stories of success, EatWell showed initial signs of encouraging users toward increased wellness.

Concluding Remarks

Both celebratory and corrective health technologies have the same goal: to increase and promote wellness in the lives of system users. However, they differ in terms of the functionality that allows them to reach this goal. We argue that it is important to design corrective *and* celebratory health technologies but that the latter has received less focus. Taking a celebratory approach will yield a different type of design, and it is critical that future work compare the impact, drawbacks, and benefits of celebratory and corrective designs. A health technology research agenda that embraces both design perspectives will yield a richer set of applications that, together, can improve health in diverse ways. Indeed, creating applications that both correct and celebrate may make the road to wellness more appealing for end users as they see the range of their concerns, values, and practices around food being reflected in technology design.

One challenge to designing celebratory health applications is that, by focusing on the positive aspects of a person's health, a system may give users a false sense of security, leading them to feel that there is nothing about their behavior that needs to be improved. This issue could be addressed by designing the system so that it is clear that it is focusing on a subset of the users' behaviors. Furthermore, systems can take a hybrid approach, incorporating both corrective and celebratory features. Our goal in presenting the celebratory design perspective is to push the boundaries of everyday health technology design. Celebratory technology represents the extreme opposite of corrective technology, and by identifying it, we lay out the boundaries for the health technology space. We encourage future work to investigate and further characterize the design space that lies between these boundaries.

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References:

1. Apps for Healthy Kids. http://www.appsforhealthykids.com/.
2. Baranowski T, Baranowski J, Cullen KW, Marsh T, Islam N, Zakeri I, Honess-Morreale L, deMoor C. Squire's Quest! Dietary outcome evaluation of a multimedia game. Am J Prev Med. 2003;24(1): 52–61.
3. Mamykina L, Mynatt E, Davidson P, Greenblatt D. MAHI: investigation of social scaffolding for reflective thinking in diabetes management. In: Proceedings of the 26th Annual SIGCHI Conference on Human Factors in Computing Systems; Florence, Italy, April 05–10, 2008; Chi '08. New York: ACM; 2008, 477–86.
4. Silk KJ, Sherry J, Winn B, Keesecker N, Horodynski MA, Sayir A. Increasing nutrition literacy: testing the effectiveness of print, web site, and game modalities. J Nutr Educ Behav. 2008;40(1):3–10.
5. Baranowski T, Buday R, Thompson DI, Baranowski J. Playing for real: video games and stories for health-related behavior change. Am J Prev Med. 2008;34(1):74–82.
6. Abowd GD, Mynatt ED. Charting past, present, and future research in ubiquitous computing. ACM Trans Comput Hum Interact. 2000;7(1):29–58.
7. Intille SS. A new research challenge: persuasive technology to motivate healthy aging. IEEE Trans Inf Technol Biomed. 2004;8(3):235–7.
8. Brown SJ, Lieberman DA, Germeny BA, Fan YC, Wilson DM, Pasta DJ. Educational video game for juvenile diabetes care: Results of a controlled trial. Med Inform (Lond). 1997;22(1):77–89.
9. Grimes A, Kantroo V, Grinter RE. Let's play!: mobile health games for adults. Presented at: Ubicomp'10. Copenhagen: ACM; 2010, 241–50.
10. Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among US adults, 1999-2000. JAMA. 2002;288(14):1723–7.
11. Ebbeling CB, Pawlak DB, Ludwig DS. Childhood obesity: public-health crisis, common sense cure. Lancet. 2002;360(9331):473–82.
12. Karanja N, Stevens VJ, Hollis JF, Kumanyika SK. Steps to soulful living (steps): a weight loss program for African-American women. Ethn Dis. 2002;12(3):363–71.

13. Grimes A, Harper R. Celebratory technology: new directions for food research in HCI. In: Proceedings of the 26th Annual SIGCHI Conference on Human Factors in Computing Systems; Florence, Italy, April 05–10, 2008; Chi '08. New York: ACM; 2008, 467–76.

14. Paperny DM, Starn JR. Adolescent pregnancy prevention by health education computer games: computer-assisted instruction of knowledge and attitudes. Pediactrics. 1989;83(5):742–52.

15. Mansour A, Barve M, Bhat S, Do EY. MunchCrunch: a game to learn healthy-eating heuristics. In: Proceedings of the 8th International Conference on Interaction Design and Children, IDC'09. New York: ACM; 2009, 166–9.

16. Turnin MC, Tauber MT, Couvaras O, Jouret B, Bolzonella C, Bourgeois O, Buisson JC, Fabre D, Cance-Rouzaud A, Tauber JP, Hanaire-Broutin H. Evaluation of microcomputer nutritional teaching games in 1,876 children at school. Diabetes Metab. 2001;27(4 Pt 1):459–64.

17. Milk Matters for Kids. *www.nichd.nih.gov/milk/kids/kidsteens.cfm*.

18. MyFoodDiary.com. *www.myfooddiary.com*.

19. Siek KA, Connelly KH, Rogers Y, Rohwer P, Lambert D, Welch JL. When do we eat? An evaluation of food items input into an electronic food monitoring application. In: Pervasive Healthcare 2006, Proceedings of the 1st International ICST Conference on Pervasive Computing Technologies for Healthcare. 2006, 1–10.

20. Amft O, Tröster G. Recognition of dietary activity events using on-body sensors. Artif Intell Med. 2008;42(2): 121–36.

21. Chang K, Liu SY, Chu H, Hsu J, Chen C, Lin T, Chen C, Huang P. The diet-aware dining table: observing dietary behaviors over a tabletop surface. In: Fishkin KP, Schiele B, Nixon P, Quigley A, eds. Pervasive computing. Proceedings of the 4th International Conference, Pervasive 2006, Dublin, Ireland, May 2006. Berlin: Springer-Verlag; 2006, 366–82.

22. Kranz M, Schmidt A, Rusu RB, Maldonado A, Beetz M, Hörlner B, Rigoll G. Sensing technologies and the player middleware for context awareness in kitchen environments. In: Proceedings of the 4th International Conference on Networked Sensing Systems, June 6–7, 2007, INSS '07. Braunschweig: IEEE; 2007, 179–86.

23. Beidler J, Insogna A, Cappobianco N, Bi Y, Borja M. The PNA project. J Comput Sci Colleg. 2001;16(4):276–84.

24. Järvinen P, Järvinen TH, Lähteenmäki L, Södergård C. HyperFit: hybrid media in personal nutrition and exercise management. In: Proceedings of the 2nd International Conference on Pervasive Computing Technologies for Healthcare, 2008.

25. Mankoff J, Hsieh G, Hung H, Lee S, Nitao E. Using low-cost sensing to support nutritional awareness. Ubiquitous Comput. 2002;2498:371–8.

26. Chi PY, Chen JH, Chu HH, Chen BY. Enabling nutrition-aware cooking in a smart kitchen. In: Proceedings of CHI '07 Extended Abstracts on Human Factors in Computing Systems. New York: ACM; 2007, 2333–8.

27. James DC. Factors influencing food choices, dietary intake, and nutrition-related attitudes among African Americans: application of a culturally sensitive model. Ethn Health 2004;9(4):349–67.

28. Robinson T. Applying the socio-ecological model to improving fruit and vegetable intake among low-income African Americans. J Community Health 2008;33(6):395–406.

29. Lupton D. Food, the body and the self. London: SAGE; 1996.

30. Charles N, Kerr M. Women, food and families. Manchester: Manchester University Press; 1988.

31. Locher JL, Yoels WC, Maurer D, van Ells J. Comfort foods: an exploratory journey into the social and emotional significance of food. Food Foodways, 2005;13(4):273–97.

32. Macht M, Meininger J, Roth J. The pleasures of eating: a qualitative analysis. J Happiness Studies. 2005;6(2):137–60.

33. Warde A, Hetherington K. English households and routine food practices: a research note. Sociol Rev. 1994;42(4):758–78.

34. Sheldon KM, King L. Why positive psychology is necessary. Am Psychol. 2001;56(3):216–7.

35. Fredrickson BL. The role of positive emotions in positive psychology. The broaden-and-build theory of positive emotions. Am Psychol. 2001;56(3):218–26.

36. Friedman B, Freier NG. Value sensitive design. In: Fisher KE, Erdelez S, McKechnie EF, eds. Theories of information behavior: a researcher's guide. Medford: Information Today; 2005, 368–72.

37. Grimes A. Sharing personal reflections on health locally. In: Willis KS, Roussos G, Chorianopoulos K, Struppek M, eds. Shared encounters. London: Springer-Verlag; 2009.

38. Grimes A, Bednar M, Bolter JD, Grinter RE. EatWell: sharing nutrition-related memories in a low-income community. In: Proceedings of the 2008 ACM Conference on Computer Supported Cooperative Work, CSCW '08. New York: ACM; 2008, 87–96.

39. Grimes A, Landry BM, Grinter RE. Characteristics of shared health reflections in a local community. In: Proceedings of the 2010 ACM Conference on Computer Supported Cooperative Work, CSCW '10. New York: AMC; 2010, 435–44.

40. Horowitz CR, Colson KA, Hebert PL, Lancaster K. Barriers to buying healthy foods for people with diabetes: evidence of environmental disparities. Am J Public Health. 2004;94(9):1549–54.