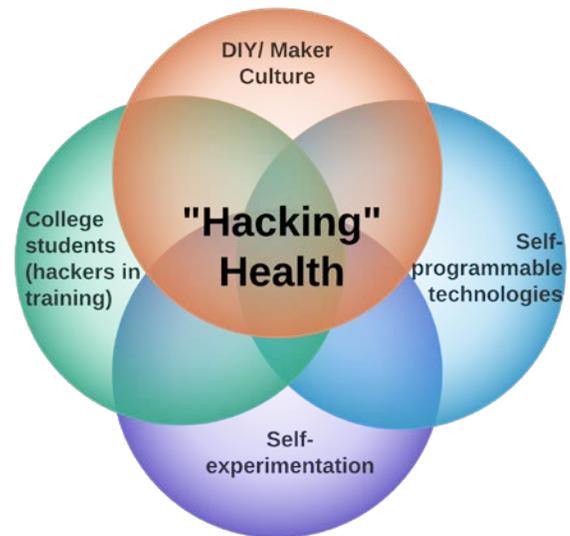


Hacking for Health: A Strategy for Fostering a Culture of Health in College

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The college years are a critical transition arena in a person's life; moving from adolescence to emerging adulthood, independence, and ideally becoming a healthy productive citizen. Since the college years are so important for setting the stage for life, it is surprising that current college culture largely emphasizes a relatively imbalanced lifestyle. As suggested in the solicitation for the workshop, it appears that many students often place primary emphasis on academic excellence in pursuit of successful careers; secondary emphasis on the development of strong social bonds and relationships if there is time, and often little else after that. This is problematic as the life skills involved in being a healthy and productive contributor to society often require far more skills such as knowing how to live a healthy lifestyle. *The purpose of this vision paper is to articulate a strategy of "hacking for health" for fostering a culture of health that better preps college students for being healthy, productive citizens.* Prior to discussing the solution, a discussion of the problem is warranted.

A central assumption of this paper is that health is essential for supporting a person's life pursuits (e.g., career, getting married, financial independence, strong social relationships) but that for most, health is largely a background "infrastructure" issue that is not thought about until there is a problem. Much like how individuals only think about the power grid, roadways, and other societal infrastructure when something goes wrong, so to it is for health. Further, just like how regular maintenance can enable effective long-term use of societal infrastructure (e.g., regularly repaving roads), so to can regular "maintenance" behaviors (e.g., regular physical activity, healthful eating, regular brushing/flossing of teeth, regular sleep, use of sun screen, engaging in activities that support "meaning-making" for improved mental and social health) keep the infrastructure of health strong. Unfortunately, maintenance is often repeatedly put off as other seemingly more important issues emerge and take precedence (e.g., for societal infrastructure, funding for education or for retiree pensions instead of repairing the roads; for health, cramming for a test rather than sleeping or exercising).



If this "health as infrastructure" assumption is true, it has important implications for the development of strategies for supporting health, particularly among college students as they are most likely to "put off" any focus on infrastructure for another time. Likely most important is the acknowledgement that many life pursuits like a career will take priority over health maintenance behaviors by definition because the health behaviors are often only meant to support the higher-level life pursuits. Based on this, rational arguments that emphasize the distal benefits of maintenance behaviors, even if linked with enabling more impactful life pursuits in the long-run, will likely not be particularly impactful for most. Second, the infrastructure analogy suggests that "quick fix" intervention strategies (e.g., 12 week training programs) will most likely not result in sustained maintenance behaviors for most as the higher-level life pursuits will re-establish their prominence as a priority and thus the "fix" will fade. This has been shown repeatedly in health behavioral research, thus providing some empirical evidence to support the infrastructure assumption. Third, the infrastructure analogy implies that health is not something that can be "boiled down" into a checklist of single activities but instead, involves a dynamic balancing act of priorities that enable the life pursuits. Just like how regular maintenance in cities often involves rotating through the various priorities based on resource constraints, health maintenance behaviors can likely be thought of as a dynamic balancing act for enabling present-day and long-term life pursuits based on current resource constraints, particularly time. For example, eating a hamburger and fries with friends might not be an inherently unhealthy act if the interactions strengthen a sense of being part of a community and purpose and if the person adjusts their eating behaviors later on to balance out for the extra calories and nutrient-light food.

Based on this concept of health as infrastructure, the question then becomes, "what are strategies that appear to enable effective maintenance of infrastructure?" A plausible albeit ambitious strategy that is implied by the Robert Wood Johnson Foundation's purpose statement is to work towards fostering a culture of health. While the visionary statement of a culture of health can be defined in a variety of ways, one plausible way of thinking about it is to make health maintenance behaviors THE normal. It also suggests that health would be something that would be recognized as embedded and, like infrastructure, enable the broader life pursuits

valued in a culture. Finally, it also points to more slowly pursued strategies for slowly shifting thinking, understanding, and ultimately norms towards more effective health maintenance as normal.

For college students, one strategy may be to empower students to actively craft the future culture of health that would work for them in terms of balancing their higher level life pursuits while also establishing health maintenance behaviors as “normal.” The maker movement – which is a cultural movement that invites amateurs and hobbyists to creatively make “things” with emerging self-programmable tools such as Arduino microcontrollers, 3d printers, and other self-programmable technologies – is a logical cultural movement for building a culture of health that might be particularly impactful among college students. Specifically, the maker movement establishes individuals/hobbyists in control of what will be created and for whom. This fits nicely as it empowers individuals to not simply use the solutions created for them by “experts” but empower them to create their own solutions. Second, often in maker culture, there is an interest in making things that could be useful for others, which could be valuable for future career pursuits as it might enable a student to engage in entrepreneurial pursuits based on their interests. That said, it is often the case that individuals are the first test subjects for anything made. As such, there is an active embrace in building things for others but also “dog fooding” (as is labeled at Google) the solutions to oneself. This type of action, particularly if it could be directed towards facilitating good health infrastructure, could be a powerful mechanism for fostering the broader culture of health that also fits with student’s goals of developing skills that would be useful for a career. Third, making things with new and emerging technologies fits well within an academic culture as individuals can learn through doing. This is important as professors could create curricula that would enable individuals to make health solutions for themselves in their classes and thus allow students to achieve academic success while improving their own health at the same time. Not only this, but it is becoming increasingly common for universities to have “hacker spaces” that enable individuals to make things. As such, a college campus is an ideal environment that already has many of the resources required to support this type of change.

From a technical standpoint, the “hacking for health” solution (see Figure 1) requires the development of curricula that establish a culture of health as an underlying “infrastructure” issue that could be discussed in classes and further enabled through tools that enable easy prototyping and sharing of health maintenance behavior intervention strategies for supporting hacking. From a curriculum standpoint, this could involve any type of projects-based-learning that would have a student learn a new skill but in the pursuit of fostering healthier living (thus moving it from an infrastructure issue to one that is also fulfilling a higher-level life pursuit). This could fit into a wide range of subjects beyond just health including engineering, computer science, and others. The tools that could enable this could be ubiquitous computing strategies, such as self-programmable sensors and feedback systems. In collaboration with Dr. Winslow Burleson at NYU, we have been working on developing a “DIY Self-Experimentation Toolkit” to enable this sort of self-hacking. Our DIY toolkit includes a “design support tool,” which is basically a simplified curriculum that teaches individuals a basic process of self-experimentation while also providing prompts for some of the most common behavior change techniques often used in evidence-based interventions. As a complement to this, individuals are also provided the Game as Life, Life as Game (GaLLaG) system, which is a low-cost self-programmable sensing and feedback system that can easily be incorporated into homes to support individuals in the creation of technology-supported solutions to help them achieve their self-chosen health maintenance behaviors (e.g., sleep better, floss more). A complementary tool for supporting prototyping of intervention ideas is the system developed by Bob Evans at Google, called Paco. In our lab, we have been actively working with Mr. Evans to establish the system architecture of Paco to support the creation of mHealth “just in time adaptive interventions” (JITAs). JITAs are a new class of behavioral interventions that provide support for behavior change to an individual whenever, wherever, and however it would be most beneficial for each individual. The Paco system, which was originally design to support self-programming of ecological momentary assessment measures, now supports the easy self-programming of JITAs. These are but two examples of the sorts of “hacking for health” technical tools that could be incorporated into college curricula and would enable a DIY culture of health within a college campus.

In terms of my credentials beyond the projects already mentioned, my PhD is in clinical health psychology from Rutgers University and I am an Assistant Professor at Arizona State University in the School of Nutrition and Health Promotion. My research broadly focuses on designing and evaluating mHealth behavioral interventions, with a particular focus on physical activity, largely due to the sophistication of measurement of that behavior. I completed my postdoctoral training at Stanford and there was the project manager on an NIH-funded project focused on developing and testing mHealth interventions. Since arriving at ASU, I have been developing further skills in applying methods and practices from disciplines outside of psychology (e.g., control systems engineering, human-computer interaction) to the development of mHealth interventions.