There Are Thousands of Apps for That: Navigating Mobile Technology for Nutrition Education and Behavior

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ABSTRACT

Mobile health (mHealth) is an emerging field devoted to the use of mobile and wireless devices to affect health outcomes, health care services, and health research. Despite great promise, little research has examined its effectiveness. It is the authors' view that the full potential of mHealth has yet to be realized in research and practice. This Perspective article explores when and for whom mHealth approaches are effective, strengths and limitations of commercially and academically generated apps, research design considerations, and public–private partnerships. These topics have implications for researchers and practitioners who wish to advance the science and practice of mHealth.

Key Words: mHealth, mobile health, behavior change, dietary change, technology (*J Nutr Educ Behav*. 2016;48:213-218.)

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INTRODUCTION

Mobile health (mHealth) is an emerging field devoted to "the use of mobile and wireless devices to improve health outcomes, healthcare services and health research"[1] including short-message service (text messages), mobile software applications (apps), sensors, wearable devices, and other wireless monitors. As a key area of public health research and practice, mHealth emerged in response to the proliferation of mobile technologies and their ubiquitous uptake. Today, 90% of Americans own some kind of mobile device and nearly two thirds own a smartphone.[2] The increased prevalence of smartphone ownership is particularly evident among ethnic minorities; indeed, 71% of US Hispanic people and 70% of non-Hispanic black people own smartphones.[3] Similarly, lower-income populations are also high adopters; half of those living in households earning < $30,000 annually own smartphones.[4] Since the 2007 release of the iPhone and the subsequent launch of the App Store in 2008, the use and uptake of smartphones and their apps have exploded. The market boasts apps for a range of devices and operating systems, most notably Android (1.5 million apps), Windows (300,000 apps), and Apple (1.4 million apps).[5,6] Among these are tens of thousands of health and fitness apps, including those that target nutrition and dietary behaviors.

In 1 month, about 46 million US adults—one third of all smartphone owners—use a health or fitness app, including nutrition apps.[7] A variety of apps allow users to track daily food intake and many also provide information about macronutrients and micronutrients. Others have been designed to help users find recipes matched to health risks and food sensitivities, create grocery lists, and engage in other aspects of meal planning. Whereas much of this technology still relies on self-report and user input, there is a movement toward integration with mobile phone camera features and other visual data capture devices to derive more objective data regarding dietary intake. On a larger scale, sensor technology is being used to assess food environments and can be employed to determine, for example, the effects of changes in food policy on the availability and accessibility of healthier food options.[8] The most popular nutrition-oriented standalone apps are Calorie Counter and Diet Tracker, both from MyFitnessPal, which had nearly 9 million users as of 2014.[7]

CURRENT ISSUE/ CONTROVERSY

Despite the great promise of mHealth, little rigorous research has examined the effectiveness of mHealth products or when, how, and for whom these commercially available technologies are likely to be most effective. In response to insufficient empirical evidence, many academics and practitioners have resorted to developing their own apps, often in the absence of multidisciplinary collaborations from fields such as human–computer interaction and user-centered design. The unfortunate result is an overwhelming majority of mHealth tools developed via traditional research

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methodologies and mechanisms that have been used only briefly and compulsorily by participants within the context of research studies. Because commercial and scientific efforts have evolved largely in parallel, to date, the field of mHealth has not been able to live up to the public health promise these technologies afford.

It is the authors' view that the question of whether and how mHealth can affect health behavior—particularly, dietary behavior—cannot be answered by building another app, but rather by understanding that the best app or technology-based approach for dietary behavior change is relative, and the full potential of these technologies has yet to be realized in both research and practice.

DISCUSSION

Choosing an App

Both the proliferation of available technologies and the lack of rigorous scientific evaluation of commercially available apps have made it difficult for researchers, practitioners, and end users to determine the most appropriate app or set of apps to use. To further complicate matters, in the area of nutrition tracking, apps use different databases for calculating caloric, macronutrient, and micronutrient information. Thus, it is often difficult to compare apps, and commercial entities are often unwilling or unable to share the proprietary information on which their apps are built, including nutrition databases. In the area of nutrition intervention, there is a dearth of scientific research that has rigorously evaluated whether, how, and for whom these apps work to elicit desired behavior change. Furthermore, although there are often similarities between apps—particularly focused on tracking—there are often key differences, including the ways in which nutrition information is presented and when, whether, and how feedback is delivered to the user.

The past 5 years have seen an increase in peer-reviewed reports in which researchers identified samples of apps (typically from the iTunes or Android app stores) targeting diet or physical activity behaviors and/or weight management, coded them based on a priori criteria, and then described and/or ranked apps based on the proportion of evidence-based or evidence-informed elements contained in them.[9-14] Across multiple criteria and reports, the majority of apps lacked evidence-based elements[10-12] or alignment with expert recommendations[9] and practices.[13] Many have interpreted the findings of these types of reviews as confirmation that commercially available apps do not work. However, it may be worth considering that whereas at face value these apps do not reflect best practices taken from intensive, in-person behavioral interventions, they may still operate on putative mediators known to be on the pathway to behavior change (eg, self-efficacy, internal motivation, readiness to change) and potentially health behavior. It is also possible, indeed likely, that the approaches and techniques that work best in technology-based interventions differ somewhat from those that have been demonstrated to be most efficacious in more traditional intervention modalities. For example, mHealth tools have the capacity to engage with users in real time in highly tailored ways, based on data from the user, including factors such as activity levels and geographic information system information. Furthermore, because users have different relationships with their mobile devices and different expectations about what those devices can deliver, apps can use gamification and other approaches not available to in-person interventions.

When and for Whom mHealth Is the Best Solution

The explosive development and uptake of mobile technology present the opportunity for unprecedented reach into populations typically not represented in traditional randomized clinical trials and who often do not access traditional clinical services. However, a the main criticism of mobile health is that although an overwhelming majority of US adults have smartphones and access to mHealth tools, the early adopters of these technologies have been those who already engage in the health behaviors targeted by these apps or are similarly uniquely motivated to track and log their health behaviors (see the Quantified Self movement[15]). Less is known about for people for whom technology-based interventions are likely to be particularly effective and how best to engage those individuals in such interventions. Although the so-called "digital divide" continues to narrow, older adults are still somewhat less likely to use smartphones and less likely to turn to technology for health advice and support[3]; at the same time, they are more likely to have multiple morbidities. Thus, what they need from an mHealth solution may be different from and more complex than that required for younger individuals.

It is also unclear when in the behavior change continuum mHealth solutions may be most effective. Randomized clinical trials often require participants to be in the contemplation or early action stages, using the Stages of Change typology. Although this is certainly beneficial for statistical power, the net result for science is an evidence base that is exclusively about those who are already near or on the path to change. Because mHealth offers interventions with a lighter touch that can be incorporated into an individual's daily routine, it may be that these types of interventions are particularly effective for engaging people who are in precontemplation or early contemplation stages of change and helping them to establish an understanding of their baseline behavioral patterns, to jump start broader behavior change. Alternatively, it may be that mHealth tools are optimal to facilitate or maintain health behaviors that are initiated via more traditional intervention modalities.

mHealth and Long-Term Behavior Change

Although not unique to mHealth interventions, the question of whether these technology-based tools facilitate long-term behavioral maintenance is also worth considering. The feasibility of mobile methods for diet and physical activity behavior change is well-established for short-term research