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INTRODUCTION

Special Issue on eHealth and mHealth: Challenges and Future Directions for Assessment, Treatment, and Dissemination

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Health care costs continue to escalate while considerable challenges remain to improve health outcomes. The United States, in particular, has the highest health care costs and the poorest health outcomes compared to other countries (Murray & Frenk, 2010; World Health Organization, 2012). However, there is an unprecedented opportunity to utilize technologies to prevent, assess, inform, and treat health behaviors across large segments of the population never before thought imaginable. This is now made possible by the ubiquity of the Internet and mobile phones across the life span and across ethnic and income groups (Borrelli, Bartlett, Tooley, Armitage, & Wearden, 2015; Duggan, 2013; Fox & Rainie, 2014; International Telecommunication Union, 2014; Pew Research Center, 2014; Smith, 2011).

"eHealth" generally refers to the use of information technology, including the Internet, digital gaming, virtual reality, and robotics, in the promotion, prevention, treatment, and maintenance of health. "mHealth" refers to mobile and wireless applications, including text messaging, apps, wearable devices, remote sensing, and the use of social media such as Facebook and Twitter, in the delivery of health related services. These two areas encompass the preponderance of growth and tend to be used as the umbrella terms for the explosion of research currently being conducted at the intersection of technology and health psychology.

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This special issue focuses on the role of eHealth/mHealth in Health Psychology. There are many benefits of eHealth and mHealth interventions including their availability and accessibility (use anywhere, anytime), cost-effective delivery, scalability, ability to personalize and tailor content, capability to provide real-time strategies to users in their everyday settings, and capacity to calibrate intervention intensity to user's needs (Kaplan & Stone, 2013). The proliferation of eHealth and mHealth has implications for the full spectrum of patient care, from prevention and health promotion through maintenance of health behavior change. eHealth and mHealth have implications for providers as well, in terms of their ability to interface with patients across a variety of platforms, ability to track patient change over time, receipt of anticipatory guidance in real time, and coordination of patient care across systems. Hospitals are also devising innovative ways to encourage eHealth and mHealth use. For example, a few hospitals have set up on-site digital health stores, in which patients, family members and medical professionals can learn about health apps and wearable devices and also purchase smartphone connected medical devices like weight scales and blood pressure cuffs (Comstock, 2015; Dolan, 2015). At one hospital in New Jersey (Dolan, 2015), physicians can now use a mobile app prescription pad that patients can take to the on-site store, where a member of the health IT team walks the patient through how to install and use the app. Whether or not these changes motivate and ultimately sustain behavior change remains an open question, but conceptually it makes sense to provide patients with interactive and individualized information during this period of heightened health awareness, when they might be more receptive to receiving this information (e.g., "teachable moment;" McBride, Emmons, & Lipkus, 2003).

Along with the many advantages of eHealth and mHealth technologies, there are also challenges, including the necessity for rigorous methods to help guide the development and evaluation of eHealth/mHealth interventions, the demand for sophisticated data-analytic processes to capture voluminous real-time data, the push for innovative interventions utilizing state-of-the-art technologies, and the need to address program specific issues such as user engagement with technologies over the short- and long-term. One key concern that has emerged is the lack of health behavior theory for most of the currently available technology-based interventions. For example, content

analyses of heath apps have shown low levels of integration of health behavior theory (Azar et al., 2013; Crane, Garnett, Brown, West, & Michie, 2015). Research suggests that health interventions designed around health behavior theory are more effective in changing behavior than those which are not (Noar & Zimmerman, 2005; Zakarian et al., 2004). Lack of theory based technology interventions not only reduces the likelihood that an intervention will be effective, but also limits the ability to better understand possible mechanisms of change. Although some programs have incorporated elements of theory, it is the rare case that all theoretical constructs within a particular theory are targeted (Hale, Capra, & Bauer, 2015), and that valid measures were of theoretical constructs are utilized. It may be that the existing theories need to be revised to incorporate both the limitations and constraints as well as the creativity and wide reach of these technologies.

Articles in the Special Issue

This special issue includes 11 articles that begin to address the need for more rigorous methodology, valid assessment, innovative interventions, and increased access to evidenced-based programs and interventions. Two articles focus predominately on theory testing; one paper tests a video game physical activity intervention with and without health behavior theory features (Peng, Pfeiffer, Winn, Lin, & Suton, 2015), whereas another utilizes multiple mediator analyses to examine the mechanisms of change of an Internet intervention that aims to improve work-related strain, including its effects on sleep (Ebert et al., 2015). A third paper integrates big data approaches, text analysis of online language, and psychological theory by testing whether future-oriented messages on Twitter are associated with lower HIV rates (Ireland, Schwartz, Ungar, Chen, & Albarracin, 2015).

The special issue also focuses on the development and optimization of intervention components. For example, several papers involve just-in-time adaptive interventions (JITAIs), an innovative framework for developing interventions that adapt over time based on the situation of the user and/or user response, resulting in the provision of real-time intervention delivery and tailored support (Klasnja et al., 2015; Nahum-Shani, Hekler, & Spruijt-Metz, 2015; Thomas & Bond, 2015). These studies articulate the range of functionality of JITAIs, offer ideas about how they can be best utilized to influence patterns of behavior, and describe methods for data analysis. Additionally, the results from the Thomas and Bond (2015) trial on reducing sedentary behavior in obese adults suggest how to design JITAIs for maximum effect. Microrandomized trials are also highlighted in the special issue as a method to optimize the delivery of the most effective intervention components by modeling the causal effects for individual intervention components. An article by Stavrakakis and colleagues (2015) reports on the importance of real-time data collection, suggesting that group level data may mask important individual effects when examining the relationship between mood and physical activity.

Two other articles focus on user engagement. One describes the acceptability and preliminary behavioral outcomes from a pilot randomized controlled trial of a Web-based indoor tanning intervention (Stapleton et al., 2015). The other study, by Graham, Papandonatos, Erar, and Stanton (2015), addresses the vexing problem of how to analyze the effects of user engagement on outcomes given self-selection biases. The authors examined automated tracking metrics from a smoking cessation Internet intervention, assessing the effects of passive engagement (e.g., reading forum posts, viewing member profiles) and active engagement (e.g., writing posts, sending messages) on smoking cessation, using novel analytic approaches (propensity modeling) to account for selection bias.

The issue also includes two randomized, controlled pilot studies; one is an Internet-based physical activity intervention for women with a family history of breast cancer (Hartman et al., 2015) and the other is a trial of bidirectional text messaging for ART adherence among substance users with HIV (Ingersoll et al., 2015). Both trials are good examples of careful formative research and targeting theoretical mediators during intervention implementation.

Overall, the issue covers a range of targeted health behaviors (smoking cessation, substance abuse, physical activity, tanning, sleep, stress, medication adherence), across a variety of populations (depressed patients, women at risk for breast cancer, obese adults, young adults, HIV+) using a mix of platforms (Web based, text messaging, twitter, gaming). This highlights the growing areas of interest and emerging research to readers of Health Psychology who are interested in eHealth and mHealth.

One issue that is not addressed by the articles in the special issue is the challenge of dissemination of eHealth and mHealth interventions, particularly for health psychologists, the majority of whom need to collaborate with industry to build and implement eHealth and mHealth interventions. Commercialization has only recently begun to be seen by academics as a viable form of dissemination with considerable potential for widespread population reach. The process of commercialization, however, depends on many external factors including identifying a team of people with specialized skills (e.g., business, marketing, sales, management, and economics), and rapidly securing significant financial commitments for start-up. There may be a steep learning curve for health psychologists, with numerous new terms to absorb (e.g., bootstrapping, capitalization rate, liquidity, value proposition), negotiations to navigate (e.g., licensing, intellectual property, royalties), and important decisions to be made, such as what functions, if any, to serve in a commercial entity, and how to manage conflicting interests and multiple roles. The "health psychologist/entrepreneur" may be forced to step down as principal investigator of current grants, unable to have any contact with study participants, restricted from handling any data and conducting any analyses, and required to include other faculty to oversee compliance to new rules to ensure study integrity with ongoing evaluations of research activities. Despite these adjustments and compromises, the success rate of new startup companies is low (Griffith, 2014). However, the desire and aspiration of seeing one's work come to fruition and be utilized by the target population in a significant and meaningful way—to be truly disseminated—may be worth the effort, energy, time and expense.

Conclusion

This special issue is intended to promote a discussion of eHealth and mHealth and its connection with health psychology. It is our hope

that the "bench to bookshelf" trajectory (Grimshaw, Eccles, Lavis, Hill, & Squires, 2012) that has plagued the majority of clinical research and treatment studies will not perpetuate with this new wave of eHealth and mHealth efforts. Creative methods are necessary to engage the target populations in the design, development, and implementation of these interventions. Innovative approaches are needed to promote cross-sector engagement for intervention adoption and sustainability. The realization that academicians and industry are dependent on one another's skills to achieve these goals has led to increased collaboration. The academics are working to decrease the time that is required to create and test eHealth/mHealth applications without losing scientific integrity, for example, through the use of new methods (Klasnja et al., 2015; Mohr et al., 2015; Nahum-Shani et al., 2015). The commercial side is working to increase scientific rigor by involving behavioral scientists in their development and evaluation process without slowing down the pace of innovation. This unified, transdisciplinary approach will result in effective theory-based, empirically validated, and engaging applications that result in improved health.

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