Chapter 11
Mobile Applications for Behavioral Change:
A Systematic Literature Review

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ABSTRACT

Access to the internet and the proliferation of mobile phones has resulted in a rising trend of mobile apps developed for disease self-management. This use of mobile health technology (mHealth) is viewed as an effective way to induce health behavior change. The authors conducted an evidence review of articles published in PubMed/Medline, Web of Science, and ACM Digital Library between January 2015 and January 2020 that developed and evaluated mHealth apps informed by behavior change theory. A total of 31 studies reviewed developed apps to encourage physical activity, dietary changes, diabetes, Alzheimer's disease, and others. The prevalent way of applying behavior theory to apps was through behavior change techniques (BCT) applied in 45% of the selected studies. Over 54% of the selected studies reported positive outcomes in inducing health behavior change. The results indicate that the use of behavior change theory to inform application design will result in statistically significant effects in improving health outcomes of a condition.

DOI: 10.4018/978-1-5225-6067-8.ch011

INTRODUCTION

The prevalence of chronic diseases is one of the biggest challenges to the future of healthcare. The World Health Organization (2009) (WHO) reports that the leading risk factors responsible for the cause of chronic diseases such as heart disease, cancer, and diabetes include high blood pressure (13%), tobacco use (9%) high blood glucose (6%), physical inactivity (6%), and obesity (5%). These risk factors are responsible for 44% of all global deaths (World Health Organization, 2009). Further, studies show that the prevalent mortality associated with chronic diseases correlates to non-adherence to medical regimen which has also been attributed to several factors including patient-related ones such as forgetfulness, psychosocial stress, anxieties, low motivation, and more (Currie et al., 2012; Sabaté & World Health Organization, 2003). Considering that only 50% of patients adhere to prescribed medication in developed economies and even less so in developing economies (Brown & Bussell, 2011; Sabaté & World Health Organization, 2003), it has been posited that regimen adherence should go beyond medication instructions and reflect behavioral modifications to underlying risk factors (Sabaté & World Health Organization, 2003).

To ensure these behavior changes, behavior change (BC) theory which has culminated from years of research in several disciplines, including psychology, sociology, and economics, have been used to address public health issues (Leviton, 1996). Behavior change in patients for regimen adherence is a critical component of meeting clinical goals (Klonoff, 2019). With the prevalence and high adoption rate of mobile technologies, features such as mobile applications (apps), text messaging, and electronic alarm-triggered reminders have been used for designing mobile health (mHealth) interventions. Further, it has been argued that their long-term widespread use for chronic disease self-management and effectiveness can be improved by basing their design on strong BC theory and sociotechnical design principles (El-Gayar et al., 2013).

Consequently, several studies have applied BC theory in mHealth interventions designed for self-management. The effectiveness of these interventions has been described in a wide range of reviews. However, it is often the case that reviews of this nature focus on specific conditions such as Internet-based asthma interventions (Al-Durra et al., 2015b), wearable technology for sedentary adults (Sullivan & Lachman, 2016), mobile apps for sustainable travel behavior (Sunio & Schmocker, 2017), healthy maternal behavior (Daly et al., 2018), epilepsy management (Escoffery et al., 2018), diet-tracking (Ferrara et al., 2019), or a combination of conditions (Milne-Ives et al., 2020). To evaluate a broader range health behavior change mHealth apps, Zhao et al. (2016) performed a thematic review of extant literature between 2010 and 2015. In a recent review, Han & Lee (2018) evaluated the effectiveness of mHealth apps using a broader period between 2000 and 2017. Although their study reported effectively on BCTs, the study did not report on the theories used by the applications. With the ever-changing nature of technology, and mHealth, an inherent gap exists in demonstrating the effectiveness of theory-informed apps for changing health-related behaviors.

Accordingly, and with the pervasiveness of mHealth applications, the current study aims to extend prior research by providing a systematic literature review using an updated timeframe (2015-2020) while focusing on theory and techniques in a broader context of mHealth apps targeting all manner of health-related behaviors. Specifically, this study presents a complimentary perspective that focuses on extant literature in the context of intervention efficacy based on the application of BC theories and techniques. The study reviews literature that has reported and evaluated either the use of BC theory or techniques in mHealth app design. Thus, this review aims to 1) identify and catalogue the conditions targeted by