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Reinforcing Health Management Intervention Effects with mHealth

Emergent Research Forum (ERF)

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Abstract

The combination of both digital and in-person interventions could lead to significant health behavior change, yet it is not clear what are the mechanisms by which mHealth intervention can help individuals sustain their health records and what factors could lead to long-term engagement with mHealth. The purpose of the study is to determine the potential impact of mHealth on reinforcing self-management knowledge, skills, and confidence gained through completion of an in-person health management program. Specifically, we assess the impact of engagement with mHealth on health behaviors maintenance and explore the role of virtual presence and perceived benefits in engagement with mHealth. Our mixed methods study will be conducted in two phases involving focus groups and semi-structured interviews with adolescents who completed an in-person health management program as well as their usage analytics from technology.

Keywords

mHealth, self-management, obesity, overweight, engagement

Introduction

Literature suggests that the combination of both digital and in-person interventions could be ideal and together lead to significant health behavior changes (Santarossa et al. 2018; Williams et al. 2014). While in-person interventions can be helpful in terms of short-term changes in health and health behaviors (Rabiei et al. 2010), mHealth intervention can sustain the effect of such behavioral change by filling in the time and distance gaps between or after in-person encounters. It is, however, not clear what are the mechanisms by which mHealth intervention helps individuals sustain health behaviors.

Moreover, the extent to which the intended benefits of mHealth interventions can be fully realized is constrained by the limited use of them (Stephens et al. 2014; Whelan et al. 2014): for example, a recent report states that most individuals stop using their mHealth applications after the fifth interaction (Krebs et al. 2015). Therefore, it is unlikely in many mHealth instances that the full intended benefits (e.g. improved health outcomes) of mHealth can be realized through very short-term uses of the applications (Feldman et al. 2019). It is not completely clear why the use of such mHealth tools tapers. Virtual presence, defined as a psychological state in which virtual objects are perceived as actual (Lee 2004), can potentially be a crucial factor leading to engagement with mHealth. Further, perceived usefulness has been recognized as a major factor affecting user acceptance of technology (Davis 1989; Venkatesh et al. 2003).

The overall purpose of this study is to determine the potential impact that mHealth may have on reinforcing self-management knowledge, skills, and confidence gained through completion of health management programs and interventions. First, we assess the impact of engagement with mHealth on health behavior maintenance by drawing on relevant literature related to this topic. Second, we evaluate potential facilitators of engagement with mHealth (specifically, virtual presence and perceived benefits).

We contextualize this two-phase mixed method study in the conditions of obesity and overweight adolescents. Overweight and obesity are major public health issue affecting 12.7 million adolescents (Carroll et al. 2015). This health condition was shown to have long-term effects on health of individuals (overweight individuals are at higher risk of developing diabetes because of an increase in insulin resistance) and the

healthcare system (extrapolated annual healthcare costs attributable to obesity are about $190B in the US, and this amount constitutes about 21% of US healthcare expenditures (2015)) (Goblan et al. 2014; Hruby and Hu 2015). Developing healthy habits at young age can lead to better health behaviors and health outcomes in adulthood, and it is, therefore, crucial for adolescents to consider ways in which they can develop their healthy habits and skills (Utter et al. 2018). There currently exist various in-person health management interventions targeting adolescents suffering from obesity and overweight (Reynolds et al. 2018) but such programs are typically periodic or short-lived and are helpful primarily in terms of inducing short-term changes in health and health behaviors (Rabiei et al. 2010).

Theoretical Background

Figure 1 illustrates our research framework guiding our study. The first part of the framework covers the role of mHealth in health behavior maintenance and explains the mechanisms by which mHealth reinforces different dimensions of the maintenance process. While there is a rich stream of literature covering theoretical aspects of health behavior maintenance (Kwasnicka et al. 2016), there is dearth of research examining mHealth in relation to various theoretical dimensions of the maintenance process. Moreover, the second part of the framework covers the role of virtual presence and perceived benefits in engagement with mHealth. Virtual presence was never explored in relation to engagement. This construct, however, has a lot of potential to impact the interaction between a user and technology, as demonstrated in prior literature (Behm-Morawitz 2013). Perceived benefits were explored in relation to engagement with technology before (Kim et al. 2013) but not in conjunction with virtual presence.
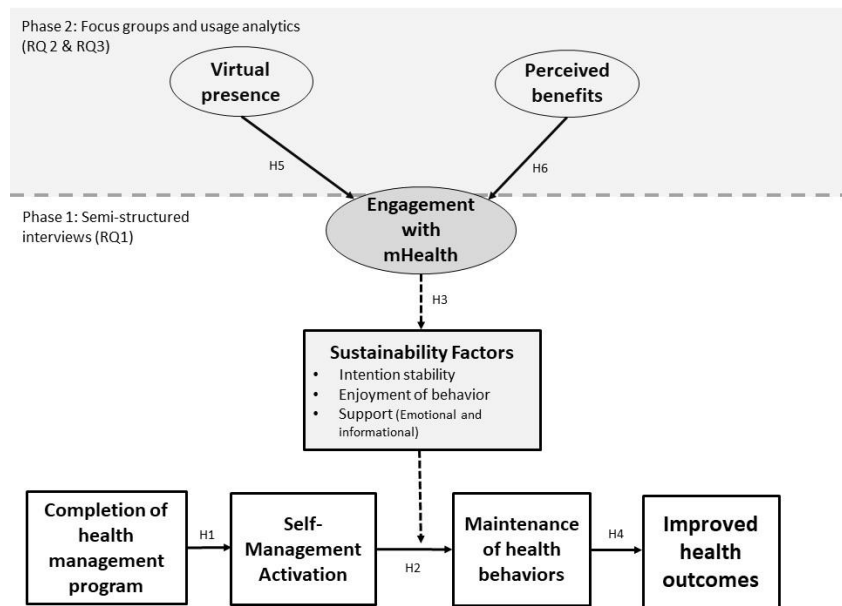

Figure 1: Research Framework

Engagement with mHealth and Health Behavior Maintenance

Self-management activation refers to patient's willingness and ability to take independent actions to manage their health and typically assesses patients' knowledge, skills, and confidence of managing their health (Hibbard et al. 2004). It is reasonable to expect that after *completion of health management program*, individuals are better equipped with knowledge and skills that they can leverage to manage their health (Hypothesis 1 in Figure 1). Prior literature does report some evidence of the relationship between in-person interventions and self-management activation (Struwe et al. 2019; Turner et al. 2015).

Even though knowledge, skills, and confidence of managing one's health can be the first step towards maintenance of health behaviors, there exist other aspects to consider. A recent synthesis of theoretical explanations for behavior change maintenance delineates the factors that contribute to sustainable health behaviors: maintenance motives, self-regulation, habits, resources, and environmental/social influences (Kwasnicka et al. 2016). In our study, we select constructs that could be reflective of the above-mentioned *sustainability factors* and that could therefore impact the extent of health behavior maintenance (Hypothesis 2 in Figure 1). *Intention stability*, which reflects habits and self-regulation, is defined as the extent to which an attitude remains unchanged over time (Sheeran 1999) and is a pre-eminent determinant of individual's ability to direct their health behavior over time (Conner 2008; Kellar and Hankins 2013). If a person maintains their intention to practice healthy behaviors, he or she will be more successful in

leveraging their skills and knowledge to realize healthy behaviors over time. Moreover, prior literature identifies *enjoyment of behavior* as one of the maintenance motives that can lead to maintenance of health behaviors (Kwasnicka et al. 2016). If a person enjoys practicing health behaviors and is satisfied with the outcomes of such behaviors, he or she will continue engaging in such behaviors. Finally, social/environmental influences were previously shown to be crucial in maintenance of health behaviors (Kwasnicka et al. 2016). Two forms of *social support* (emotional and informational) could be particularly relevant to maintenance of health behaviors. Emotional support can enhance individual's motivation to practice health behaviors, and informational support could provide individuals with necessary knowledge to continue their efforts.

Moreover, prior literature suggests that the combination of both digital and in-person interventions can be ideal and together lead to significant health behavior changes (Santarossa et al. 2018; Williams et al. 2014). *Intention stability, enjoyment of behavior, and social support* can be strengthened through various modalities of mHealth (specifically, physical activity and social networking) (Hypothesis 3 in Figure 1). First, *intention stability* could be supported by mHealth in a way that presence of mobile health application can serve as a reminder to practice healthy behaviors. In addition, *enjoyment of behavior* could be reflected in participants' enjoyment of using different interactive modalities of the application that integrate practices of healthy habits with elements of entertainment. Finally, *social support* could be reflected in the social networking component of the application. Through social networking, participants could gain emotional and informational support from their peers. Even though these components might be available to participants without mHealth (e.g. their parents, peers, and online sources can motivate and support participants), mHealth makes it easy to gain access to such components and aligns with what participants learned during an in-person intervention better. Individuals with better intention stability, enjoyment of behaviors, and supports are more likely to maintain their health behaviors and, therefore, have a better chance to improve their health outcomes (Hypothesis 4 in Figure 1) (Kwasnicka et al. 2016).

To attend to the purpose of the study and assess the impact of engagement with mHealth on patients' intention stability, enjoyment of behavior, and support (as compared to patients that do not engage with mHealth), we address the following research question:

R1: How does patient's engagement with mHealth enhance patient's intention stability, enjoyment of their behaviors and social support?

Antecedents to Engagement: Virtual Presence and Perceived Benefits

Virtual presence, psychological state in which virtual objects are perceived as actual (Lee 2004), can potentially be a crucial factor leading to engagement with mHealth. Prior studies have indeed recognized the impact of virtual presence on user's behavior (Behm-Morawitz 2013) but this state was never explored in research on patient engagement with mHealth. Different forms of virtual presence (telepresence, social presence, self-presence, hyper presence, and eternal presence) can potentially facilitate creation of a personal connection between a user and technology by blurring the boundary between the physical and virtual and enhance engagement (Hypothesis 5 in Figure 1).

Furthermore*, perceived benefits* of technology have previously been associated with user's engagement with technology (Kim et al. 2013). In the context of health, perception of benefits of mHealth in the health maintenance process can be a motivator to continue engagement with mHealth over time (Hypothesis 6 in Figure 1).

To assess the impact of perceived benefits and virtual presence on post-intervention use of mHealth to sustain healthy behaviors, we address the following research questions:

R2: How do perceived benefits of mHealth affect patient's engagement with mHealth?

R3: How does the experience of virtual presence through various modalities of mHealth affect patient's engagement with mHealth?

Methods

The study will be conducted in two phases. We will recruit adolescents who completed weight management

camp sessions[1] in summer 2019 and 2020 to participate in individual semi-structured interviews (Phase 1) and focus groups (Phase 2). Our study will include a diverse group of adolescents coming from various socioeconomic backgrounds. We will include both males and females. The inclusion criteria will be based on the age (12-17 years old) and body mass index (85th-99th percentile).

Phase 1

In Phase 1, we will conduct semi-structured interviews with users and non-users of a complementary mHealth to assess the impact of engagement with mHealth on health behavior maintenance. First, we will recruit 20 non-users of mHealth who completed weight management sessions in summer 2019, and we will conduct interviews with them in May 2020. Second, we will recruit 20 users of mHealth who will have completed weight management sessions in summer 2020, and we will conduct interviews with them in May 2021. By using semi-structured interviews, we will compare responses between mHealth users and non-users.

Phase 2

In Phase 2, we will conduct focus groups with mHealth users to explore the effect of virtual presence and perceived benefits on user's engagement with a complementary mHealth tools introduced to the participants during the camp. During focus groups, we will evaluate different forms of virtual presence and perceived benefits of two main modalities of this mHealth – social networking (the virtual group chat) and physical activity (videos for exercising). We will recruit participants for three to six, 40-minute focus groups (an appropriate number of focus groups as they reveal 90% of themes (Guest et al. 2016)) in July and August 2020 (after they complete weight management sessions). Focus groups will cover adolescents' perception of different forms of presence in different modalities of mHealth as well as perceived benefits thereof. In addition to the qualitative data from focus group, we will compare adolescents' frequency and duration of use of mHealth and BMI, where possible (data will be provided by the founder of Camp Jump Start), with their personal reflections.

Semi-structured interviews and focus group transcripts will be coded using deductive thematic analysis using a priori coding schema (Saldaña 2013). Constant comparison method (Glaser 1965) will be applied. Interview transcripts will be coded independently by one or more researchers.

Acknowledgements

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[1] Camp Jump Start (http://www.campjumpstart.com/) is a recognized adolescent weight loss and healthy living summer camp program (grounded in evidence-based techniques and led by a medical provider).

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