TBM

EBBM SYNOPSIS

Mobile health: a synopsis and comment on "Increasing physical activity with mobile devices: a meta-analysis"

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ABSTRACT

We offer a synopsis and commentary on J. Fanning and colleagues' article "Increasing Physical Activity with Mobile Devices: A Meta-Analysis" published in the Journal of Medical Internet Research. Although regular physical activity has a range of benefits, very few adults in the USA meet recommended guidelines for daily physical activity. The meta-analysis of Fanning et al. (2012) aimed to synthesize the results of research using mobile devices to increase physical activity. Their review identified 11 studies that used mobile technologies, including short message service (SMS), apps, or personal digital assistant (PDA) to improve physical activity behaviors among participants. Fanning et al. conclude that while literature in this area is limited to date, there is initial support for the efficacy of mobile-based interventions for improving physical activity. Included studies varied greatly, and the majority used only SMS to influence physical behaviors, meaning generalization of results to other forms of mobile technologies may be premature. This review does, however, provide a foundation for understanding how mobile-based interventions may be used efficaciously for the development of future interventions to improve health behaviors.

KEYWORDS

Behavior change, Exercise, Meta-analysis, Mobile phone, Physical activity, Review

Implications

Researchers: Researchers should investigate how and why mobile interventions improve physical activity behaviors.

Practitioners: The evidence base is sufficiently promising for practitioners to encourage their patients who want to use mobile technologies to increase their physical activity.

Policymakers: Policymakers should begin to consider methods that will facilitate the integration of mobile technologies into everyday practice as the use of mobile devices and development of evidence-based mobile interventions grows.

INTRODUCTION

We present a synopsis and commentary on Fanning et al.'s article "Increasing Physical Activity with Mobile Devices: A Meta-Analysis," a systematic review of the evidence on whether mobile health tools increase the effectiveness of physical activity interventions and participants' adherence to them [1]. Engaging in regular physical activity is associated with preventive health benefits, but very few adults in the USA meet recommended daily physical activity guidelines [2]. The authors hypothesized that mobile technology could be harnessed to develop physical activity interventions with a high level of efficacy and adherence. Interventions employing mobile phones have demonstrated efficacy across a range of health behaviors [3] and are ubiquitous: 91 % percent of Americans are now cell phone users, and 56 % of Americans own a smartphone [4, 5]. Personal mobile phones are especially promising platforms for physical activity interventions, given the potential to provide real-time monitoring and instantaneous feedback via short message service (SMS) or telephone with minimal disruption of a participant's day-to-day life. This article outlines and offers commentary on the findings of Fanning et al.'s meta-analysis investigating the effectiveness of mobile technologies to increase physical activity.

KEY QUESTION

What is the efficacy of using mobile devices to increase physical activity?

SEARCH STRATEGY

The authors searched PsychINFO, PubMed, and Scopus using the keywords: mobile phone, cell phone, personal digital assistant (PDA), SMS or text message, and physical activity or exercise. Searches were conducted between August 2011 and July 2012. Studies were required to be published or in press since the year 2000, be in English, and describe studies aiming to improve physical activity behavior and using mobile technologies in the collection of data or dissemination of study materials. Studies that did not include a comparison group

or did not provide sufficient original data to calculate Cohen's d effect sizes were excluded.

RESULTS

The authors identified 11 studies with a participant pool of 1,351 for their review. The types of mobile technology used in these studies included the following: short message service (SMS), native mobile software ("apps"), and personal digital assistant (PDA). Physical activity measures were operationalized as reports of duration of moderate to vigorous physical activity (MVPA), frequency of MVPA, reported percent of time of MVPA, pedometer counts, accelerometer counts per minute, number of days per week and number of days spent exercising, and reported metabolic equivalents. Some studies used more than one of the above measures.

Short message service

Eight studies used SMS messages in their interventions. SMS was used as a means to give feedback and information to the participant, allow participants to read intervention messages at their leisure, and provide a real-time assessment of behavior for investigators. Fjelsdoe and colleagues, for example, demonstrated how SMS messages can significantly influence intervention outcomes. Postnatal women were enrolled in a 12-week intervention designed to impact physical activity. The intervention group received an in-person goal setting consultation, a goal setting magnet, three to five personally tailored SMS messages per week, and the support of a designated individual who also received two SMS messages per week. The control group received only the initial consultation. Frequency of MVPA per week increased significantly in the intervention group by the end of the assessment period, and the duration of MVPA also tended to improve [6].

Smartphone native application

Two interventions that were delivered via the mobile phone (SMS and native applications) were found to produce a moderate effect on pedometer steps. One was Kirwan and colleagues' study of Australia's 10,000 Steps program. Participants were given a smartphone application to report their daily steps along with using other intervention content delivered via the program's website. Participants in the intervention group were matched to controls on age, gender, level of self-monitoring, pre-intervention physical activity level, and length of membership in the 10,000 Steps program. The intervention group was more likely to log steps daily compared to the control group. Furthermore, those in the intervention group were more likely to log greater than 10,000 steps on each entry [7].

Personal digital assistant

Although only two included studies used PDAs in physical activity-promoting interventions, these few studies suggest that PDAs have been an effective mechanism of intervention delivery. In one study by King and colleagues, participants 50 years or older were given PDAs along with an instructional session. The PDA delivered daily and weekly feedback, goal setting, and support. The control condition received standard education materials. Participants in the intervention condition reported significantly greater minutes per week of moderate or greater intensity levels of physical activity, as well as greater mean estimated caloric expenditure at the end of the 8-week study. Ratings of satisfaction with the PDA were high, which is an encouraging finding particularly given the older age of the study sample [8].

CONCLUSIONS

The authors concluded that their meta-analysis supports the potential of mobile-based interventions to increase physical activity despite the limited extent of the evidence to date. There were, however, some important limitations. First, since SMS was the main platform used in most studies, any separate effects of smartphones alone cannot be disentangled. Although SMS interventions to promote physical activity have proven successful in past trials, most studies have supplemented texts with additional intervention components. Furthermore, the findings from SMS interventions showed substantial heterogeneity. Additionally, as the authors indicate, grounding in theory is necessary to further tease out the effectiveness of individual intervention components. Theory development is needed particularly within the context of mobile interventions, for most do not account for the flexible and dynamic nature of mobile interventions. The authors anticipate that future physical activity interventions will become even more dynamic and multifunctional as they use sensors implanted within existing mobile technology to promote more objective and accurate measurement.

COMMENT

On the basis of their systematic review, Fanning and colleagues concluded that mobile technology holds the potential to influence physical activity. We agree with Fanning et al.'s appraisal but think that the science of mHealth physical activity promotion is still in its infancy. In line with Fanning et al.'s conclusions, the Community Guide Task Force recommends technology-supported counseling or couching interventions intended to help people reduce weight [9]. More research is needed to identify mediators and moderators of the results of physical activity interventions. It remains unclear what aspects of mobile technology produce desired physical activity outcomes and how these effects come about. The studies included in this review varied greatly in study design, included mobile components, and population characteristics. More research is needed to understand the influence of these factors. Only studies using SMS, PDAs, and native mobile software were included, and the vast majority of

the interventions used primarily SMS. As SMS and smartphone applications become increasingly dominant and as other forms of mobile technology emerge, these too will need to be investigated. For instance, mobile technologies in the form of portable tablets and handheld game devices also warrant investigation as channels for intervention delivery and any unique effects of delivery channel will need to be disentangled. Future investigators will wish to differentiate between the roles of mobile accelerometry as an assessment tool for measuring physical activity outcomes versus as a motivational tool to give feedback and reinforce maintenance of activity. Both theoretical development and empirical analysis of interventions to promote physical activity will support clinicians' and policy makers' efforts to promote active living for the entire population.

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