

MHealth Games as Rewards: Incentive or Distraction?

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ABSTRACT

Games may be employed for delivery of a clinical protocol, or as an incentive for protocol tasks. We focus on serious games in mHealth apps for pediatric patients with a chronic disease as an incentive for behavior modification. A patient is rewarded with enhanced gameplay in proportion to her/his compliance with a clinical protocol. The game-as-reward prevents fatigue and sustains patient engagement as the mHealth apps are used on a frequent basis when the affliction is a chronic disease. However, our experience shows a fine line between games that encourage engagement and ones that distract patients from protocol tasks.

CCS CONCEPTS

- **Software and its engineering** → Software organization and properties → Contextual software domains

KEYWORDS: Mobile, Design, Games

1 INTRODUCTION

Challenges to gamification adoption in healthcare includes 1) a validated framework shown to improve health outcomes for all medical areas does not exist [1]; 2) gamification does not hold user interest for long periods [2]; 3) a lack of user-centered design principles in building gamification elements [3]; and 4) clinicians are not included in gamification design [1,4]. Despite issues game interest among healthcare practitioners continues to rise.

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DH'17, July 2-5, 2017, London, United Kingdom.

ACM ISBN 978-1-4503-5249-9/17/07.

DOI: <http://dx.doi.org/10.1145/3079452.3079459>

Those favoring games in healthcare point to benefits like: 1) it makes mundane tasks interesting to patients [5]; 2) it improves satisfaction, self-use, and self-esteem for coping with conditions [6]; 3) it promotes behavior change and a desire to be healthy [7]; and 4) allows patients to be socially active with peers [8]. Sufficient evidence exists for continuing to understand gamification impacts for pediatric chronic disease.

In our view, a game may be seen as a *delivery mechanism* or as a *reward* or *incentive*. When used as a delivery mechanism, it means the clinical protocol is embedded directly into the game; completing game-based tasks is equivalent to completing the clinical protocol. When used as a reward, often alongside other reward mechanisms like leaderboards and badges, the game is used as an incentive for the user to complete clinical protocol tasks, much in the same way giving a gift card is often used as an extrinsic motivator for participating in a clinical trial. We present in brief the gamification elements of two mHealth apps that use games as a reward for patient compliance to a protocol.

2 MHEALTH APPS

The apps described in this section improve compliance of a paper-and-pencil clinical protocol by using a gamified mHealth app to replace an out-of-session paper exercise.

2.1 SCD-PROMIS

Children's National Health System (CNHS) relied on paper PROMIS surveys to collect data about pain intensity and burden for children with Sickle Cell Disease (SCD). Patients were asked to describe pain intensity and burden at in-clinic interviews and to complete paper surveys at home, but few did. Data collection required visits to the clinic, resulting in canceled appointments. Improving compliance was a significant need for CNHS.

We created a mobile app leveraging HTML5, REST, and native smartphone features to deliver PROMIS surveys. Our 1st generation app showed poor compliance rates in weekly surveys [9]. The latest version of the SCD-PROMIS app added two new

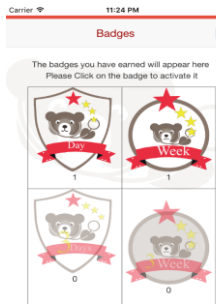


Figure 1: App Badges over a non-gamified version for both weekly and daily PROMIS surveys (Table 2). Interestingly the disparity is mostly seen when considering only the younger population (8-17) in our protocol.

	W	W%	D	D%
w/ games	28/44	64%	159/309	51%
No games	20/42	48%	127/325	39%

Table 1. Weekly/Daily PROMIS compliance SCD-PROMIS

2.2 REACH+

REACH is an indicated prevention and early intervention targeting chronic anxiety in children [10,11]. REACH provides Brief Cognitive-Based Therapy, or BCBT, delivered in 6 sessions, 20-30 minutes in length, in a group format. In CBT, after a face-to-face session with therapists, patients are asked to fill in worksheets as homework using pencil-and-paper forms. REACH+ is an mHealth app developed for Android that ports homework activities from paper-and-pencil to app [12,13]. Each REACH protocol activity has been ported into a space-theme task in the app, where the patient interacts with a friendly "blob" character. The blob guides a patient through tasks, gives feedback, and rewards a patient through leveled "tricks" (Figure 2) the blob plays when tasks are completed. In REACH+ clinical protocol activities are mini-games, and other gamification like tricks are extrinsic rewards.

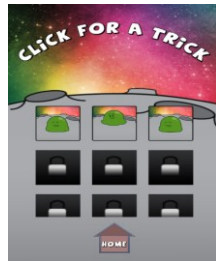


Figure 2: Blob tricks

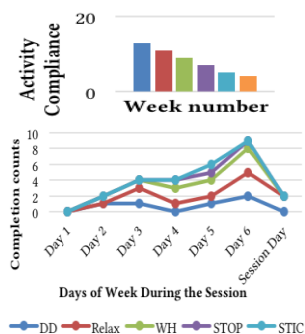


Figure 3: REACH+ compliance

N=10 middle-school children participated in an experimental study with the REACH+ app for the full length of the protocol (6 weeks). These participants were provided with mobile phones to perform out of session practice at home. Every week a school psychologist conducted a REACH session in school, then asked participants to practice a particular skill (with the app) as homework. Weekly compliance is shown Figure 3 top, and daily compliance Figure 3 bottom. Unsurprisingly, weekly compliance trends down, and daily activity peaks a day before a session.

4 INCENTIVE OR DISTRACTION?

This paper asks whether mHealth apps that use gamification features for rewards provide an incentive or a distraction to the end user. An intent of game features is to extrinsically motivate a patient to complete clinical protocol tasks. Extrinsic motivation does not obscure the protocol or make tasks more appealing; it simply provides an incentive for completing the tasks. This is in contrast to an *embedded game* as a delivery vehicle for clinical protocol tasks. If a patient does not like a game, he will not complete protocol tasks; but if he does it he completes tasks, often without realizing he is performing the protocol.

The gamification features of the mHealth apps in section 2 include various rewards for patient behavior. In practice we observed that sometimes these features have the intended effect, improved compliance, but in other cases we observe they distract the user from protocol tasks. We presented preliminary results in two mHealth apps for pediatric chronic disease. Compliance rates follow a downward trend often seen in mHealth apps ("app fatigue") yet patients feedback suggests positive perceptions of gamification, Review of in-app user activity suggests compliant users gravitate toward gamification features, though in isolated cases those same features may be encouraging non-compliant behavior.

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