Design Principles for the Conceptualization of Games for Health Behavior Change

Abstract
This paper presents a list of principles that can be used to conceptualize games for health behavior change. These principles are derived from lessons learned after teaching two design-centered courses on Gaming and Narrative Technologies for Health Behavior Change. Course sessions were designed to create many rapid prototypes on specific topics coupling behavior change theory with iterative human-centered and game design techniques. The design task had two broad goals: 1) designing efficacious technologies, with an emphasis on short-term behavior change and 2) using narratives and game dynamics as vehicles for increased engagement and long-term sustained change. Example prototypes resulting from this design approach are presented.

Keywords
gaming, serious games, gamification, drama therapy, narrative therapy, narratives, behavior change, identity, personalization

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

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Design, Experimentation, Human Factors

**Introduction**
Behavior Change apps and games must adhere to both engagement and efficacy of the intervention. Several studies have shown that CCBT (Computerized Cognitive Behavioral Therapy) such as MoodGym [12], Beating the Blues [13], among others, compare well with face-to-face therapy. However, 2/3 of depressed patients prefer therapy over drug treatment, but only 20% of them actually start it, and 1/3 of those will quit [9].

Gaming has characteristics that enhance selective attention [5], helping people pay attention to the main message. Another characteristic is that games make the learning process fun [7], which in turn increases motivation [10] and emotional engagement [6].


Complementary to gaming literature, persuasive technology has shown improved usability and engagement for physical activity. The Ubifit system [3], showed increased exercise levels using goal tracking and metaphors. Other examples around lifestyle change such as Nike Plus [14], HeartMath [15] and FitBit [16] show increased levels of engagement.

**The challenge: Efficacy + Engagement**
The challenge to merge efficacy and engagement can be dissected into the following design dualities (Fig. 1):

*Scientific vs. Iterative methods:* A gap exists between current clinical intervention development methods based on the scientific method (hypotheses + statistical validation) and iterative gaming and app technology design. Usability design demands an approach that favors exploring ideas based on prompt user feedback through the construction of prototypes. Merging this approach with a efficacy testing procedure is one of the constraints used to design our course sessions.

*Short vs. Long-term engagement:* Short-term engagement demands knowledge around decision-making, emotional elements and personal skills, while long-term engagement demands a deeper understanding of identity and personality. A way to mix behavior change with identity change is through narrative-driven games. Such games use metaphors, scenarios and stories that help develop the adoption of new identities.

*Content vs. Dynamics:* Commercial apps, as opposed to therapeutic interventions, do look for a more complete user experience, which pays attention to execution as well as engagement and identity details. However, success is usually measured in terms of revenue generation, rather than behavioral metrics. Merging both the experience design (i.e. narrative elements) with the game dynamics (i.e. behavioral elements) into a coherent design that help develop real life skills is another challenge to be considered.

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**Figure 1 – Efficacy + Engagement game design dualities**
Behavior Change Topics:
- Intro to Behavior Change Theory
- Intro to Life Stories
- Body-Mind Connection
- Positive Psychology
- Narrative Psychology
- Sports Psychology
- Anxiety, Depression and Cognitive Behavioral Therapy
- Behavior Change in Society
- Drama Therapy
- Neuroscience Games
- Trauma Narratives
- Improv-based Games
- Communitarian Mental Health Interventions
- Digital Storytelling
- Social Networking for Behavior Change

Table 1 – Behavior Change and Narrative Topics taught in addition to Gaming Development and Human Centered Design Topics

Design methodology
In this paper we present a set of principles for the conceptualization of games for behavior change derived from lessons learned after teaching two health and wellbeing game design classes. The objective was to maximize creativity under the constraint dualities aforementioned. Each session consisted of two parts:

First hour - Theory/Base Knowledge: Behavioral theories are presented by a specialist to later be used as the basis of the design challenge. The session closes with a brief discussion around the way such theories can influence the design of new technology. Table 1 shows a list of the theoretical topics presented.

Second hour - Design challenge: Students must go from problem assessment to a complete game concept leveraging the theory presented. The exercise is divided into four fast-paced parts:
- Narrative Storyboarding - Describe and storyboard the “disempowering” narrative and the counteracting “empowering” narrative.
- Externalization - Intangible elements such as the problems themselves and/or the feelings associated with them must be externalized into enemies, scenes, obstacles or other gaming elements. The skills needed to overcome such problems should also be externalized into weapons, skills or game dynamics.
- Game Design: Students are then requested to design the game rules and to focus on game flow, incorporating the narrative and externalized elements.
- Test, Role-playing and Critique: Finally, students must test each other’s games, present their game with a movie billboard as if it was being launched on TV, present their storyboards and act their games out.

Prototype examples
At the end of the semester a complete game prototype is presented using the relevant theories and design elements learned during class. Among many others we chose a few examples of the final projects.

- Monsters (Fig. 2) – a simple two-player game based on monsters and weapons. Concepts from drama therapy are used to represent inner problems with monsters and tangible tools and weapons represent skills to destroy them. For example, “stress” could be a flaming monster; player 2 helps you train by blowing a torch, which in-turn can teach you to remember that to kill stress you need to breath better.
- Scheherazade’s World (Fig. 3) – a multi-player game based on digital storytelling that aids in the prevention of suicide by creating a community for at-risk young women to share their stories. The One Thousand and One Nights tells of a king named Shahryar, who would marry a new wife each day and sentence yesterday’s wife to death. Unlike previous wives, Scheherazade had a secret weapon to keep her alive. Every night, she would tell the king a story, only to end with a cliffhanger each night. Because the king wanted to know the rest of the story, he would spare her life for another day. Through stories, she was able to survive.
- Semester Adventure (Fig. 4) – a role-playing game to reduce anxiety and improve time management around test exams. The player follows an adventure as a warrior that needs to gain powerful tokens by defeating time wasting enemies, i.e. by fulfilling tasks on time. Life stories theory indicates that people assume new roles based on the way they define themselves. A “warrior” role helps people to be active and assertive, while a “victim” one makes the person passive and receptive of disgrace.
Principles for Conceptualization

The following principles offer a baseline for behavior change game design. These principles can be used to help game designers brainstorm, refine and select game concepts. Participatory design with stakeholders (specialists, users, etc.) is recommended during this phase.

Understanding disempowering narratives

a. Narratives are lived - not only used to tell stories about one self. People confront ideas and situations based on the way they portray themselves. This is observed in trauma patients who cannot overcome the generalization of their disempowering narratives. Understanding the narratives underneath unhealthy behaviors will help design new empowering gaming narratives that help change unhealthy habits, eliminate generalizations and organize thoughts around the appropriate context.

b. Focus on strengths - Design around behavior change can benefit from understanding people’s current strengths, rather than imposing an ideal model for functioning under a specific situation. A key concept that describes the basis for behavior change is what Bandura defines as self-efficacy [1]. In a nutshell, self-efficacy explains our self-assessment and use of our current strengths. However, discovering strengths demands exploration not only of thriving experiences but also of difficult experiences, where strengths are used to be resilient and survive emotional or physical pain or disgrace. Games could be designed to incorporate ways to discover strengths used to adapt and overcome challenges during the game flow.

c. Interpretation and introspection - People suffering of behavioral problems rarely have time to better understand their problems. Designers should provide time lapses prompted by cues to help people interpret problems and introspect. Games with forced prompts for reflection could help increase people’s awareness of their own thoughts and problems – however, a balance between action and pause is important to avoid breaking game flow. Furthermore, behavior change games ought to be designed to be adaptive to changes in the problem definition, as the game could help the user discover the root cause of an initial superficial problem.

d. Problems as fictional enemies - Externalizing problems into concrete game elements (i.e. objects, monsters, obstacles, etc.) helps people understand that a problem does not occupy every aspect of their lives. It also helps the user understand the characteristics of the problem, which in turn will help derive possible solutions. Designers should provide users with ways to externalize problems and feelings into concrete game element(s) that can later be destroyed or controlled. These element(s) should have a clear metaphor (for example, stress as an oppressive rock, or depression as glue that impedes you to move) in order to aid the user to discover new “affordances” of the problem at hand.

e. Materializing Skills into weapons - Complementary to the materialization of problems, tools and weapons, which represent the skills required to overcome the problem, should also be materialized. Such tools must carry a clean meaning that is memorable and supports the notion that change is possible via the use of the metaphors and game mechanics associated with such weapons.
**Game Dynamics as Interventions**

f. **Progress as a proxy for self-efficacy** – Eliciting progression should be a key element of game design for behavior change. Many times users need to realize first that “change” is actually possible. If no progress is perceived, the sensation of inefficacy is perpetuated and therefore, any effort to develop skills or motivations could be futile. The initial levels must show the user that change, even if small, exists. Game flow must be carefully designed to maintain a belief that change being attained.

**Social Validation** – Without social affirmation (i.e. celebration and positive feedback) change may seem part of our imagination. Game designers should use social affirmation to promote self-efficacy. Social influence (i.e. socially controlling and affecting the gamer’s choices) could also be used as a vehicle to drive change. However, this latter approach runs the risk to make the user feel that they were imposed a new reality by others, therefore reducing or eliminating self-efficacy, which in turn will not drive real and lasting change.

**Conclusion**

Differently to purely entertainment games, the challenge around designing behavior change games is to strive not only for engagement but also for efficacy. A group of design principles for conceptualization is derived from an experience-driven analysis of this challenge. Overall, these principles can be used to conceptualize games aimed towards sustained change.

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**References**


[17] https://www.superbetter.com/