

IgnitePlay: Encouraging and Sustaining Healthy living through Social Games

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Abstract—Many successful social and casual games use techniques in their design that help sustain players’ interest over time. The success of these games amongst players who consider themselves ‘non-gamers’ has resulted in the development of applications that attempt to use these same techniques to encourage behavior change in the real world. Most of these applications gamify their sites by adopting a system of points, badges, and leveling up. In this paper, we take a different approach. In collaboration with Igniteplay – a company created to develop a product to encourage users to adopt a healthy life style through online social media – we investigated the connection between social game and media design mechanics and user motivation. This investigation led to several concrete techniques that we are currently testing and revising in the hope that such techniques will enhance participant retention. In this paper, we discuss these techniques and outline future directions.

I. INTRODUCTION

In the US and Canada, approximately 66% of adults—more than 160 million people—are overweight [1, 2]. Obesity-related healthcare costs are over \$123B/year in the US and Canada [1]. Nowadays, it is very easy to drift into unhealthy habits, such as eating unhealthy food or going for weeks with no or little physical activity. This is particularly due to the easy access to cheap high calorie foods and little requirement for physical exercise [2]. These habits are very hard to break. However, recently, researchers have started exploring the potential utility of social networks and games [3, 4] in inducing behavior change [5], and potentially breaking some habits. In order to use the power of games and social networks, however, researchers need to understand the systems that make games engaging and appealing [5, 6].

The contribution of this research is a list of distilled and implemented psychological techniques and game mechanics that engage and motivate users in a social health-based media application. In this paper, we discuss these techniques and show how we implemented them within a commercial product under development by *IgnitePlay*, a company formed with the goal of making it fun and easy for women to lose weight and stay healthy.

II. PREVIOUS WORK ON HEALTH GAMES

There are several research and commercial products that use game-like elements and tracking to help deal with the obesity epidemic. For example, the *Nintendo Wii Fit* facilitates diet and exercise tracking on a game console, and *Wii Sports* includes physical movement as part of gameplay. Other systems encourage healthy behaviour through transmission of information within a game. Baranowski et al. [7] developed *DIAB*, which promotes awareness about different kinds of food through game narrative supporting better and healthy

nutrition [8]. Other products, such as *My Weight Loss Coach* (Nintendo, 2008) and the DS game *Pokémon HeartGold* (Nintendo, 2010), use activity-tracking devices, such as pedometers, to promote real-life physical activities.

Although these products have shown short-term success, the long-term effects on behavior are still unknown. In this research project, we took a different approach. We believe that the adoption and sustainability of healthy life styles require an attitude change and constant motivation to encourage habit formation. To target this goal, we developed a set of community-based visualization techniques, in combination with innovation in health-based social game design. We think, based on previous work on motivation, that the use of these techniques will increase the likelihood of long-term engagement and behavior change. We outline these techniques next.

III. TECHNIQUES AND CURRENT IMPLEMENTATION

Research by Rigby and Ryan suggests that there are specific factors that motivate players to continue playing [5]. They have devised a framework called Player Experience of Need Satisfaction (PENS), based on 30 years of research in the psychology of human motivation [5]. This framework suggests that there are three major factors affecting motivation and engagement in computer games. These factors are: *competence*, which they defined as the “innate desire to grow our abilities and gain mastery of new situations and challenges;” *autonomy*, which they define as the “need to reflect our innate desire to take action out of personal volition and not because we are controlled by circumstances or by others;” and *relatedness*, which they defined as “our need to have meaningful connections to others.”

We draw upon this model to develop novel techniques that pull participants into the application. We also interweave health concepts within the structure of a social virtual world, under development by Igniteplay, thus promoting awareness to allow behavior change. These techniques will increase the use of the application and potentially may have long-term impact in terms of real-world behavior. Below we discuss an example technique under investigation to pull the participants in and help keep them in the application. In addition, we discuss an example of how health concepts were interwoven into the application structure through mini-games. We outline results from preliminary tests conducted to test these methods with participants. While the test results were fairly positive, understanding the long-term effects of such designs can only be truly tested in a longitudinal study outside of a lab setting (i.e. in an ecologically valid environment). Thus, our next step is to evaluate these techniques in a longitudinal study through tracking the use of IgnitePlay’s product.

A. Use of Expressive Visualization to Increase Motivation

The IgnitePlay application will allow players to track and view data on themselves, their friends and other community members. For example, players will be able to track their food and calories consumed and burned, their fitness activities and their success in completing goals.

Given that *Competency* is an important quality that tends to challenge and motivate participants, we decided to redesign the social game ‘leader boards’ to target competency. Since Igniteplay is collecting and tracking participant data through the virtual and real world. We decided to give participants the ability to compare their achievements against their goals or against others through visualizations. The idea behind these data visualizations is to give the participants a positive message, saying you are doing well compared to your goals or your friends. We use this data as a catalyst for motivation guided by the principles discussed above.

In order to leverage motivation, based on previous work, we know that different people within our target market are motivated differently. People can be motivated by a desire to lose or maintain weight, to improve their appearance, to engage with others (relatedness), by enjoyment, or by a combination of these factors [9]. Even displaying data needs to be adjusted to better target the different motivations. In order to motivate participants and knowing that they are motivated differently, we need to adjust the visualizations. For example, we know that some of our participants will be motivated by competition while others are not. For the competitive group we used expressive designs and developed visualizations that demonstrated participants’ progression against friends and the larger IgnitePlay community. For the non-competitive group, we added non-competitive visualizations that show how well participants are doing against themselves or their own goals. For example, players can compare their current progress towards meeting their goals, progress over time and also compare their current data to past data. Additionally, we developed theme-based visualizations, e.g., an ocean theme, where the type and number of sea life shown in the player’s virtual ocean will depend on the type and number of activities and goals met in the real world.

To fully explore the differences in motivation, we conducted a pilot test with 14 female volunteers whose ages ranged from 25 to 50. The participants completed a questionnaire based on Markland and Tobin’s Exercise Motivations Inventory [10] to assess the strength of possible motivating factors for engaging in healthy activities (e.g., weight loss, competition, appearance). In addition to the questionnaire, we also sought to get participants’ self-reported opinions on the prototypes of the IgnitePlay mini-games and visualizations. These self-report elicitations were made through a semi-structured interview.

The data from these initial experiments revealed several important motivational aspects about the target market. Weight management, appearance and challenge were the strongest motivators (see Fig. 1), while competition was the weakest motivator ($df = 13, n = 14, p < 0.05$).

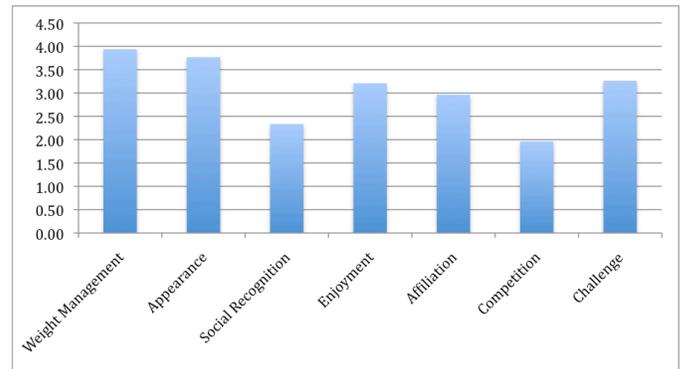


Fig. 1. Motivations Inventory means (out of 5).

As we expected, when it comes to competition, we found that participants migrated to two groups: participants who were competitive and liked to see how they were progressing compared to friends or others in the community and participants who preferred to see their progress in a non-competitive way. This division into competitive and non-competitive groups was shown through both the Motivations Inventory and the semi-structured interviews. Ten of the 14 participants described themselves as non-competitive, and four as competitive. This self-categorization was confirmed by their scores on the Motivations Inventory, with four participants ranking higher than the mean of 1.38 for competition (out of 5) and 10 ranking lower.

We gauged our design ideas through qualitative analysis of interview data. We found that in most cases the competitive group expressed a preference to see their progress compared to either their friends or women who were similar to them. In the words of one participant, "I would find it motivating to see this information (calories burned) for myself and others like me displayed over time." They felt that the comparison with the wider community was less relevant.

Women in the non-competitive group, on the other hand, were more interested in tracking their own results over time and in seeing how they were progressing towards reaching the exercise and healthy living goals they had set. As one self-described non-competitive participant put it: "it could make you feel bad if you’re not doing well. The default should be a comparison with yourself."

The concept of *competence* was a key motivator for all of our testers who believed that the data visualizations could help drive them to improve their diet and fitness. The major difference was that the competitive group appeared to be more motivated by *competence* when connected to *relatedness* and non-competitive users were more motivated by *competence* when linked to *autonomy*. That being said, *autonomy* is likely to be an important motivator for both competitive and non-competitive players as evidenced by the fact that the thematic visualizations appealed to both groups.

Relatedness is also likely to be important to both competitive groups. One non-competitive participant, for example, commented that she would be interested in competitive team based visualizations where groups of players are compared. Both non-competitive and competitive testers also liked the non-competitive visualization, which indicated which healthy activities other users in the community performed. This could indicate the importance of harnessing the power of *relatedness*

through both competitive team-based and non-competitive visualizations.

B. Integration of Health Concepts in Casual Games

Embedded into the IgnitePlay application are several casual games that have a health theme yet are designed using traditional game mechanics found in successful games such as Bejeweled and Diner Dash. These games were incorporated into the application to help make IgnitePlay more attractive to potential participants, to increase the site's "stickiness", and to reinforce healthy behaviors. Though using traditional game mechanics, the IgnitePlay games have health-specific themes, such as learning yoga poses and preparing healthy meals.

Like other social games, players can purchase power-ups for these games with the virtual currency they have earned performing real-world healthy activities. These power-ups will increase their chance of success and *competency* in the games.

We tested these games with the same user group as the visualizations. At the time of the testing, the games were single-player and did not integrate the visualizations discussed above. They were designed with a focus on *competency* and *autonomy*.

We gauged participants' assessment of the games through self-report using a semi-structure interview. Participants said the games were *addictive* and 50 percent said that they would use the power-ups in levels where the games became more difficult. We expect that the desire for *competency* in these games will motivate players to perform real-world healthy activities so that they can purchase game power-ups.

The divergence between competitive and non-competitive players was also evident in comments by our participants on these games and not just the visualizations. Therefore, game designs are currently being extended to include a social dimension that will tackle the non-competitive group and increase the relatedness dimension.

IV. CONCLUSIONS AND FUTURE WORK

Our initial tests with participants from the target market showed initial success of using data visualizations of real-life food intake activities as well game activities at both competitive and non-competitive levels as a motivation technique to hook and sustain participants' interest. Casual games with health themes seem to be capturing participants' attention. Our next steps include revisions and integration of the different systems within IgnitePlay as well as evaluation of the methods. To truly evaluate the techniques discussed in this paper, we need to conduct a longitudinal field study. We plan to conduct this study through several weeks of tracking data of beta testers after IgnitePlay releases its product in October. This will allow us to measure more specifically the impact of the discussed methods on motivation and the impact of the entire package on behavior change or attitude change considering healthy lifestyle.

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REFERENCES

- [1] NIH, "Statistics Related to Overweight and Obesity: The Economic Costs. <http://www.win.niddk.nih.gov/statistics/index.htm>," in *National Institutes of Health: National Institute of Diabetes, Digestive and Kidney Diseases*, (accessed August 2, 2010).
- [2] World Health Organization, "Obesity and Overweight. <http://www.who.int/dietphysicalactivity/publications/facts/obesity/en/>." (accessed August 2, 2010).
- [3] Facebook, "Statistics," in <http://www.facebook.com/press/info.php?statistics>, (accessed July 26, 2011).
- [4] B. Hameed, "Farmville About To Cruise Past 80 Million Users," <http://www.allfacebook.com/farmville-about-to-cruise-past-80-million-users-2010-02>, (accessed July 26, 2011).
- [5] S. Rigby and R. Ryan, *Glued to Games: How Video Games Draw Us In and Hold Us Spellbound*, Greenwood Publishing Group, Inc., 2011.
- [6] T. W. Malone and Lepper, "Making Learning Fun: A Taxonomy of intrinsic motivations for learning," *Aptitude, Learning, and Instruction: Cognitive and Affective Process Analyses*, Lawrence Erlbaum: Hillsdale, NJ, 1997.
- [7] T. Baranowski, R. Buday, D. Thompson, and J. Baranowski, "Playing for Real: Video Games and Stories for Health-Related Behavior Change," *Am J Prev Med.*, vol. 34, 2008.
- [8] D. Thompson, T. Baranowski, R. Buday, J. Baranowski, V. Thompson, R. Jago, and M. J. Griffith, "Serious Video Games for Health: How Behavioral Science Guided the Development of a Serious Video Game," *Simulation & Gaming*, 2010.
- [9] D. Ingledew and D. Markland, "The role of motives in exercise participation," *Psychology & Health*, vol. 23, no. 7, pp. 807-828, 2008.
- [10] D. Markland and V. Tobin, "A modification of the behavioural regulation in exercise questionnaire to include an assessment of Amotivation," *Journal of Sport and Exercise Psychology*, vol. 26, 2004.