

Does One Size Fit All? Personalizing Persuasive Games for Health by Gamer Types

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1 Introduction

Persuasive games that employ various persuasive technology strategies in motivating behavior change have recently attracted the attention of researchers and practitioners as a novel approach for promoting healthy behavior change. In the last decade, several persuasive games have been developed, targeted at modifying one or more aspects of users' behaviors [1, 2]. However, these games generally take a one-size-fits-all approach, rather than tailoring their contents and strategies to individual users or user groups. Although a few persuasive games have been designed with a specific user group in mind, the influence of various gamer personalities (gamer types) – as identified by game design researchers (e.g., BrainHex [3]) – on the effectiveness of persuasive games has largely been ignored. Gamer types have not been considered in the choice of persuasive strategy and theoretical determinants to manipulate in persuasive game design. However, decades of research on gameplay motivation has shown that treating gamers as a monolithic group is a bad design approach [4]; translated to persuasive games, that means that what works for one individual may actually demotivate behavior change in another [5]. One way of tailoring a persuasive game is to adapt it to various user personalities or user groups based on their susceptibility to various persuasive technology (PT) strategies [6]. Another way is to adapt the theoretical determinants of the target behavior to various personalities. PT interventions that are informed by theories and models tend to be more successful than those based on intuition [7]. Therefore, persuasive gaming interventions could be more effective when they are strategically tailored and theoretically relevant to the gamer types under consideration. However, because the theories are abstract and generic [7] and what is influencing behavior may vary from one user to another, they are not directly applicable in PT intervention development. Similarly, the Persuasive System Design (PSD) Framework – a widely adopted framework in the design and analysis of PT – is conceptual-theoretical by its nature [8] and provides no guidance on how to select appropriate PT strategies to suit various personalities.

Hence, for developing effective persuasive game interventions it is essential to investigate the suitability of various theoretical determinants and PT strategies and to develop guidelines for tailoring them to various personalities and user groups.

To address this problem, in this research, we conduct two large-scale studies of gamer's health behavior, their associated determinants, and the influence of various

PT strategies on various gamers' personalities. The aim is to answer the following **research questions:**

- Q1. Is it possible that members of one gamer type will respond differently to various persuasive strategies and theoretical determinants from members of other gamer types?
- Q2. Which persuasive strategies and theoretical determinants are suitable for designing persuasion games for various gamer types?
- Q3. Can persuasive strategies and theoretical determinants be mapped to common game mechanics?
- Q4. To what extent can we employ the one-size-fits-all approach and what persuasive strategies support one-size-fits-all approach?

2 Personalizing Persuasive Games

Personalized games are games that use various game player models to tailor game design and game play experiences to individual players or player groups [9]. Persuasive games, on the other hand, describe games that use various PT strategies in motivating behavior change. The coupling of personalized games and persuasive games give rise to *personalized persuasive games* - a term we use to describe persuasive games that use various game play models to tailor its design to various players or player groups.

One way that players differ is in their preferred play style. By tailoring games to a player's preferred style, games can be made relevant to the player and interesting to repeat. Research on gameplay and players' motivation has shown that different people play games for myriad of reasons. Therefore, it is inappropriate to treat gamers as a monolithic group [4]. The BrainHex model identifies 7 types of players – *Achievers, Conquerors, Daredevils, Masterminds, Seeker, Socializers, and Survivors*.

Generally, people have different goals and are motivated by different needs [2, 10]. According to Berkovsky et al. [11], there are three major ways in which persuasive systems in general can benefit from personalization: *Personalized assistive features, personalized messages, and personalized persuasive strategies*. Research has identified *personalizing persuasive strategies* as a core aspect of personalized persuasion, which has been thus far under-investigated. According to Berkovsky et al. [11], personalizing persuasive strategies has a "huge untapped potential to maximize the impact of persuasive applications." Therefore, research in this direction will be of value to both PT designers and personalization researchers.

3 Research Plan

Based on review of literature on PT, especially persuasive games, we identify how behavior theories, associated determinants, and PT strategies have been both implicitly and explicitly applied in persuasive game design. We establish a taxonomy of application areas of persuasive game for health. Specifically, healthy eating is one of the common application areas of persuasive games and the majority of these games

target adults. Therefore, our research will focus on persuasive game design for adults and will study this within the context of healthy eating.

To answer the research questions, we conducted two separate studies. In the first study, we investigated gamer's eating behavior and their associated determinants using the Health Belief Model (HBM) [12]. We used validated scales for accessing each determinant and we also included the 28 BrainHex questions to classify the participants into various gamer types [13]. We employed Confirmatory Factor Analysis (CFA) and used Partial Least Square (PLS) Structural Equation Modeling (SEM) to develop structural models of healthy eating determinants for various gamer types. We used the multi-group comparison approach [14] to investigate for differences and similarities between the models. Our study is based on the seven gamer types identified by the BrainHex model [3], and the health determinants – *perceived susceptibility*, *perceived severity*, *perceived benefit*, *perceived barrier*, *cue to action*, and *self-efficacy* – identified by HBM, one of the oldest and the most widely employed models of health behavior promotion.

In the second study, we investigated the gamer types with respect to the persuasiveness of the various PT strategies. To investigate the perceived persuasiveness (susceptibility) of the PT strategies for motivating healthy behavior for the seven gamer types, we used a storyboarding approach. Specifically, we represented each strategy in a persuasive game for motivating healthy eating in a storyboard drawn by an artist and based on storyboard design guidelines by Truong et al. [15]. Although we could implement the individual strategies and evaluate their suitability in applications, we chose to use storyboards for three main reasons. First, it is easier to elicit responses from diverse populations because storyboards provide a common visual language that individuals from diverse backgrounds can read and understand [16] and storyboards have been shown to be effective at depicting persuasive strategies in previous research [17]. The storyboards show a character and his/her interactions with a persuasive game application for promoting healthy eating.

To elicit feedback on the persuasiveness of the strategies, each storyboard is followed by a validated scale for measuring the perceived persuasiveness, adapted from Drozd et al. [18]. Before assessing the perceived persuasiveness, we made sure that the participants understood the strategy depicted in each storyboard by asking them to identify the illustrated strategy from a list of different strategies and to describe what is happening in the storyboard in their own words (comprehension question). We also included the 28 BrainHex questions to classify the participants into various gamer types; questions for assessing the participants' demographics factors and eating behavior were also included.

We employed Exploratory Factor Analysis (EFA) and Partial Least Square (PLS) Structural Equation Modeling (SEM) to develop seven models showing the persuasiveness of ten commonly employed PT strategies – *competition*, *comparison*, *customization*, *cooperation*, *personalization*, *reward*, *self-monitoring*, *suggestion*, *praise*, and *simulation* – for various gamer types. We employed the multi-group comparison approach in PLS-SEM [14] to compare our model (for possible differences between the gamer types with respect to their perception of the strategies) and test for significant differences in effect size across the gamer types.

4 Expected Contributions, Research to Date, and Future Work

We propose guidelines for a personalized approach for designing persuasive games that tailors persuasive games for healthy behavior change to gamer type. We tailor these guidelines to the individual gamer types identified by BrainHex to make them personalized for each gamer type using their persuasive profiles – comprising of a list of suitable PT strategies and determinants. To make our findings actionable for designers of persuasive games, we suggest mappings of the determinants of health behavior and PT strategies to common game mechanics that can be employed in persuasive game design.

To the best of our knowledge, this research is the first to link research on the psychology of player typologies (as identified by BrainHex) with the psychology of health behavior change (as identified by HBM) and with the PT strategies to find patterns in gamers' motivation that can inform the choice of PT strategies and game mechanics for designing games that will motivate behavior change. It is also the first to suggest data-driven and gamer type-relevant game design approaches that are actionable for designers and developers of persuasive games for motivating health behavior. We argue that having a personalized persuasive profile of what motivates different gamer types, and mapping these theoretical motivators and persuasive strategies to game mechanics, provides a crucial theoretical and methodological bridge between research on what motivates health behavior change (i.e., theories) and research on designing games for health (i.e., persuasive games). It also provides methodological bridge between game researchers and PT researchers and also between personalization researchers and PT researchers.

Our findings can be used also to select the most adequate “one-size-fits-all” approach that would appeal to the majority of players, and can be used as default in situations where not enough information about the user is available to personalize.

We have concluded the literature survey of persuasive games for health to identify how and which theoretical determinants and PT strategies are commonly employed. We have also compiled list of commonly employed game mechanics in PT design and taxonomy of application areas. A preliminary studies based on the influence of the six theoretical determinants identified by HBM have been conducted and the result from the study will be presented at CHI [5]. Through the study, we exposed the limitations of the current approaches to persuasive game design, and presented design opportunities for both a one-size-fits-all and a personalized approach to persuasive game design that is grounded in both theory and data.

Presently, we are recruiting participants for our second study on personalizing persuasive strategies. In the future, we will concentrate on running this study, analyzing the results, and mapping the PT strategies to corresponding game mechanics. One of the challenges we may face, apart from finding a good number of participants for each gamer type, is the mapping of game mechanics to PT strategies and theoretical determinants. It will be crucial for the outcome of my dissertation research to have the correct evaluation methodologies in place; so, I am especially looking forward to receiving feedback from my peers and the panel on how to validate the effectiveness of the developed guidelines in practice, about the amount

and scope of implementation and experiments that would be required to make a convincing argument for the practical usefulness of the findings of this research.

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