
Towards a Personalized Playful Digital Wellness Assistant

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Abstract

Positive effects of using digital games to improve personal health have been studied, but it remains unclear which game design techniques are most successful at motivating and changing long-term behaviour to improve wellbeing. To inform the design of gamified and effective personal healthcare, we will develop design guidelines and tools for gameful health and wellbeing applications, personalized to the needs and challenges of each individual user.

Author Keywords

Personalization; Wellness; Health Games; Personal Assistant; Persuasive Technologies; Adaptive Systems.

ACM Classification Keywords

H.5.2. Information interfaces and presentation (e.g., HCI): User Interfaces; J.3. Computer Applications: Life and Medical Sciences.

Introduction

Gaming technology has become a crucial supplement to wearable computing devices, mobile health applications, and clinical care. Health games encompass topics as diverse as exercise or physical therapy [5, 8, 18, 22], disease management [2, 33], mental health [29], nutrition [2], health literacy [28, 31], and others. Commonly, the goal is to increase personal health

awareness, and more broadly, improve general public health. Past work has investigated positive effects of health games, such as an increased understanding of personal health [2, 28]. However, specific game design techniques for mobile health are currently not well developed and we lack a comprehensive understanding of how we can motivate behaviours of people that improve their mental, physical, or emotional wellbeing.

Alternatively, the *Quantified Self* movement [27] invites people to track large quantities of information, including their health, fitness, and diet habits, aiming to learn more about themselves and improve their lifestyle. However, data collection and interpretation are difficult, and no well-established guidelines exist for developing health-focused apps in a way that meaningfully engages users with different backgrounds [3].

To help users adopt a healthier lifestyle, health games or gamified applications must act as persuasive technologies, which attempt to change their users' attitudes or behaviours without coercion or deception [9]. Using models such as the Health Behaviour Model (HBM) [30] or the Kaleidoscope of Effective Gamification (KEG) [11] to inform game-based interventions for health can increase their effectiveness [14]. However, this approach does not account for individual differences in motivation. Thus, a health game or gamified application that is tailored or personalized to each user according to their personality profile will be even more effective than a *one-size-fits-all* approach [12, 13, 24].

The main goal of our research is to develop a gamified Personal Digital Wellness Assistant (PDWA), with a playful user experience that allows individuals to track their personal health. By integrating a visual analytics

tool, this application will explore new ways of processing health-related data. We intend to study and employ personalization approaches, such as persuasion profiles [13], player and gamification user typologies [15, 20], and affective ludology [19], to further improve the application with personalization capabilities that will tailor its features according to the individual needs and preferences of each user.

Background

One definition of gamification is *the use of game design elements in non-game contexts* [4]. This approach is related to but distinct from serious games, because it involves the use of games for real-life outcomes. While gamification only takes elements from game design and integrates them into other applications, serious games are full-fledged games for real-life objectives. The goal of this new field of study is to motivate a sense of personal accomplishment in all activities [17], with an increasing focus on health, education, and business.

The use of games and gamification to improve general health has become a major research area in the field of games research, including the recently initiated *Games for Health* journal and conference series [31], and the emerging field of mobile health research (*mHealth*), which refers to the provision of health services and practices via mobile devices, patient monitoring devices, and personal digital assistants [34]. There is a growing body of knowledge concerning topical experiences and reviews documented in the literature [2, 7, 16, 25]. Personalized medicine is another emerging field, closely related to the Quantified Self movement, where the concept of healthcare is moving from the notion of exclusively curative treatment towards personalized, preventative health maintenance [27, 32].

Persuasive Technologies (technologies that attempt to change their users' attitudes or behaviours without coercion or deception [9]) are often applied together with gameful design in applications whose purpose is to ultimately drive changes in user behaviour. The Fogg Behaviour Model (FBM) [10] states that three principal factors need to be considered when designing persuasive technologies: motivation to perform a target behaviour, ability to perform it, and a trigger to action that invites the user to perform the behaviour at an appropriate time. Further studies have shown that the results of persuasive systems significantly vary for different users, thus revealing the need to personalize these systems for each user to accomplish more effective results [1, 12, 13, 23, 24].

Personalized Elements

The design of our PDWA will be based on existing literature, and expanded upon by allowing personalization. The PDWA will help users learn about health-related topics, help users track their health information and visualize them in a meaningful way, assist users in developing beneficial habitual changes, and employ playful, gameful and persuasive design to engage and motivate users to adopt new habits. The adoption of a *one-size-fits-all* approach is incompatible with the concept of a personal assistant, thus personalization of the user experience to each user will be a core element in our design. Our upcoming research will concentrate on studying and evaluating which personalization features may be used and how the application may adapt itself to each user. We will then design, implement, and test the PDWA. The success of our design will be determined by the application's ability to communicate with each user individually and help them achieve the goals that they can set for themselves.

User-specified Personalization

The user will be able to personalize the system to their needs, learning styles, and personal goals.

- *Letting the user define their own goals.* For example, the user may want to learn about general health topics, to track their health status, to plan and adopt new habits, or maybe combine all these goals.
- *Offering different ways of studying about health.* For example, some users might prefer to find and read about specific topics, others to watch videos, others to play games or gamify their activities, and so on.
- *Offering different ways of information tracking and visualization.* Depending on their goals, users may want to track different information, such as health conditions, exam results, dietary, or fitness habits. Users might also have different preferences on how to visualize information, for example, graphically or textually, aggregated, or detailed.
- *Employing different persuasive, playful, and gameful elements to help users achieve their self-defined goals.* People respond differently to each element according to their psychological traits, thus it is important to personalize the user experience to help each user in the most effective way [12, 13, 24].
- *Using a virtual character as a personal assistant, who learns to respond differently the more it interacts with a user.* Research has demonstrated that humans respond to social computers similarly to how they respond to other humans [9, 21], thus the addition of a social user experience may contribute to the accomplishment of the pursued goals.

System Personalization

In addition, it is necessary to investigate and test how the system will choose which personalized elements to use. Presenting the user with a large list of options is inefficient. It would increase the complexity of the user's task too much, since it is difficult to understand all the options at once. Some options for *on-the-go* adaptation that we plan to study include:

- *Define a user profile from personality or player typology surveys* [13]. Further studies will also be needed to understand which kind of personalized elements would work better for which type of user.
- *Present information and increase challenges/options bit by bit*. This common game design element helps the user understand the system and the options they might have. Instead of presenting all the options and possibilities at once, the application would present a single activity or option for the user at a time, increasing complexity as the user masters each single step.
- *Ask what the user wants to do or prefers on-the-go*. Together with the previous approach, instead of presenting the user with a lot of options at once, each possible option will only be presented at the precise moment that the user needs it.
- *Present information in different ways and ask which one the user prefers*. These choices would also be presented *on-the-go* at the precise moment the user needs to make the decision.
- *Track results of engagement and try different approaches*. This approach consists of building an adaptive and intelligent system [6, 12], by continuously tracking user input and selecting the most ap-

propriate design elements for the next interaction based on the results of previous one.

- *Employ affective computing* [26] *and affective ludology* [19]. By being able to assess the user's affective reaction and emotional state, the application can modulate the interactions of the virtual personal assistant with the user accordingly, thus supporting them in the best possible means and according to their daily form or mood.

Conclusion

We presented an outline for the development of a Personalized Playful Digital Wellness Assistant, which will help users track their health status and adopt new habits. Many studies were already conducted in the field of health games and apps, gamification, and persuasive technologies, but personalization of these applications for each individual user is still a new field. Our research intends to coincide with its development by studying and testing new approaches for personalization of gamified health apps. The proposed application will draw together the current best practices of existing health-focused applications, gamification research, and persuasive technologies in a meta-review, which will lend them a baseline for developing future gamified and personalized health systems.

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