

# Gamification of Self-Care by Type 2 Diabetic Patients

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**Abstract.** The project addressed by this paper was undertaken by graduate students in a healthcare-related design studio course within the MID program in the School of Industrial Design at the Georgia Institute of Technology.

After being briefed on the problem, students began with background research intended to help identify and understand the needs of various users, existing solutions, the use environment, as well as specific developmental requirements. In researching this problem further, the team that is the focus of this paper narrowed their attention from general medication adherence to the specific issue of medication adherence in Type 2 Diabetic patients. The team wished to address this population segment after discovering that the required adjustments to lifestyle & medication adherence are particularly problematic and challenging to the newly diagnosed.

This paper details the process of how this team leveraged “gamification” of the self-care process to ease the process of updating diet, medication and lifestyle habits. The design encouraged the patient to care for a virtual pet which moved the focus away from oneself and towards the virtual companion. By caring for this virtual pet, the patient could improve his/her self-care, presumably resulting in improved exercise, diet & medication adherence.

This “gamification” contrasted with more traditional conceptual solutions proposed by other teams that included improved medication organizers, medication dispensers, and reminder Apps. The lifestyle adjustments required by a Type 2 Diabetes diagnosis are largely a psychological and emotional challenge; addressing these problems through providing care for a virtual companion was a novel approach.

**Keywords:** Gamification, Virtual Pet, Industrial Design, Type 2 Diabetes.

## 1 Introduction and Background

More than 37 million people in the United States have diabetes, with 90-95% of them having type 2. With Type 2 diabetes, the body does not respond to insulin normally, resulting in abnormally high levels of blood sugar. Type 2 diabetes often develops in people over 45, but it is increasingly prevalent in children and teens (CDC, 2022). Successfully managing Type 2 diabetes requires a number of significant lifestyle changes. These changes can be difficult and lead to social or psychological problems that get in the way of a person’s ability to self-manage their diabetes (Garrett, Doherty 2014). The need to perform glucose monitoring for example, has been described by

adolescents as the least favorite task, leading some to avoid testing in social environments due to the associated stigma (McCarthy, Ramirez, Robinson 2017).

Behavioral factors are an important component of successful diabetes self-management. There is a high prevalence of depression with diabetes and an opportunity to integrate mental health treatment with diabetes care in order to improve patient and public health outcomes (Ducat, Philipson, Anderson 2014). Generalized anxiety disorder and eating disorders have been found to be more prevalent in people with diabetes (Robinson, Luthra, Vallis 2013).

Gamification is an approach that has been successful for behavioral and educational intervention in a number of contexts. In children for example it has been shown to have significant impacts on nutritional knowledge and promoting good nutritional habits (Suleiman-Martos, et.al. 2021). It has shown highly satisfactory results in helping to develop healthy eating habits (González et.al. 2016). With relation to diabetes, gamification and virtual environments have shown positive results in promoting behavior changes to reduce diabetes related risk, increased extrinsic motivation and provided positive reinforcement (Theng et.al. 2015). This paper outlines how “gamification” was used in the design of an App to facilitate changes in diet, medication and lifestyle habits by newly diagnosed Type 2 Diabetic patients.

## 2 Method

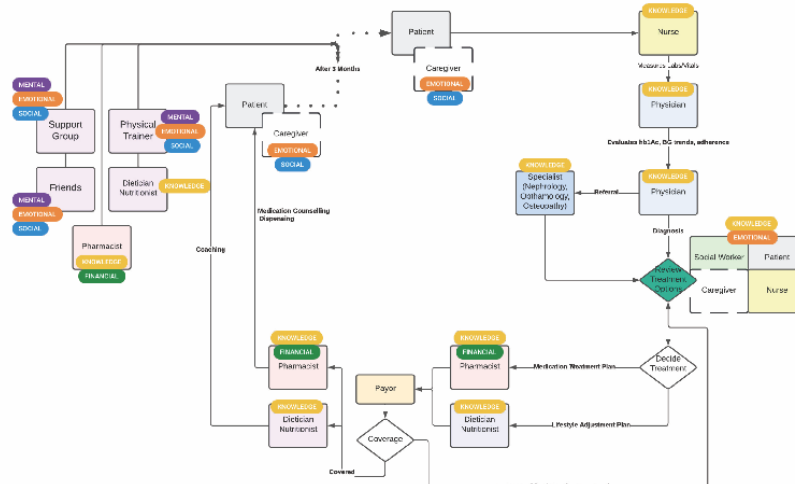
The problem addressed by students was identified and presented to the class by Cognizant, which supported the student’s efforts throughout the semester.

In one of several project prompts distributed to the students, Cognizant outlined the general problem of assuring medication adherence in individuals suffering from chronic diseases. Students formed teams of three to address specific prompts of their choosing. A virtual panel discussion was conducted in which experts from Cognizant provided additional detail and fielded questions related to the various prompts to help students identify specific problem areas to undertake and to define the scope for the resulting projects.

After being briefed on the problem, the team that is the focus of this paper narrowed their attention from general medication adherence to medication adherence in Type 2 Diabetic patients since this diagnosis typically occurs later in life after habits and lifestyle preferences are already established. In conducting background research, the team discovered that the most common causes for treatment non-adherence can be attributed to 1) Financial; 2) Mental; 3) Emotional; 4) Knowledge; and 5) Social factors. Based on their preliminary research, students developed specific design goals & design criteria to guide subsequent design development.

Students generated a wide range of ideas and used morphological matrices for concept mapping, resulting in three solution concepts that were presented to Cognizant and the class. Based largely on feedback received during this presentation, the team decided to move forward with the design of an App featuring a virtual pet to encourage the newly diagnosed to follow medication routines and make lifestyle adjustments such as diet & exercise. The journey that newly diagnosed patients typically undergo was examined in order to identify pain points to be addressed by the App.

**Fig. 1.** Patient Journey from Diagnosis.



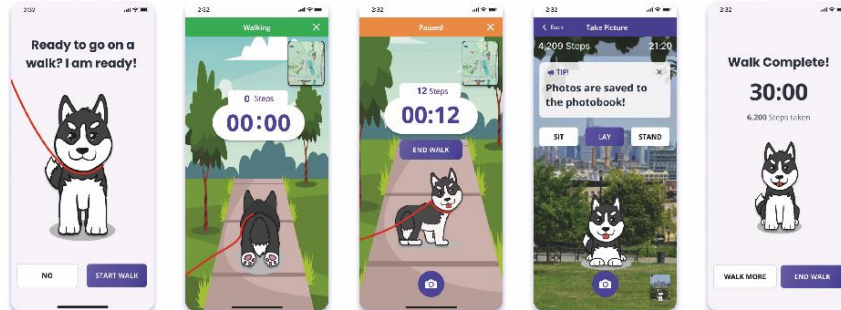
This App was developed and underwent preliminary usability testing with HCI students who evaluated the usability of the app (vs. the efficacy of the app in actually improving the habits of diabetic patients). Recommended adjustments were made to the App design and a final version was presented to Cognizant and the class at semester's end.

### 3 Results & Discussion

In theory an App based on interaction with a virtual companion could ease the transition to a healthier lifestyle for patients by shifting the focus from making required changes in one's own diet, medication and exercise to caring for another entity (in the form of the digital pet).

The team's design was an innovative approach to easing the difficult lifestyle transition faced by newly diagnosed Type 2 Diabetic patients and represented a more complete solution than most developed by other teams in the class – in that it addressed all the adjustments that must be made to one's lifestyle after a Type 2 Diabetes diagnosis, diet, medication adherence and exercise.

**Fig. 2.** Selected Screenshots from the final App design.



## 4 Conclusions & Recommendations

The final App design resulting from this project focused primarily on the needs of the patient vs. those of healthcare providers. To be widely adopted (and as originally envisioned), the design must provide targeted users with easy access to healthcare providers by incentivizing the involvement of those providers. Solutions to this issue should be explored further in subsequent refinement of this approach. Clearly it is recommended that the design be prototyped further and that testing with actual users, Type 2 Diabetic patients, be conducted in order to provide a more objective measure of the potential usefulness of the App proposed by students.

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