Çocuklarda Diyabet Farkındalığını Sağlamak İçin Eğitici Bir Mobil Oyun Geliştirme

Developing an Educational Mobile Game to Provide Diabetes-Awareness Among Children

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***Özetçe*—Diyabet, insan vücudunda insülin hormonlarının yetersiz üretilmesinden veya insülin hormonunun insan vücudunda yetersiz kullanılmasından kaynaklanan yaşam boyu sürecek ciddi bir hastalıktır. Diyabet gün geçtikçe daha yaygın hale gelmektedir ve çok önemli bir hastalıktır. Yine de insanlar diyabeti ciddiye almıyorlar çünkü diyabet hakkında yeterli bilgiye sahip değiller. Ayrıca çoğu insan şeker hastası olduğunun farkına varamaz. Bu nedenle literatürdeki çalışmaların çoğu sadece diyabet teşhisine odaklanmıştır. Diyabet tedavisi son derece maliyetli bir süreçtir. Diyabet tedavisinde öncelikle hasta yakınlarının ve hastanın bilinçlendirilmesi amaçlanmaktadır. Hasta yakınlarını ve hastayı bilinçlendirmek için eğitim çalışmaları yapılmaktadır. Hasta ve yakınlarının bilinçlendirilmesi amacıyla verilen bu eğitim, diyabet tedavi sürecinin en önemli ve vazgeçilmez adımıdır. Böylece bu eğitim amacına daha kolay ve hızlı bir şekilde ulaşacaktır. Hazırlanan oyunda şeker hastalığı önleme yöntemleri ve şeker hastalığı hakkında bilgiler yer alacaktır. Oyunda şeker hastalığına neden olabilecek faktörlerin yapılması durumunda, hastalığın belirtileri oyuncuya gösterilecektir. Ödüllü sınavlar ve oyundaki kısa bilgiler yardımıyla çocuklar için eğlenceli bir öğrenme süreci hedefleniyor. Çalışmanın uzun vadeli hedefleri hasta olmayanları bilinçlendirmek ve oluşturulan farkındalıkla diyabet hastalığının görülme sıklığını azaltmaktır.**

Anahtar Kelimeler—Diyabet Eğitimi, Oyun Temelli Eğitim, Mobil Programlama, Oyun Programlama.

Abstract—Diabetes is a serious life-long disease caused by the insufficient production of insulin hormones in the human body or the inefficient use of the insulin hormone in the human body. Diabetes is becoming more common day by day and it is a very important disease. Even so, people do not take diabetes seriously because they do not have enough information about diabetes. Also, most people cannot realize they have diabetes. For this reason, most of the studies in the literature have focused only on the diagnosis of diabetes. Diabetes treatment is an extremely costly process. In the treatment of diabetes, it is primarily aimed to raise the awareness of the patients' relatives and the patient. Training studies are carried out to raise the awareness of patient relatives and the patient. This training, which is given to raise awareness of patients and their relatives, is the most important and indispensable step of the diabetes treatment process. So, this education will achieve its goal more easily and quickly. In the prepared game, there will be information about diabetes prevention methods and diabetes disease. In case of doing factors that may cause diabetes in the game, the symptoms of the disease will be shown to the player. With the help of award-winning quizzes and short information in the game, a fun learning process is aimed for children. The long-term goals of the study are to raise awareness among non-patients and reduce the frequency of occurrence of diabetes disease with the help of created awareness.

Keywords—*Diabetes Education, Game Based-Education, Mobile Programming, Game Programming.*

I. INTRODUCTION

A. Description and Epidemiology of Diabetes

Diabetes is a metabolic disease that requires constant medical care. Diabetes patients cannot benefit from carbohydrates, fats, and proteins sufficiently due to insulin insufficiency or insulin defects. If insulin is not used adequately in the body, the glucose level in the blood rises [1,2].

Diabetes may also cause coronary heart diseases, cerebrovascular diseases, and peripheral vascular diseases to occur at an earlier age [2].

B. Statistics

Turkey, after Russia and Germany, is the third country with the most diabetes across Europe. And Turkey is the country with the fastest increase in diabetes. In Turkey, 15% of the adult population is diabetic. However, the number of people who are aware of diabetes is estimated quite low [17]. One out of every five people in Turkey has at least some information about diabetes. In 2015, the estimated diabetes prevalence in Turkey is 12.5%, while the number of adults with diabetes is 6.3 million [18].

C. Classification of Diabetes

There are three clinical types in the diabetes classification [1]. The first one is type1 diabetes is a lifelong disease. In this type of diabetes, the pancreas secretes no or too little insulin hormone. For this reason, glucose does not enter the cell to convert into energy [2].

The second one is type 2 diabetes is the most common type of diabetes and is known as non-insulin-dependent diabetes or adult diabetes [3]. Type2 diabetes was generally starting in middle age or later. But the incidence of type 2 diabetes in children and adolescents has increased recently. Obesity plays a role in the increase in the prevalence of type 2 diabetes in children [2].

The third one of Gestational diabetes (GDM) is a glucose intolerance disorder that first appeared during pregnancy [4,5]. GDM is diagnosed in 7% of pregnancies, and its prevalence has increased in parallel with obesity [3]. GDM occurs after placental hormones block the effects of insulin, usually after the 24th week of pregnancy [5].

D. Diagnostic Criteria of Diabetes

The principal causes of diabetes are Stress, Destruction of hormones that make insulin in the pancreas, Genetic factors, Obesity, an Unhealthy diet, a sedentary lifestyle, and a life without sport [6,7]. Some symptoms seen in patients with diabetes include excessive thirst, a significant increase in fluid intake, extreme and frequent urination, fatigue and weakness, frequent and excessive hunger, leg pain, and acetone-like smelled breath [6,7]. Diagnosis of diabetes or pre-diabetes is made by fasting plasma glucose (FPG), 2-hour oral glucose tolerance test (OGTT), and glycosylated hemoglobin A1c (HbA1c) measurements [2].

E. Complication of Diabetes

Various systems, tissue, or organ damages may occur in the short and long term in case of uncontrolled blood glucose levels in diabetic individuals. These injuries are called complications of diabetes [8]. These cause to decrease the quality of life and maybe life-threatening. Complications of diabetes are acute and chronic and can affect all organs and systems [9].

F. Treatment of Diabetes

The treatment is to give the insulin into the body and to improve the patient's life quality. Pills to reduce insulin resistance and insulin injections using pumps, injectors, or pens are preferred in general (Figure 1) [10].

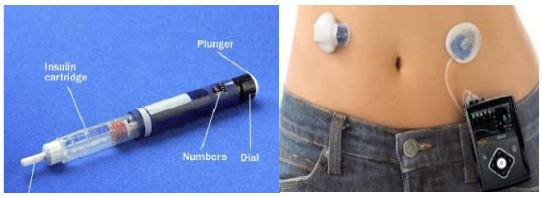

Figure 1. Insulin Pump Injector (on the left) and Insulin Pump (on the right) [11].

Other elementary treatments imply medical nutrition therapy, medical treatment, exercise, and education [12]. First, a patient with diabetes and his/her family should be educated to carry out an effective diabetes treatment. The education helps patients to understand and gain healthy behaviors and diabetes management [13].

G. Game-Based Education

According to recent scientific research, games are an excellent learning tool and students can learn via this concept with fun [14]. Game-based learning is simply to create a specific problem scenario. Game-based learning is motivating and interesting. It allows learners to focus longer. In game-based learning, students are directly in the experience and take advantage of it. Giving feedback is very important in game-based learning. Thus, students do not waste time due to their mistakes and take action to correct their mistakes immediately. Game-based learning motivates the student, being interesting and entertaining, it enables students to focus longer. Game-based learning helps students to remember complex events and concepts more easily and makes it easier for students to learn. Moreover, educational computer games reduce students' fears and anxieties about the subject [15,16].

H. Aim of the Study

This study aims to develop a game to train all individuals to increase diabetes awareness, especially among children. We prepared a scenario and developed a one-shot game for this purpose.

II. Materials and Methods

A. Unity

A game engine is essential to develop games [15]. Unity makes the development of both 2D and 3D games and simulations easier thanks to its available libraries and tools [19]. Figure 2 shows the main screen of Unity Game Engine.

B. Visual Studio IDE

Visual Studio is an integrated development environment to write codes that work compatibly with Unity [19].

C. Adobe Photoshop CC

Adobe Photoshop CC is a photo editor program that helps the programmer to edit existing images and to create a new image [4].

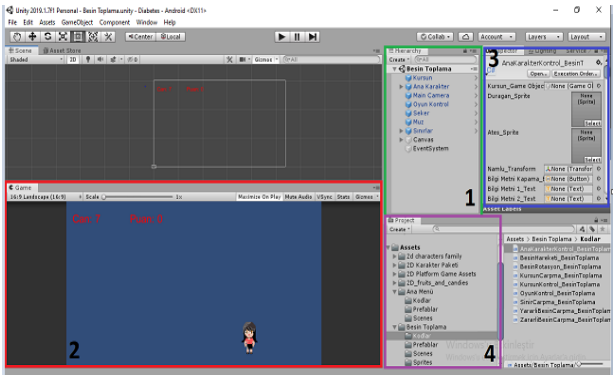

Figure 2. Main Screen of Unity Game Engine.

D. Scenario

The main menu screen appears first as the game starts. There are the "Ouyunu Oyna (Play Game)," "Oyundan Çık (Quit Game)," "Kullanıcı Bilgileri (User Information,)" and "En Yüksek Skoru Sil (Delete the Highest Scores)" buttons here (Figure 3). The user information button allows changing the user's age, weight, height, and gender at the beginning of the game (Figure 4).

Figure 3. Main Menu Scene.

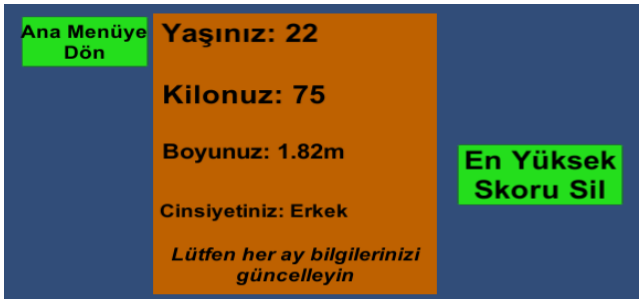

Figure 4. User Information.

There is a main character in the game that the user can control. The character can only move in the horizontal plane since the game is a 2-dimensional (2D) game. Nutrients fall from the top towards the main character. The main character's goal is to catch useful foods and shoot harmful foods with an insulin needle. The sample of this scene is shown in Figure 5. As the game's difficulty levels increase, the number of foods, the number of the type of food and the speed of food increase. In this way, it is aimed to make the game more enjoyable, the game to be more interesting and thus to increase the level of learning by having fun. Catching beneficial foods and hitting harmful foods are positive score points, collecting harmful food and hitting beneficial foods are negative score points, and beneficial foods falling to the ground is -1 health point. The user has a total of 7 health points. If he drops the beneficial food 7 times in total, his life will be zero and the game is over.

Figure 5. An Image from within the Game.

When the game is over, the total scores and best scores are printed on the screen and saved. In this way, the player can track the total score. If the user feeds on harmful foods too much, she or he will become fat (Figure 6). In this way, some side effects of diabetes and some problems experienced by the individual with diabetes are shown to the user. At the same time, as the character becomes fat, the player will be informed about diabetes with the information boxes that appear on the screen. At regular intervals, the player will be given quizzes about diabetes. In this way, the knowledge level of the player and the increase in the knowledge level of the player can be measured. As a result of these measurements, it was aimed to determine how much awareness about diabetes disease increased.

Figure 6. An Image from within the Game.

III. RESULTS

Some constructive criticism about the game was also received. Constructive criticisms "Graphics and

backgrounds need to be improved." And "There need to be more levels." it was in shape.

The game consisted of the main menu scene and a game scene. While designing the main menu scene, 1 script file was used. In the main menu scene, there are a total of 6 button components, 1 image component, 5 text components, and 1 camera object. 8 script files were used while creating the food collection scene. These script files are written for the main character movement, food movement, rotation of food, bullet control, game control, the control of foods that hit the border, the control of beneficial foods that collides with bullet or character, the control of harmful foods that collides with bullet or character. A total of 6 objects were used in the food collection scene: bullet, the main character, sugar, banana, camera, and borders. Besides, 9 button components, 1 image component, and 11 text components were used in the food collection scene.

77 lines of code were written for the preparation of the main menu scene. 457 lines of code were written for the prepare the food collection scene. 155 lines of code were used in the script file written for the main character movement. 18 lines of code were used in the script file written for the food movement. 36 lines of code were used in the script file written for food rotation. 21 lines of code were used in the script file written for bullet control. 44 lines of code were used in the script file written for game control. 125 lines of code were used in the script file that was written for the control of the food that collides with the border. 29 lines of code were used in the script file that was written for the control of beneficial foods that collides with bullet or character. 29 lines of code were used in the script file that was written for the control of harmful foods that collides with bullet or character.

As a result, a total of 9 script files and a total of 534 lines of code were used to write this game. Besides, a total of 6 game objects, 2 camera objects, 15 button components, 2 image components, and 16 text components were used in the game.

So this education will achieve its goal more easily and quickly. In the prepared game, there will be information about diabetes prevention methods and diabetes disease.

In case of doing factors that may cause diabetes in the game, the symptoms of the disease will be shown to the player. With the help of award-winning quizzes and short information in the game, a fun learning process is aimed for children.

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