Journal of Artificial Intelligence with Applications

Journal of Artificial Intellicence with Application, 2020, 1, 15-19

Developing An Educational Mobile Game To Provide Diabetes-Awareness Among Children

Mustafa Berkant Selek[1], Uğur Adnan Çiftçiogulları[2], Yılmaz Kemal Yüce[3], Yalçın İşler[2*]

[1]Ege Vocational School, Ege University, İzmir Turkey
[2]Biomedical Engineering Deparment, İzmir Katip Celebi University, İzmir Turkey
[3]Department of Computer Engineering, Alanya Alladdin Keykubat University, Alanya, Antalya, Turkey

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 project 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.

1. INTRODUCTION

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 (TEMD, 2020), The presence of diabetes can also cause macrovascular problems such as coronary heart diseases, cerebrovascular diseases, and peripheral vascular diseases to occur at an earlier age (TEMD, 2020).

1.1. Classification of Diabetes

There are three clinical types in the diabetes classification (TEMD, 2020). The first one is type1 diabetes is a lifelong disease. In this type of diabetes, the insulin hormone is any produced from the pancreas, or too little is produced. For this reason, glucose does not enter the cell to convert into energy (TEMD, 2020). 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 (American Diabetes Association, 2016). Type 2 diabetes was generally starting in middle age or later. But, the incidence of type2 diabetes in children and adolescents

Corresponding Author: Yalçın İşler, E-mail: yalcin.isler@ikcu.edu.tr

has increased recently. Increased obesity in childhood is thought to play a role in the development of type 2 diabetes in children (TEMD, 2020). The third one is Gestational diabetes is a glucose tolerance disorder that first appeared during pregnancy or was diagnosed during pregnancy (Karakurt, 2009, Blumer 2013). GDM is seen in 7% of pregnancies. In recent years, GDM prevalence has increased in parallel with obesity and type 2 diabetes prevalence (American Diabetes Association, 2016). Gestational diabetes occurs after placental hormones block the effects of insulin, usually after the 24th week of pregnancy (Blumer, 2013).

1.2. Diagnostic Criteria of Diabetes

Diagnosis of diabetes or prediabetes is made by fasting plasma glucose (FPG), 2-hour oral glucose tolerance test (OGTT), and glycosylated hemoglobin A1c (hba1c) measurements (TEMD, 2020). The main causes of diabetes include Stress, Destruction of hormones that make insulin in the pancreas, Genetic factors, Obesity, an Unhealthy diet, A sedentary lifestyle, and a life without sport (Sivrikaya, 2019, Özer, 2002). Some symptoms seen in patients with diabetes include excessive thirst, a significant increase in fluid intake, excessive and frequent urination, fatigue and weakness, frequent and excessive hunger, leg pain, and breath begin to sharply smell like acetone (Sivrikaya, 2019, Özer, 2002).

1.3. Complication of Diabetes

In cases where blood glucose levels are not controlled in all diabetic individuals, various systems, tissue, or organ damage may occur in the short and long term. These injuries are called complications of diabetes (Uludağ, 2010). Complications in diabetics decrease the quality of life and maybe life-threatening. Complications of diabetes are acute and chronic and can affect all organs and systems (Mudaliar, 2012).

1.4. Treatment of Diabetes

The main purpose of the treatment is to replace the insulin that is lacking and to improve the patient's quality of life. In diabetes treatment, pills that reduce insulin resistance and insulin injections such as pumps, injectors, or pens are used (Durmaz, 2004). In figure 1, you can see the example of an insulin pump and insulin injector.

Figure 1. Insulin pump and insulin pump injector (Internet, 2020, Kaushik, 2012)

Basic diabetes treatments are medical nutrition therapy, medical treatment, exercise, and education (Yıldız, 2009). An individual with diabetes and his family should be educated to carry out an effective diabetes treatment (Yıldız, 2009). Diabetes education helps patients to know about the health of the patient, to understand and apply healthy behaviors and diabetes management (Ishikawa, 2008).

1.5. Game-Based Education

Game-based learning environments are created with specific problem scenarios. According to the results of recent scientific research, games are an excellent learning tool and students can learn via this concept with fun (Akın, 2015).

Some of the features of game-based learning are: It 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 (Aslan, 2015, ADA, 2016).

1.6. 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 to be quite low (O'Reilly, 2005). One out of every five people in Turkey has at least some information about diabetes. In 2015, diabetes prevalence in Turkey is 12.5%, while the number of adults with diabetes is 6.3 million (IDF, 2020).

2. MATERIALS AND METHODS

2.1. Unity

Unity is a game engine. The game engine is the universal laws in the game (Aslan, 2015). Unity enables the development of both 2D and 3D video games and simulations thanks to the libraries and tools it contains (Gruszkiewicz, 2014).

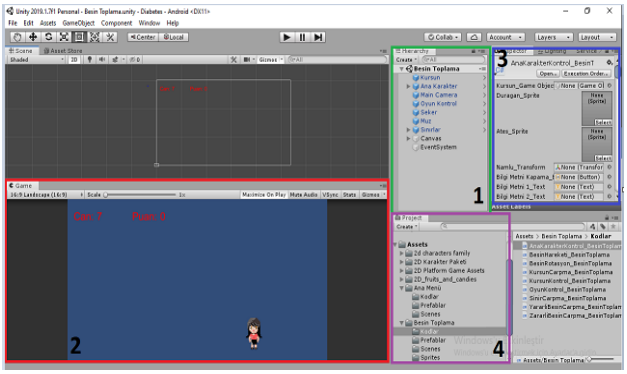

Figure 2. Main screen of unity game engine

In figure 2, you can see the interface of unity. Also, this photo was taken from the food collection game.

2.2. Visual Studio IDE

Visual Studio is an integrated development environment to write codes that work compatibly with Unity (Gruszkiewicz, 2014).

2.3 Visual Photoshop CC

Adobe Photoshop CC program is a photo editor where you can shape your graphics and photos. Graphic editing and designing software are programs that help you make edits to existing images rather than creating a new image (Karakurt, 2009).

2.4. Scenario

When the game is opened, the main menu screen appears first. There are "Play Game" button, "Quit Game" button, "User Information" button and "Delete the Highest Score" button here. You can see these buttons in figure 3. With the help of the user information button, the user's age, weight, height, and gender information will be recorded at the beginning of the game. You can see this part in figure 4. This information will be requested to be updated by the user once a month. The game is a 2D game. There is a main character in the game that the user controls. The main character can only move in the horizontal plane.

Figure 3. Main Menu Scene

Figure 4. User Information

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 food, 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.

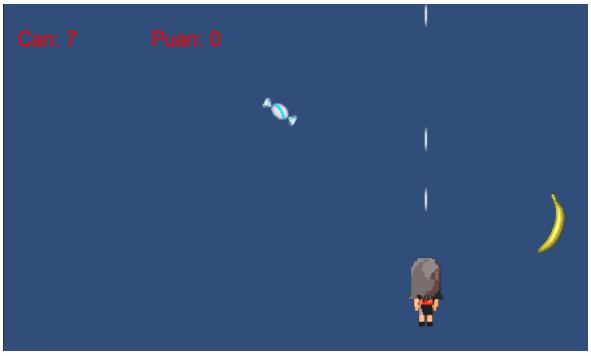

Figure 5. An image from within the game

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 as shown in 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

3. 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. As a result, although some features were not liked by the users, the project achieved its intended purpose.

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.

The long-term goals of the project are to raise awareness among non-patients and reduce the frequency of occurrence of diabetes disease with the help of created awareness

4. REFERENCES

Türkiye Endokronoloji ve Metabolizma Derneği (TEMD) ,Temd Diabetes Mellitus ve Komplikasyonlarının Tanı, Tedavi ve İzlem Kılavuzu – 2020 Yazım Komitesi. Diabetes Mellitus ve Komplikasyonlarının Tanı, Tedavi ve İzlem Kılavuzu [İnternet]. [Erişim Tarihi: 9 Aralık 2020]. Erişim Adresi: http://temd.org.tr/admin/uploads/tbl_kilavuz/20200625154506-2020tbl_kilavuz86bf012d90.pdf

Türk Halk Sağlığı Kurumu Yayın Komisyonu. T.C. Sağlık Bakanlığı Türkiye Diyabet Programı (2015-2020) İnternet. [Erişim Tarihi: 9 Aralık 2020]. Erişim Adresi: https://extranet.who.int/ncdccs/Data/TUR_D1_T%C3%BCrkiye%20Diyabet%20Program%C4%B1%202015-2020.pdf

American Diabetes Association. Standards of medical care in diabetes, Approaches to Glycemic Treatment. Diabetes Care.2016, 39 (1): 52-59

Karakurt, F., Çarlıoğlu, A., Kasapoğlu, B., Gümüş, İ. Gestasyonel Diabetes Mellitus Tanı ve Tedavisi. Yeni Tıp Dergisi. 2009; 26: 134-138.

Sivrikaya, S., Ergün, S. Diyabet eğitim ve hemşirenin rolü. Ahi Evran Üniversitesi Sağlık Yüksek Okulu Sağlık Bilimleri Dergisi Cilt:2, Sayı:3, Sayfa: 25-36, 2019.

Özer E. Etkin diyabet hasta eğitim programlarının geliştirilmesi. Yılmaz T, (Ed). Diyabet Merkezleri Alt Yapısının Organizasyonu ve Diyabet Tanı ve Tedavi Algoritması. İstanbul: Türkiye Diyabet Merkezi Yayınları. P: 33-42, 2002.

Durmaz Akyol A. Diyabet eğitimi. Fadıloğlu Ç.(Ed). III. Ege Dahili Tıp Günleri Diyabet Hemşireliği. İzmir: Meta Basım Matbaacılık Hizmetleri. P:201-227, 2004.

Yıldız, E., Pekcan, G., Besler, T., Bozkut, N., Mercanlıgil, S., Baysal, A., Aksoy, M., Besler, T., Bozkurt, N., Keçecioğlu, S., Merdol, T. Diyet El Kitabı. 5. Baskı. Ankara: Hatiboğlu Yayınevi; 2008

Ishikawa, H., Takeuchi, T., Yano, E. Measuring Functional, Communicative, And Critical Health Literacy. Diabetes Care. 31(5): 874-879, 2008.

Akın, A., Atıcı, B. Oyun Tabanlı Öğrenme Ortamlarının Öğrenci Başarısına ve Görüşlerine Etkisi. Turkish Journal of Educational Studies, Cilt: 2, Sayı: 2, Sayfa: 75-102 2015.

Aslan, S., Balci, O. GAMED: digital educational game development methodology. Simulation, Volume: 91 Issue: 4, Pages: 307-319, 2015.

American Diabetes Association. Standards of medical care in diabetes, Foundations of Care, and Comprehensive Medical Evaluation. Diabetes Care 39(1): 23–35, 2016.

O'Reilly, C. Managing the Care of Patients With Diabetes in the Home Care Setting. Diabetes Spectrum. 2005; 18(3):162-166.

IDF Members İn Europe / Turkey [İnternet]. 2017 [Erişim Tarihi: 9 Aralık 2020] Erişim Adresi: https://idf.org/our-network/regions-members/europe/members/163-turkey.html#:~:text=Turkey%20is%20one%20of%20the,will%20rise%20to%2068%20million.

Gruszkiewicz, S. Three-Dimensional Engine Simulators with Unity3D Game Software. The 13th Annual General Assembly of the JAMU, Newfoundland, Labrador, Canada: October 15-17, 2014.

Blumer, I., Hadar, E., Hadden, D., Jovanovič, L., Mestman, J., Murad, M., Yogev, Y. Diabetes and pregnancy: an endocrine society clinical practice guideline. J Clin Endocrinol Metab. 98 (11):4227-4249, 2013.

Uludağ, O. Diyabete Bağlı İkincil Hastalıklar (Komplikasyonlar). Mised. 23-24: 39-44, 2010.

Mudaliar S.V.H. Management and prevention of diabetic complications. J.S. Skyler, editor. Atlas of Diabetes. Miami, USA: Springer Science + Business Media, 2012

Diyabet Hastalarının Kullandığı İnsülin Pompası Ele Geçirilebilir! [İnternet]. Erişim Tarihi: 09 Aralık 2020]. Teknoloji turu: https://teknolojituru.com/2016/10/25/diyabet-hastalarinin-kullandigi-insulin-pompasi-ele-gecirilebilir/

Kaushik, A. Newer Strategies for Insulin Delivery. International Journal of Research in , 1717-1721, 2012.