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Practical study on the effect of educational games on ADHD students

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Abstract

Rising kids' concentrations is a hard task for both parents and teachers. We can achieve our goal of the game (Increasing kid's concentration level) by making the game surroundings a lot harder in the intercourse of the game, so we have here four kinds of surroundings for the kid to interact with: Green box: this is the main box for the kid to hit. Yellow box: this is a box with negative attitude that the kid should stay aware of. White box: this is a box for increasing time if he ran out of time. Red box: this is a rare box it's appears and disappears in a 1 second and requires a high concentration level to hit it. They abducted the hero's girlfriend and he got angry and try to restore her and free the planet from this disastrous occupation.

Keywords: Educational Games, ADHD treatment, FPS Games.

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1. Introduction

ADHD is the abbreviation of Attention Deficit Hyperactivity disorder. It is a mental disorder of the neurodevelopment type. Its main points are excessive activity, problems paying attention or the difficulty for someone to control his/her behaviour. Most of the cases that have symptoms appear before the age of 12 or after they pass 6 months. Problems can appear in at least two settings, such as school, home or recreational activities. When children have problems paying attention, this may result in a poor performance in school. Although it might be bad for society, many children with ADHD can have a good attention span for tasks they find interesting. The exact cause of the disorder is unknown for the majority of the cases although it's the most commonly studied and diagnosed disorder in children and infants. After 2015, the number of affected people rose to 51.1 million globally. ADHD can affect boys three times more than girls. About 30%–50% of people are diagnosed in their childhood and continue to have symptoms in adulthood and between 2% and 5% of the adults are continued to have the symptoms. Therefore, in order to fight this disorder with newly technological way comes my game. It's a game in the aspect of First Person Shooter (FPS) where the player (Kid) tries to hit as many cubes as he can in a closed environment before time runs out. In my game, I use Unity Game Engine as the main development tool for designing, programming and running the game. Unity Game Engine is a multi-functionality game engine that can support 2D and 3D graphics along with drag and drop with the benefit of C# scripting. There were two additional scripting languages, like Bo, which was deleted when they released Unity 5 and JavaScript which began its removal process in the beginning of Unity 2017.1. Unity supports the following APIs: Direct3D on Windows and Xbox One; OpenGL on Linux, MacOS and Windows; OpenGL ES on Android and iOS; WebGL on the web and professional APIs on video game consoles. In addition, Unity provides many other APIs. Unity allows in 2D games to import outside animated patterns along with the advanced 2D world viewer. As for 3D games, Unity can compress textures and mipmaps along with other different graphical settings that suits every platform it supports. It supports terrain design, reflection mapping, landscape layout, SSAO which stands for screen space ambient occlusion. Unity also provides developer services: Unity Ads, Unity Analytics, Unity Certification, Unity Cloud Build, Unity Every play, Unity IAP, Unity Multiplayer, Unity Performance and Reporting and Unity Collaborate. It can create a custom vertex, part (or pixel), tessellation, compute shaders and shading Unity's own surface using Cg which is a modified version of Microsoft's high-level shading language. Our game storyline talks about a peaceful planet called Pill-earth where everyone loves each other. We have our hero and his lover (girlfriend) sitting in the park and all of the sudden an invasion of cubes came to the planet to occupy it and spread hatred among planet's inhabitants. They abducted the hero's girlfriend and he got angry and tries to restore her and free the planet from this disastrous occupation. At last, he succeeds to kill the leader and restore his lover and free the planet. This story makes the child interacts more in the game.

2. Objectives and aims of the research

1. ADHD treatment & its kinds.
2. ADHD & how to identify it.
3. Educational Games and its role in our lives.
4. Introduction about different kind of games.
5. Introduction to My Game.
6. My Game's role in fighting ADHD.

3. Comparsion between unity and unreal game engines

Wide view on comparing Unity Game Engine and Unreal game engine

4. Data collection and analysis

4.1. Unity Game Engine

4.1.1. Overview

Unity Game Engine is a multi-functionality game engine that can support 2D and 3D graphics along with drag and drop with the benefit of C# scripting. There were two additional scripting languages, like Bo, which was deleted when they released Unity 5 and JavaScript which began its removal process in the beginning of Unity 2017.1.

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4.1.2. Supported platforms

Unity can module into 27 different platforms, some of them are: IOS, Android, Vulkan, Oculus Rift, Windows, Linux, Mac OS, Samsung TV, PlayStation 4, PlayStation Vita, VR Rift, Android TV, Facebook Gameroom, etc.

Unity has previously supported seven other platforms, including its Unity Web Player software, which was turned off for WebGL.

Unity is the primary SDK for the Wii U console platform, with a free version by Nintendo with each Wii U developer license. Unity calls this package of third-party SDK an “Industry First.”

4.1.3. History

In 2012, VentureBeat said: ‘Few companies have contributed significantly to the flow of independently produced games called Unity Technologies. ... More than 1.3 million developers are using its tools to create gee whiz graphics on iOS, Android, console, PC, And web games ... Unity wants to be the engine for multi-platform games, period’.

For the Apple Design Awards at the WWDC 2006, Apple, Inc. named Unity as the second best-used category for Mac OS X Graphics, 1 year later Unity launched at the same trade show. Unity Technologies says this is the first time a game design tool has been nominated for this award. A May 2012 Game Developer poll identified Unity as the best gaming engine for mobile platforms. In July 2014, Unity won the ‘Best Engine’ award at the annual UK's Develop Industry Excellence Awards.

Unity 5 received similar praise, with The Verge saying that ‘unity has begun with the aim of making the development of games available to all. Unity 5 is a long-awaited step towards the future’.

After Unity 5 was released, Unity Technologies received some criticism of the huge production of fast-produced games released on the Steam platform by inexperienced developers. CEO John Riccitiello said in an interview that he thought this would be one of the side effects of democratizing game development: ‘If I had my way, I would like to see 50 million people using Unity—although I do not think we will get there any time soon I'd like to see high school and college kids using it, people outside the core industry. I think it's sad that most people are consumers of technology and not

creators. The world's a better place when people know how to create, not just consume, and that's what we're trying to promote'. He said.

In December 2016, Unity Technologies announced that they will change Unity's version numbering system from sequence-based identifiers to release year to align its versions with its most frequent launch.

4.1.4. Marketing

On December 16, 2013, Unity Technologies Japan unveiled new screenshots of an official mascot named Unity-Chan (Yuniti-chan), the real name Kohaku Otori (expressed by Asuka Kakumoto), with a character show at Tokyo's Comic Market 85 event from 29 to 31 December, where goods of the special character will be distributed and her voice actress will be represented at the event. The game data associated with the character was to be released in the spring of 2014. The character was designed by the Japanese designer of Unity Technologies 'ntny' as an open-source heroine. The company allows the use of Unity-Chan and associated characters in secondary projects under certain licenses. For example, Unity-Chan appears as a playable character in Run bow. The popularity of the character also resulted in VOCALOID adaptations appearances, including its own VOCALOID 4 audio library and a special VOCALOID configuration designed to work with Unity Engine 5.0 named Unity with VOCALOID.

4.2. Unreal Game Engine

Unreal Engine was developed by Epic Games Inc., first game had been made by the engine called Unreal. Its main use was for FPS games only, but it proved useful in other game genres, such as MMORPG, Stealth and Adventure. The source code is written in C++ and the most advantageous feature is its portability and it's being used by a lot of game developers nowadays. The game engine has a lot of awards one of them is the gunnies world record for the most successful game engine.

The official stable version is Unreal Engine 4. It can support Windows, Mac OS, Oculus Rift, Xbox, PS, Nintendo and other platforms, which is crucial in the game industry nowadays.

4.2.1. History

Unreal Engine 1

First generation of Unreal Game Engine was made by Epic Game Inc. founder Tim Sweeney; the game engine was inspired from Carmack's marvellous work on Doom and Quake. The game engine started in 1995 and the developer started developing a FPS game called Unreal which will be released 3 years after in 1998 and it's a medieval game with alien weapons and elements.

In the first edition of the game engine, it has both software and hardware rendering along with collision detection, coloured lights, texture filtering and a level editor called UnrealEd, which had real-time geometry operations and was supported in the beginning of 1996. In the development process, they added real time detects illumination and light sourcing which was integrated, respectively, in 1995 and 1997. Unreal had the support for windows, Mac and Linux. It started the support of PlayStation 2 in the opening of Unreal Tournament, along with a secret level they supported Dreamcast also. Unreal added a lot of improvements in 2000 like skeletal animation system, higher polygon models and large scale terrain system.

In the end of 1999, New York Time announced that 16 projects were using Unreal Game Engine, such as Deus Ex, Nerf Blast Arena and Duke Nukem Forever, which was made by 3D Realms and it was extraordinary famous on GameCube Consoles. It costed around 3 million dollars to create and 350 thousand dollars to license. Unreal gave creators the ability of creating their own world with the help of UnrealEd and UnrealScript which is a newly added scripting language.

Unreal Engine 2

In 2002, second version of Unreal Game Engine came out along with a game called America's Army, which was a free multiplayer shooter game developed by U.S. Army for the recruitment. This version was the same as last but the renderer was totally rewritten. It had a lot of varieties, such as exporting plug-ins from Maya and 3D Max, Karma Physics Engine, Matinee Cinematic edition tool. It had a new version of UnrealEd called UnrealEd 2, which was distributed just before this generation came out and followed shortly by UnrealEd 3. It had improved assets and added support to Xbox console Platform.

Unreal Engine 2.5 was the same as Unreal Engine 2 but they added a few features like vehicle physics, particle system editor for UnrealEd, 64 bit support and they improved the overall rendering performance. Ubisoft Montreal announced that Unreal Engine 2 can module successfully to Nintendo 3DS in March 2011.

Unreal Engine 3

In 2004, there were screenshot of the UE3 which was under development for over 18 months, but unlike UE2 which had the support of fixed function pipeline; UE3 was developed to use the advantageous of the fully programmable hardware shader. All lightening calculations were made by pixel. UE3 supported gamma correct high dynamic range renderer.

Firstly, UE3 supported only Windows, PlayStation 3 and Xbox 360, IOS and Android were added in late 2010. Infinity Blade was the first game made for IOS and Dungeons Defenders was the first for Android. OS X support was added in 2011 along with the support of adobe flash player 11 and it had been added through stage 3D hardware accelerated APIs. It was used in 2 Wii U games: Batman: Arkham City and Aliens: Colonial Marines. In 2012, Windows 8 and Windows RT support was added. Epic Games cooperated with Mozilla in 2013 to add the support of HTML5. UE 3 added a lot of significant updates through its lifetime like: large crowd simulations, destructible objects, touch functionality, soft body dynamics, IPod support, real time global illumination solution, Steamworks integration, etc.

4.2.2. Unreal Development Kit

Although Unreal Engine 3 was just released for Modder's to work with, they need to buy a license to be able to publish and sell games. However, Epic Games released a free version of UE 3's SDK in November 2009. It was called UDK which stands for Unreal Development Kit. They added the support of both IOS and Android in December 2010.

Unreal Engine 4

Mark Rein, vice president of Epic Games, announced that Unreal Engine 4 was under development since 2003 in August 2005. It was not until 2008 that development was basically done by Tim Sweeny the CEO of Epic Games. The engine supports eighth generation consoles, PCs and Tegra K1 based devices running Android that was announced in January 2014 at CES.

UE 4 has a major feature which is real-time global illumination using voxel cone tracing, pre-computed lighting was eliminated. Prior to release this feature was replaced by a less computationally-expensive algorithm for platforms support because of some performance concerns. UE 4 has also included a new feature for reducing iteration time and update C++ code, while the engine is running. New visual scripting system allows rapid developing of game logic without the use of C++, and has the ability of live debugging.

At the game developers' conference on 19th March 2014, Epic Games released Unreal Engine 4 with all its tools and a complete C++ source code to the community but only available through a subscription model. Epic Games CEO said that the new engine is a reflection of the changes of the industry. Epic Games made its new engine available to huge AAA development teams but at the cost of millions of dollars because of the evolving of the gaming industry.

On 4th of September 2014, Epic Games made a release of the game engine to schools and universities for free, and including a personal copy for students enrolled in game development courses, art, computer science, and simulation, architecture, and visualization programs.

On 19th of February 2015, Epic Game launched Unreal Dev with a 5 million dollar development fund that was made to provide financial aid to innovative projects made by UE 4.

After March 2015, UE 4 has become available to everyone for free with all its future updates, but with a selective royalty schedule. On October 2016, Oculus Rift announced that it will cover all royalty fees of all UE 4 titles shipped on Oculus Store for up to the first 5 million dollar revenue per game.

Currently, the supported platforms by UE 4 are Mac OS, Windows, Linux, HTML5, IOS, Android, Steam OS, Nintendo Switch, PlayStation 4, Xbox one, Magic leap one and Virtual Reality.

4.2.3. Unreal Script

Unreal Script is UE's native scripting language being used for designing game code & gameplay events before UE 4 release. It was made as a simple, high-level game programming language.

Same as in Java, Unreal Script is object-oriented without multiple inheritance, and classes are created in individual files named for the class they inherit from. Different from Java, Unreal Script has not object wrappers for primitive types. Interfaces was only supported in third gen. engine and few UE 2 games. Unreal Script supports operator overloading, but not method overloading, except for optional parameters.

At the 2012 Game Developers Conference, Epic announced that Unreal Script was being removed from Unreal Engine 4 in favor of C++. Visual scripting would be supported by the Blueprints Visual Scripting system.

4.2.4. Reception

Awards and nominations

Unreal Game Engine won several technology awards, some of them are 8 Game Developer Magazine Front Line Awards for best Game Engine. It has a place in the Front Line Awards Hall of Fame and 6 Develop Industry Excellence Awards for Best Engine. It won also Games Radar's E3 in 2012 important stuff awards for 'Best Taste of Next Gen', IGN's best of E3 2012 for 'Coolest Tech', Game Informer's best of E3 2012 awards for 'Best Tech' and was named 'Best Engine' in Develop 100: The Tech List 2014. Guinness World Records named Unreal Engine the most successful video game engine in 2014.

5. Games made by unity

Aegis Defenders, Battletech, Crowfall, Dusk, Fe, Ghost of a Tale, The Last Night, The Lost Legends of Redwall, Oddworld: Soulstorm, OK K.O.! Let's Play Heroes, Ooblets, Pillars of Eternity II: Deadfire, Shadowgun Legends, Subnautica, Runner3.

6. Method

This research is a developmental study in which the final result is the mobile game application. Only one type of user can interact and log in to the game, namely**,** Players.

7. Procedure

Before the design process commenced, certain measures were taken. Market survey: The researchers searched Google Play Store, Apple Store using various key words, including Educational Games, Action Educational Games, FPS Educational Games, etc. (**Birer, 2016**; Coskun, Adıguzel, &

Catak, 2019; Miyan, 2018; **Schaal, 2017**). This process was implemented to determine the existence of similar game app in order to avoid duplication. Experts' opinions: The opinions of experts in mobile gaming and mobile development were sought before, during and after the design process to ensure that the needs of the player (patient) were met. Student's opinions: Sample students were also interviewed as part of the target analysis to assess their needs, as they are the end consumers of the game. The above **two** and **three** steps were repeated multiple times before the game was actually completed.

8. System organization

Below is a summary on how the game is organised, the kind of the input system will accept, the process and the expected output. The game is divided into **three** stages where the game has input (game start), process (moving and shooting) output (win or lose the stage).

9. Input stage

The game is divided into two stages where, namely**,** the main menu and game start. First stage is the main menu where the player interacts with the menu in **three** languages (English, Turkish and Arabic) and adjusts his options then press start to advance to the next stage.

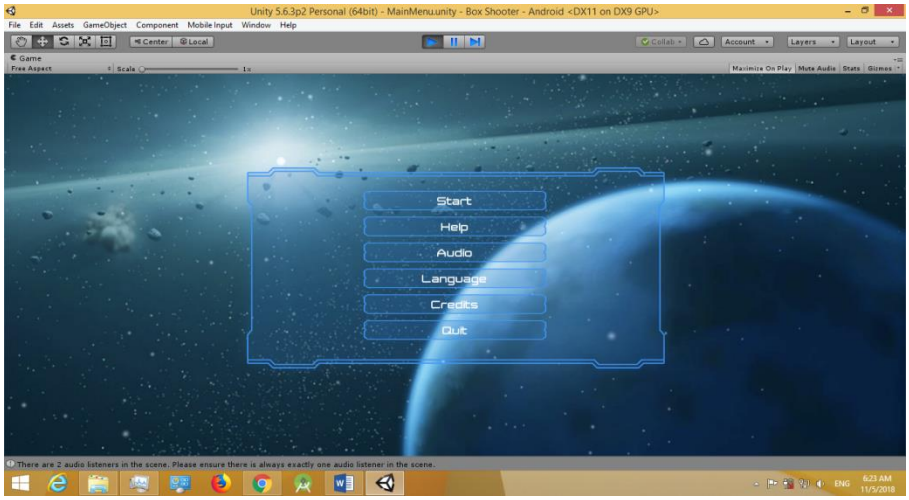

Figure 1. Main game menu

Second stage is the stage where a short movie plays to introduce the player to the game and its storyboard and then the game begin with three different elements where:

My Player: it's a pill shaped player with its physics component and simulation and his firing gun.

Camera: it's the main camera of the game and it follows my player whenever he moves or sees something.

And the last elements consist of another four sub-elements and it's called cubes:

Green Cubes: Gives +5 points to your score.

Yellow Cubes: Gives −3 points to your score.

White Cubes: Gives +3 seconds to your time.

Red Cubes: These are rare cubes. It appears and disappears in only 1 second and it gives +50 points to your score.

The screen are provided with a game controller to help the player take control of the hero to freely look and starts firing with his gun, when the player's shot hits a target that's when the process stage arrive.

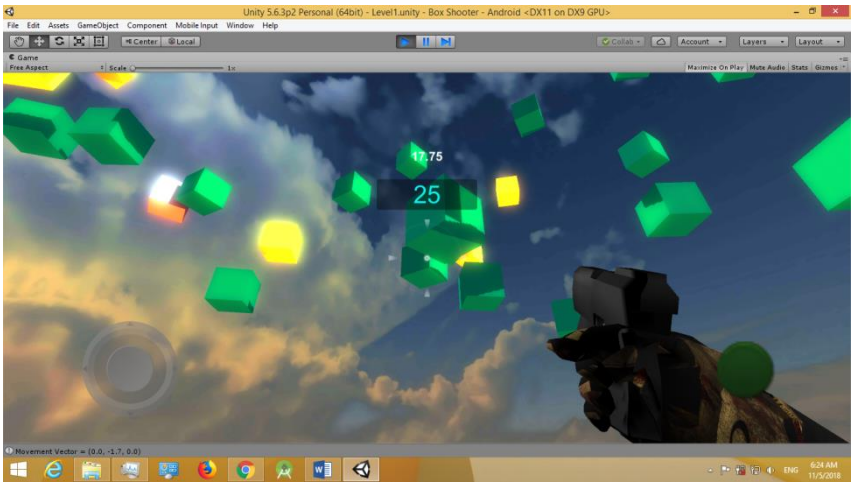

Figure 2. Game in action

10. Process stage

When the player starts to move and shoots the target the gun output**,** if it hits the target correctly**,** it calculates the estimated amount of points whether it's positive points or negative ones then add it to the scoreboard above the player's cursor until the timer runs out or the player achieves the required score to advance to the next level. When the player advances to the next level that's where the output stage comes.

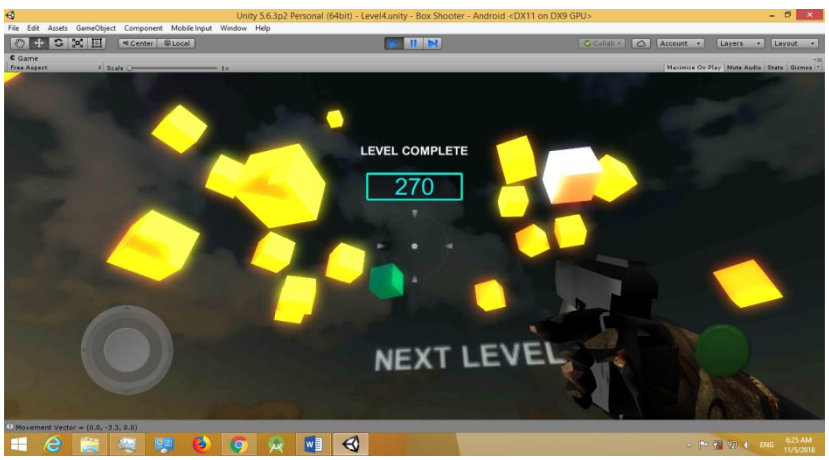

Figure 3. Succes in overcoming the level

11. Output stage

The output stage triggers when the player achieved the required score and hit the next level buttons appeared after **the** success in each level to advance to the next one which is more harder than the previous**,** where he starts with the input stage then the process stage again**,** and finally to the output stage**,** until he reaches and finishes level 5 that's the only condition**,** where he will exit the game to the main menu.

12. Transforming design into prototype

My Game was made by Unity Game Engine and its graphics was made by Adobe's Photoshop and Adobe's Aftereffects. It took a lot of coding in order to make the game run without any errors regarding the design process and movement and animation parts combined all together to achieve the movement of the objects to play the game correctly.

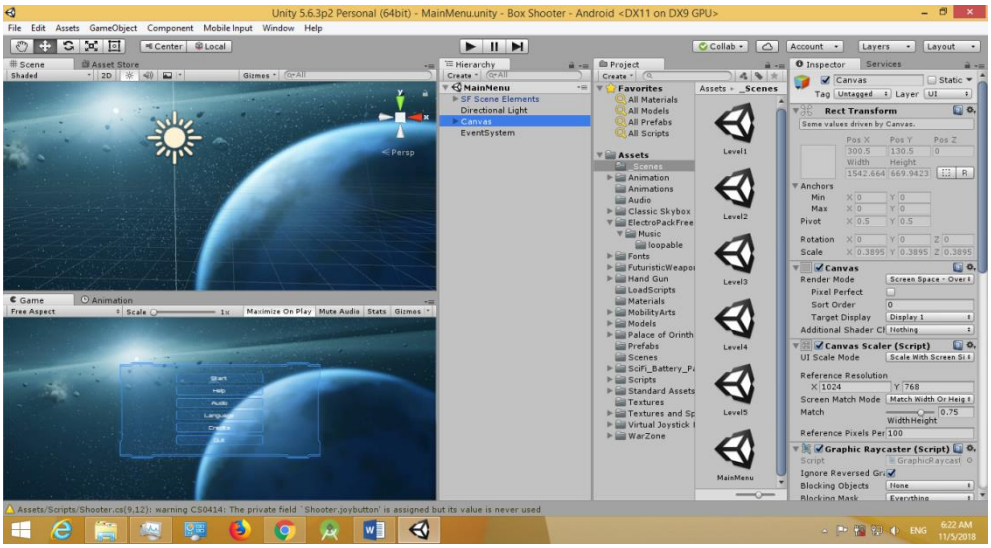

Figure 4. Designing the game 1

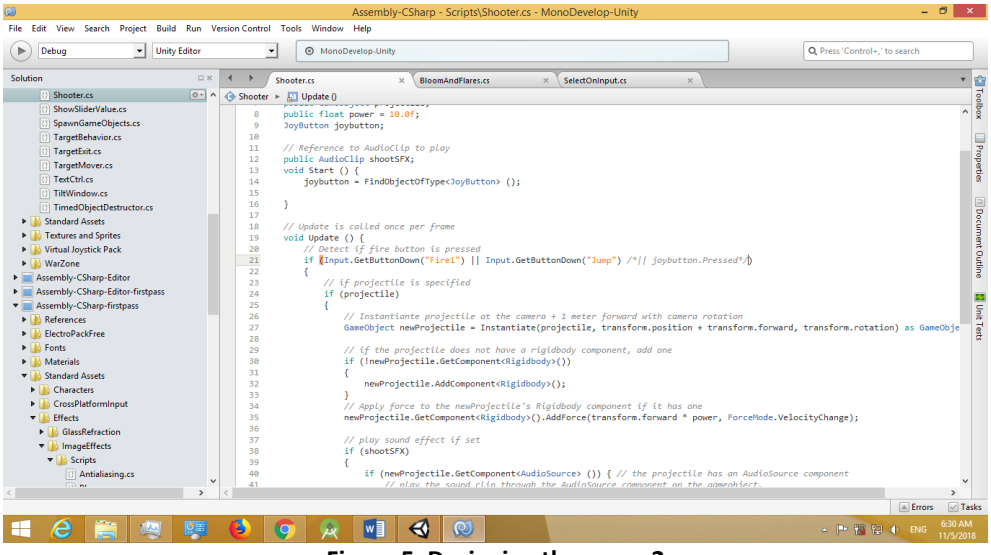

Figure 5. Designing the game 2

13. Conclusion

The analysis of the ADHD disorder gave us a clear view of how to identify the disorder in kids and how to start the cure process. With new technological programs and cures**,** we can apply my game to be included in the cure strategy to cure the kid partially or fully of the disorder. We can make new games to be used in fighting the disorder using the new game engine available now to achieve the maximum efficiency. My game aim **is** try to identify the disorder and be included within the cure

process of the affected kid to cure him/her. I achieved the aim by making the game more challenging by advancing in the course of the game.

References

Birer, E. (2016). Game as a mediator in a first year architectural design education. *New Trends and Issues Proceedings on Humanities and Social Sciences, 2*(1). doi:10.18844/gjhss.v2i1.304

Horachek, D. (2014). *Creating E-learning games with unity* (1st ed.).

Coskun, Z., Adiguzel, T. & Catak, G. (2019). Acoustic Labyrinth: validation of a game-based heart auscultation educational tool. *World Journal on Educational Technology: Current Issues, 11*(4), 245–256. doi:10.18844/wjet.v11i4.4394

Lougy, R. & Rosenthal, D. (2002). *ADHD: A survival guide for parents and teachers* (1st ed.).

Menard, M. (2012). *Game development with unity* (1st ed.).

Miyan, M. (2018). Hygiene awareness through digital-game-based learning. *New Trends and Issues Proceedings on Humanities and Social Sciences, 4*(8), 67–73. doi:10.18844/prosoc.v4i8.2986

Peacock, J. (2002). *ADD and ADHD* (1st ed.).

Schaal, S. (2017). Location-based games with smartphones – developing a toolbox for educators. *New Trends and Issues Proceedings on Humanities and Social Sciences, 3*(1), 417–430. doi:10.18844/gjhss.v3i1.1799

Sinicki, A. (2017). *Learn unity for Android game development* (1st ed.).