



# Development of a game based on proven psychological theories for the diagnosis of symptoms of mental illness.

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Final Degree Work

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*To my father, for showing me the world of videogames, even without knowing that it would lead me to want to dedicate myself to developing them.*

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*To my mother, for supporting me in my decisions and helping me to get to where I am now.*

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*To all the people who deal with mental illness while going about their daily lives without their environment being aware of it.*

\*\*\*

*And myself, for not letting mental illness stop me.*

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Thanks also to Paula, my psychologist, who gave me the necessary tools to deal with my illness so that it was not an impediment for the correct development of the project.



# ABSTRACT

This document represents the Final Degree Work report of Anna Tonda Ramos in Video Game Design and Development.

The main concept is a narrative video game based on the incorporation of psychological hypotheses with the aim of identifying possible symptoms of mental illness in order to intervene [1], especially at an early age. This video game is not intended to be a substitute for diagnoses made by mental health, but a tool that can help them or the player himself independently, encouraging him to receive professional support if necessary.

The most treated disorders will be anxiety and depression, since when conducting research and search for references it has been concluded that other more complex disorders are usually accompanied by one of the two [4] [6] [8] [12]; in this way, we get its identification to be more accurate. The recommendation of professional help is in charge for referring specialists who can give a more personalized treatment and locate other disorders in case there are.

**Keywords:** video game, psychology, mental health, mental illness, and symptoms.

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# CHAPTER 1: INTRODUCTION

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This chapter is the explanation of what was the motivation and intention at the time of opting for a complex proposal such as the investigation of symptoms and causes of a mental illness for its diagnosis, as well as the objectives to be achieved and how the idea started to be developed.

## 1.1 WORK MOTIVATION

Mental illness is widespread today, and with the COVID-19 pandemic the situation has only worsened. Despite this, and the importance of taking care of our mental health, we find that the tools at our disposal are scarce. This is largely because mental illness has been stigmatized in most societies for a very long time, so that having a mental illness has even been a cause for humiliation. Consequently, there have been cases where the patient does not seek help or treatment for fear of being rejected by his or her environment.

On the other hand, even if a patient were willing to ask for help, both personal and professional, they find that the only really useful option to improve their mental health is to go to a private clinic with professionals who really want their clients to get better; however, this is not available to everyone, leaving aside the most disadvantaged classes, who are also the most likely to suffer from their mental health [19]. For the vast majority of societies do not have a public health system that is truly viable in treating mental illness on a long-term basis.

To take my country, Spain, as an example, there are 0.55 psychologists per thousand inhabitants [24], which means that their agenda is always full, because they receive appointments every few months.

Because of this situation, I decided to carry out a project based on the possibility of giving an explanation to those who suffer from a mental illness without being aware of it, since the impossibility of receiving help prevents them from obtaining an official diagnosis. The aim is that those who feel that there is something strange in their behaviour and feelings have an option to understand what is happening to them before they blame themselves for it. The aim is that they do not come to think that behaviours and symptoms related to mental illness are their own fault.

## 1.2 OBJECTIVES

Based on the motivation of the work, there are the social main goals to achieve:

- Develop a tool that can be used by mental health professionals in their diagnoses.
- Offer the possibility to people with inability to receive a professional diagnosis to know if there may be any mental illness behind the symptoms.
- Highlight the reliability of the end game and the sources used to gain the trust of mental health experts and parents of potential patients, as they are likely to be the ones who should acquire the game for their children.
- Help players recognize the signs indicative of mental illness so they can help both themselves and their environment.

In order to achieve the above objectives, other objectives have been set with regard to the development of the game:

- Realize a friendly art style for the comfort of the player.
- Create a narrative that allows the player to relate to the topics to be covered in order to move away from the style of a quiz, while also helping to entertain the player
- Create a measurement system that analyses player responses and draws conclusions based on them.
- Provide feedback to the player based on the conclusions drawn.
- Combining Unity2D and Unity3D to bring more dynamism and move away from what would be a simple visual novel, also helping to entertain the player.

At the end of the TFG it is expected to obtain a tool based on information from reliable and proven sources able to make a correct diagnosis of symptoms corresponding to mental illnesses and to make recommendations based on it, so that it is useful for both professionals and potential patients.

### 1.3 ENVIROMENT AND INITIAL STATE

The work to be done was divided into several periods: the research process, this was crucial because it will be the one that will support the Project, reliable sources of information were sought from which to obtain the hypotheses to incorporate; the approach, with all the selected hypotheses it was proposed how and with what mechanics to implement them with the art style so that they are attractive to the player; the development of the game, which began making the art with the style defined in the previous period for once defined the style to implement it in Unity along with the mechanics

An example of how the game works is, for example, to analyze irritability and difficulty concentrating through repetitive and irritating questions or on the game narrative itself respectively, as these are symptoms of anxiety. Try to produce emotions that can be detected and analyzed [2]. With the accumulation of symptoms, the possible presence of mental illness can be diagnosed (albeit unofficially).

Therefore, the project began with the research process, where the Mendeley tool was used almost entirely. On the one hand, through its website, a collection of scientific articles from various previously contrasted sources could be found, thus making it easier to obtain a lot of information in a much more orderly way than searching the internet [33]. On the other hand, the application of Mendeley was essential for the collection and investigation of the articles obtained, allowing them to be stored and notes to be taken on them in a comfortable way [34] The use of Mendeley was also essential for the collection and investigation of the articles obtained.

To continue, once all the information considered useful and plausible to test through the game had been extracted, the mechanics in charge of obtaining the player's answers and behaviors were chosen, as well as the narrative that would link them together. At this stage, the 2D visual novel style was chosen alongside 3D puzzles.

Finally, the development of the game and the final product with all the information and conclusions obtained in the previous stages using Unity2D and Unity3D has been started, making both the art and the programming.

# CHAPTER 2: PLANNING AND RESOURCES EVALUATION

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This chapter will show the planning that has been followed to complete the project, as well as the resources used.

### 2.1 PLANNING (300H)

In this section, the tasks to be carried out that were proposed at the beginning of the project and that have been completed for this point will be developed, as well as the hours dedicated to each one and a Gantt chart with the most deployed tasks to show the information in a more visual way (Table 2.1).

- **The research - information gathering and understanding (45h):** search for reliable sources of scientific articles on mental health, search for information in the sources and in the articles, extraction of hypotheses from that information and hypothesis contrasting in various sources.
- **The approach – game design (55h):** selection of mechanics for each hypothesis created in the research, creation of narrative that relates the mechanics and selection of a comfortable artistic style.
- **The development – game development (115h):** realization of art, incorporating art and mechanics programming with the C# language into Unity, incorporation of a data storage and analysis system to analyse the answers' player, game completion with details and sound, polishing and testing.
- **Documentation (80h):** the making of memory, making of the analysis and design document, making of presentation, and presentation's preparation.

	January	February	March	April	May	June
Search for reliable sources (20h)	Orange					
Search for information in sources (10h)	Yellow	Yellow				
Extraction of hypotheses from information (10h)	Blue	Blue				
Hypothesis contrasting in various sources (5h)		Green				
Memory's realization (45h)		Orange	Orange	Orange	Orange	Orange
Selection of mechanics for each hypothesis (25h)		Yellow	Yellow			
Creation of narrative that relates the mechanics (20h)		Blue	Blue			
Realization of the analysis and design document (15h)			Green			
Selection of artistic style (10h)			Orange	Orange		
Realization of art (40h)			Yellow	Yellow	Yellow	
Incorporating art and mechanics into Unity (55h)			Blue	Blue	Blue	Blue
Incorporation of a data storage and analysis system. (10h)				Green	Green	Green
Game completion and polishing (10h)					Orange	Orange
Presentation's realization (10h)					Yellow	Yellow
Testing (5h)					Blue	Blue
Presentation's preparation (10h)						Green

Table 2. 1: Gantt Chart

**Schedule Note:** each month is divided into two symbolizing the first and second half of this. Tasks with the text in blue correspond to the research process, while the greens to the approach and the oranges to the development; those kept in black correspond to the documents to be delivered.

## 2.2 RESOURCE EVALUATION

Here is a list of the resources used to carry out this project in order of highest usage:

- **Hardware:**
  - **Portátil Gaming ASUS ROG Strix GL502VS**, i7, 16 GB RAM, 512 SSD, 1 TB HD, GTX 1070 8 GB: the computer used in all the development. (1.784,99€)
  - **YockTec RGB Backlight Optical Gaming Mouse**, 8 Buttons: the mouse used in all the development. (18,99€)
  
- **Software:**
  - **Unity 2020.3.32f1**: a cross-platform game engine developed by Unity Technologies to create games, used to create the project and work on it [25].
  - **Visual Studio 2019**: used as the script writing program with the C# language. It is attached to Unity. [26]
  - **Unity Asset Store**: a website attached to Unity used to obtain some of 3D models of the project. [27]
  - **SketchFab**: a website used to obtain some of 3D models of the project. [28]
  - **Blender**: multiplatform computer program dedicated specially to modelling and rendering used to edit some of the 3D models. [29]
  - **GitHub**: a server used to upload the project to a created repository. [30]
  - **DaFont**: a website to download text's fonts used in the game. [31]
  - **Microsoft Word**: a word processing software used to prepare all the documentation. [32]
  - **Mendeley**: reference manager used to manage and share research works [34] and articles collection.[33]
  - **Clip Studio Paint**: an illustration app used to create all the 2D artwork. [35]
  - **Lucichart**: a diagramming web page used to create the use case diagram (Figure 3.2).[36]
  - **Unity Documentation**: a web page used to access information of the system's architecture. [37]
  - **Dia**: a diagramming app used to create the game progress diagram (Figure 3.1) and the game state flow diagram (Figure 3.1). [38]
  
- **Human work:**
  - **Programmer**: 14,62€ per hour. Which makes a total of 1.169,6€ for eighty hours. [40]
  - **Artist**: 18€ per hour. Which makes a total of 720€ for forty hours. [41]
  - **Level Designer**: 10€ per hour. Which makes a total of 550€ for fifty-five hours. [42]
  - **Scientific analyst**: 11.28€ per hour. Which makes a total of 507,6€ for forty-five hours. [43]

# CHAPTER 3: SYSTEM ANALYSIS AND DESIGN

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In this chapter we will discuss more technical topics such as requirements analysis and architecture. To better understand this chapter, it should be noted that, as it is a style of visual novel, most functionalities can be fulfilled with the left mouse button.

### 3.1 REQUIREMENT ANALYSIS

#### 3.1.1 Functional requirements

Functional requirements are those that define operations to be performed by the system. In this project, and considering the above explanation, we find the following:

- R1.** The player can take and modify the quiz.
- R2.** The player can open the settings menu.
- R3.** The player can change the music volume, screen resolution and graphics.
- R4.** The player can change the speed at which the text appears.
- R5.** The player can review the sources of information used in the development.
- R6.** The player can open the pause menu.
- R7.** The player can exit the game.
- R8.** The player can start the narrative adventure.
- R9.** The player can return to the home screen.
- R10.** The player can save the game.
- R11.** The player can move to the next sentence of a character.
- R12.** The player can select a response to another character's question or comment.
- R13.** The player will be able to select a space in the 2D scene to search for the talisman.
- R14.** The player can pick up the talisman fragment.
- R15.** The player can return to the 2D scene from the 3D scene.
- R16.** The system will be able to collect the player's responses.
- R17.** The system will be able to provide a conclusion with the player's responses.

### 3.1.2 Non-functional requirements

Non-functional requirements are those that define characteristics that the system must have. In this project, and considering the above explanation, we find the following:

- R18.** The game will be played on PC.
- R19.** The visual novel game play will be in 2D.
- R20.** The mini-quest game will be in 3D.
- R21.** The models in the mini-quest game will be low-poly.
- R22.** The mechanics will be intuitive.
- R23.** The aesthetics of the game will be visually friendly.
- R24.** The UI will be simple, to favor immersion in the game.
- R25.** Controls will be simple and convenient.

## 3.2 SYSTEM ARCHITECTURE

This section describes the system architecture of the project. The video game has been developed for PC with the Unity3D engine base but having imported elements from the Unity2D engine for the correct incorporation of both, specifically with version 2020.3.32f1. Following the information provided by the Unity documentation regarding the architecture of the games created with its engine, although without the guarantee that it will work in all the systems that comply with them, the minimum system requirements can be seen in the following table (Figure 3.1).

Operating system	Windows	Universal Windows Platform	macOS	Linux
Operating system version	Windows 7 (SP1+) and Windows 10	Windows 10, Xbox One, HoloLens	High Sierra 10.13+	Ubuntu 16.04 and Ubuntu 18.04
CPU	x86, x64 architecture with SSE2 instruction set support	x86, x64 architecture with SSE2 instruction set support, ARM, ARM64	x64 architecture with SSE2	x64 architecture with SSE2 instruction set support
Graphics API	DX10, DX11, DX12 capable	DX10, DX11, DX12 capable GPUs	Metal capable Intel and AMD GPUs	OpenGL 3.2+, Vulkan capable
Additional requirements	Officially supported hardware vendor drivers	Officially supported hardware vendor drivers For development: Windows 10 (64-bit), Visual Studio 2015 with C++ Tools component or later and Windows 10 SDK	Apple officially supported drivers	- Gnome desktop environment running on top of X11 windowing system - Other configuration and user environment as provided by default with the supported distribution (Kernel, Compositor, etc.) - Nvidia and AMD GPUs using Nvidia official proprietary graphics driver or AMD Mesa graphics driver
Windows, macOS and Linux all support the Unity Editor on workstations or laptop form factors running without emulation, container or compatibility layer.				

Figure 3. 1: System requirements extracted from Unity documentation [37]



# CHAPTER 4: GAME DESIGN

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## 4.1 GAME OVERVIEW

### 4.1.1 Game concept

The main concept is a narrative video game based on the incorporation of psychological hypotheses with the aim of identifying possible symptoms of mental illness in order to intervene [1], especially at an early age. This video game is not intended to be a substitute for diagnoses made by mental health, but a tool that can help them or the player himself independently, encouraging the player to receive professional support if necessary.

The most treated disorders will be anxiety and depression, since when conducting research and search for references it has been concluded that other more complex disorders are usually accompanied by one of the two [4] [6] [8] [12]; in this way, we get its identification to be more accurate. The recommendation of professional help is in charge for referring specialists who can give a more personalized treatment and locate other disorders in case there are.

### 4.1.2 Main features and genre

The video game will be a first-person narrative adventure accompanied by a character who will have the role of guide, this will be a magical being who will be lost and will need the player's help to return to his dimension. During their journey they will move to different scenarios where they will witness different situations regarding which the player must make decisions. This narrative line will be used to test and compile the various choices, which will allow you to have a clearer idea of him or her personality and whether it exhibits any behavior that could be clarified as the symptom of a mental disorder.

An example of the operation of the game would be, for example, to analyze irritability or difficulty of concentration through repetitive and irritating questions or about the game's own narrative respectively, as these are symptoms of anxiety. It will try to produce emotions that can be detected and analyzed [2]. With the accumulation of symptoms, the possible presence of mental illness can be diagnosed.

However, the video game will begin with a brief questionnaire where the player must clarify if he has diagnosed any previous disorder or pathology. This is because during research it has been proven that some diseases such as diabetes or cardiovascular problems can

facilitate the onset of mental disorders [16] [12] [4] [11]; still and all, it is considered too forced an anticlimactic for the guide to ask questions about these, so it has been decided to use a questionnaire at the beginning of the game to be able to have proof of these factors before the start of the narrative adventure.

### **4.1.3 Target audience and platforms**

By the very nature of the game the target audience will span an almost unlimited range of ages; however, will be focused on tweens, teens and young adults, since during research it has been proven that they are the most likely to develop mental illnesses [6] [10] [14] [15] [17].

The platform chosen for the launch of the video game will be computer, since it is more distributed than other consoles such as PlayStation or Xbox [20] but has more power than a mobile phone to work with all the data collected.

### **4.1.4 Game states**

In the following, an explanation of the game states will be given reference to the different screens and a diagram indicating the flow of these screens (Figure 4.1).

#### ***4.1.4.1 Home screen***

Upon starting the game, the player will find the main menu with four options and buttons. The first one is "Start" and is responsible for starting the narrative adventure and the game play; this can only be pressed once the questionnaire has been completed. The second is "Quiz" and will allow the player to take and store the quiz required to start the game, which will ask for information relevant to mental health that would be considered anticlimactic if asked during the narrative adventure. The third is "Settings", where basic settings such as sound and music volume, screen resolution, graphics and text display speed can be modified, as well as a reference page where the sources used for the creation of mechanics will be mentioned to achieve more reliability. The fourth and last one is "Exit", and it oversees exiting the game.

#### ***4.1.4.2 Pause screen***

The pause screen can interrupt the game screen at any time by pressing the "escape" key, allowing the player to take breaks during game play. From the pause screen it is also possible to return to the home screen, access the same basic settings as in the home screen settings and save the game.

#### 4.1.4.3 Game screen

Focusing on the narrative adventure, the game screen will start when the "Start" button on the home screen is pressed. In this we will find two types of mode, a main mode characteristic of visual novels and a mini game. In the first one, the player will have conversations with a character who will act as a guide, for which he will have a dialogue box where the words of the characters will appear and, once the sentence is completed, the player will have to click on it with the left mouse button to continue with the dialogue. There will also be the option boxes, where possible answers to the guide's questions or comments will appear; the player will have to select one with the left mouse button. The second is a mini-search game accessible at the end of each level, where within the 2D scenario the player must select with the left mouse button the space where he/she wants to look for a fragment of a talisman. Once the space is selected, the player will be taken to a 3D representation of the space, where he/she can look around for the fragment and, if not found, return to the 2D stage by clicking on the arrow button in the lower left corner to select another space. When the fragment is found, the player will be moved to the next level. At the end of the game the player will be taken to a final screen with the results of the analysis of the answers, through which he can return to the initial menu.

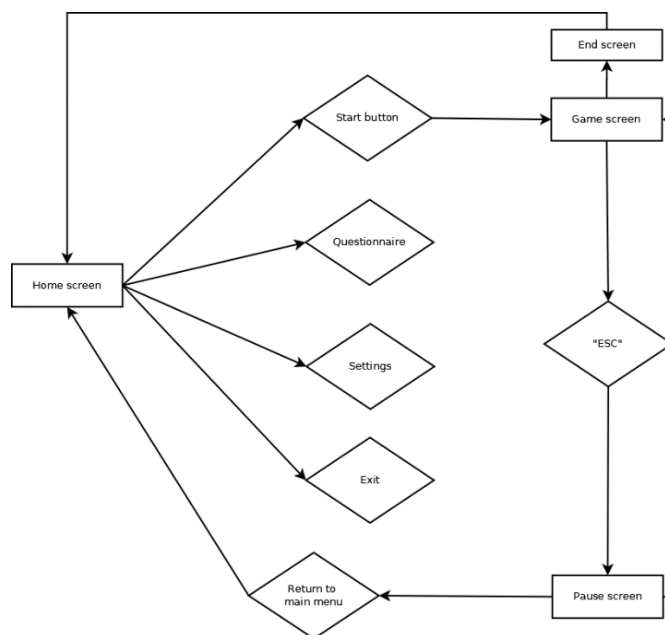


Figure 4. 1: Game state flow (Made with Dia) [38]

#### 4.1.5 User interface

The game's user interface, GUI, has been created in such a way that it interrupts the game play experience as little as possible; this is the main reason why the pause menu is accessed by pressing the "escape" key instead of an on-screen button. For a more detailed explanation, let's separate the visual novel style game play and the quest mini- game again.

During the visual novel part, the GUI is limited to the characteristic elements of the visual novel (Figure 4.2): the dialogue box, including the box indicating the name of the speaker, and the option boxes. It should be noted that their appearance is never

simultaneous, as the answer option boxes only appear when the character participating in the conversation has finished his or her sentences, so the dialogue box will be hidden.



Figure 4. 2: Interface

In the search mini-game, and during the selection of the space in the 2D scene, the only interface element will be the mouse itself, which will change to a magnifying glass (Figure 4.3) when it is on top of one of the spaces that can be investigated. Once the player has been moved to the 3D scene this mouse feature will be inactive, and the only interface element we will find will be the arrow button in the bottom left corner of the screen that will allow us to return to the 2D scene.



Figure 4. 3: Magnifying glass

#### 4.1.6 Game controls

The player will only use the left mouse button to interact with the elements of the environment on all screens, both to access the different menus and options and for the game itself, where conversations will be continued by clicking on the dialog box and on the available answer options. This button will also be used in 3D scenes, where the player must click on the corresponding talisman fragment to collect it. The camera of these scenes will be controlled by the movement of the mouse itself.

The only exception will be the “escape” button, which will fulfil the function of opening the pause menu during the game scene.

## 4.2 MECHANICS

The mechanics will be similar at all levels: the player will be presented with a situation whereby he will be invited to give his opinion or to talk about himself. The difficulty or controversy of these will increase, since you want to give priority to the player being comfortable playing before subjecting him to complicated situations and decisions.

As mentioned above there will be two differentiable mechanics or game mode types: the visual novel style, where the player will hold conversations by selecting some of the predefined and available answers, and the mini-game of search, which will lead to the of each level and will consist of searching through point-&-click a fragment of the talisman within a scenario and then place it in its corresponding position to complete it.

### 4.2.1 Questionnaire

The questionnaire will be the only one that will come out of the guidelines of mechanics established to collect information, in it the player will be asked: whether he has been previously diagnosed with any disorder and which [14] [18], if he has a family of any disorder and which [19], if he has ADHD (attention deficit hyperactivity disorder) [6], if he takes or has taken medication that may cause hormonal imbalances and which [8], if he is autistic [11] [4], if he is in the pregnancy or postpartum period (first two/three weeks or six months) [18] [9], if he has type diabetes mellitus [16], if he has suffered or is at risk of cardiovascular accidents, cerebrovascular accidents, high blood pressure, hypercholesterolemia or hyperglycemia [16] [12] and if he is diagnosed with dementia [12].

### 4.2.2 Items

The game will only consist of one type of item: the fragments of the talisman that allow the guide to be tele-transported. Each will have a different shape and appearance depending on what place they took in the talisman. By collecting them and putting them together, the player will be able to see how the fragments fit together forming the complete talisman.

### 4.2.3 Punctuation

Each answer given by the player will have two scores from 0 to 10 associated: one corresponding to the possibility of suffering from depressive symptoms when having selected this response and another corresponding to the anxious symptomatology. These scores will be collected and added throughout the game, so that if the player ends up with any of these being high will jump the notice that some symptoms that could be at risk to his mental health have been detected next to what they are and the recommendation to go to professional support.

#### 4.2.4 Game progress

The following diagram shows how the game progresses (Figure 4.4), starting with the completion of the quiz and then the first level of the narrative adventure. As can be seen, all the levels follow the same pattern: at the beginning, certain aspects of the player's life are checked through a conversation and their answers, which would happen during the visual novel type of game play; then, the quest mini-game proceeds and, once the talisman fragment is found, the next level begins. This pattern is repeated until the last level, where the quest mini game is replaced by the end of the narrative adventure and the display and discussion of the results obtained during the analysis of the answers.

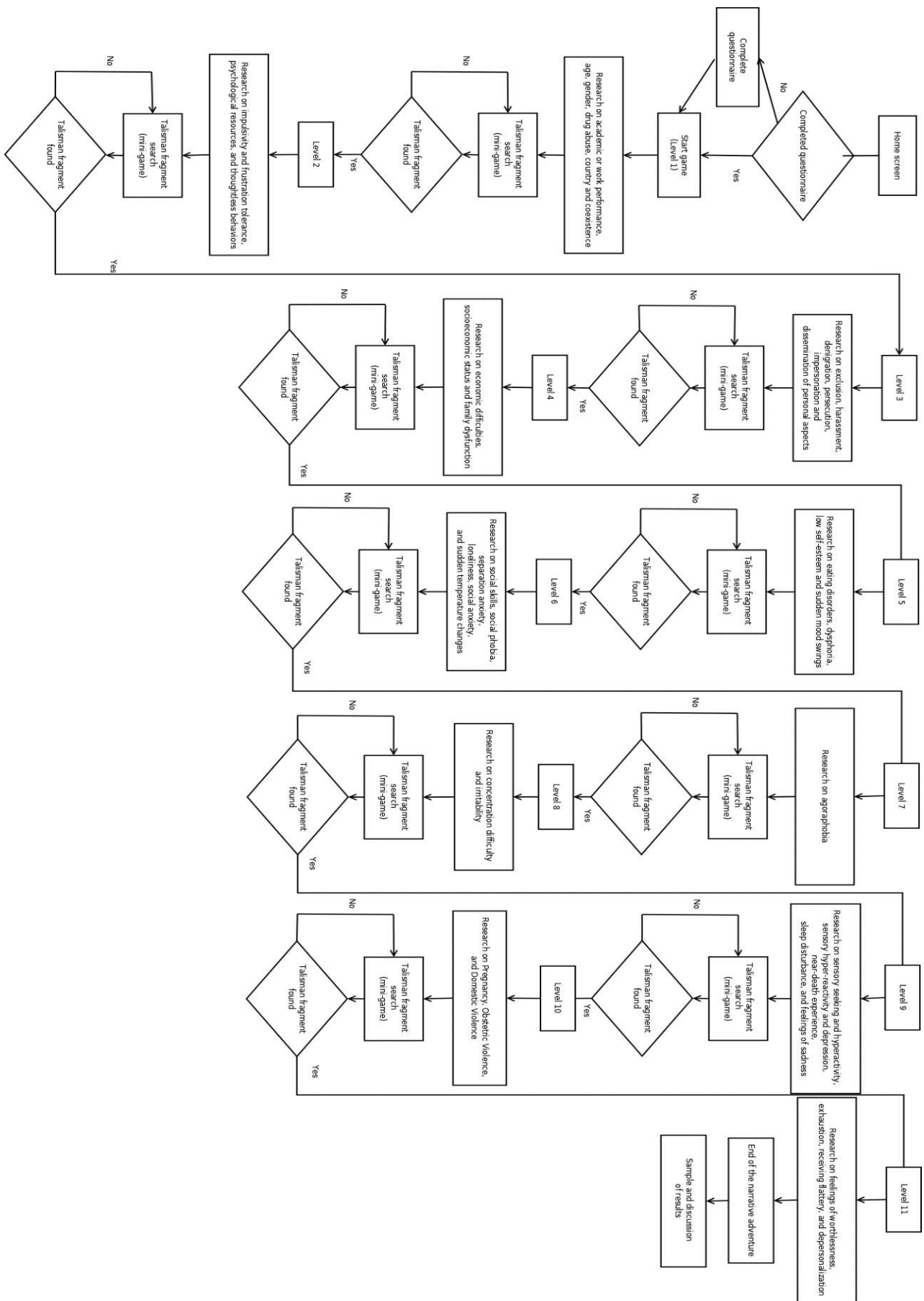


Figure 4. 4: Game progress (Made with Dia) [38]

## 4.3 NARRATIVE FOR MECHANICS

This section will specify the overall narrative and the narrative that will follow each level, specifying what information will be collected during the conversations that occur in the level.

### 4.3.1 Characters

#### Kairi

**Etymology:** this is a Japanese name, translated it can have several meanings all related to water: ocean, sea or ocean village. The name is also French and means 'song' or 'melody'.

**Description:** magical creature.

**Motivation:** guide of the player who is lost and asks for help to return to his dimension.

**Encounter:** appears at the beginning of the narrative adventure and is the one who triggers the story.

**Abilities:** flight and teleportation by using a talisman.

#### Player

**Description:** it is up to the imagination of the player.

**Motivation:** help Kairi find the parts of its talisman and return to her dimension.

**Encounter:** appears as soon as the narrative adventure begins.

**Abilities:** communication skills to influence Kairi's decisions.

### 4.3.2 Global narrative

The narrative will be based on the story of Kairi, a being from another dimension who will end up on Earth unwillingly, having been diverted by turbulence on her last journey between dimensions. To return to her dimension, she will need to collect the fragments of her transporter talisman, which allows her to travel, and she will ask the player for help. Fortunately, Kairi can sense where the fragments are located, starting from the player's room, and guiding him through various scenarios.



### 4.3.3 Levels

#### Level 1

The first level will serve as an introduction for the player, will be introduced to the guide and he will ask for help to return to his dimension. He will explain that for this they must collect the pieces of the talisman that allows him to tele-transport. Without knowing very well how to deal with a human the guide will ask he his age, his, gender (explain that he knows that humans distinguish gender, but he doesn't know how to use them to question his) and what does he do to live ("What was that question that humans ask when they meet each other? Oh yes, do you study or work?"). Depending on the player's response, the guide will inquire more about the subject with curiosity. In this way the player will know the academic or work performance of the player, which is significant in mental health [19] [5].

Once presented the guide will ask the player about a foreign substance that will be on the desk thinking that it is some narcotic to see the player's reaction and position in front of them [19]. After the confusion the guide will worry that he is making a lot of noise, so he will question if the player lives with someone, as living outside the family home is also considered a mental health risk situation [19].

To finish he will ask where he is, since it is lost, and if the player has always lived there, since living in a third world country or being a migrant is usually unfavourable [19] [17]. They will look for the first fragment of the talisman and when they pick it up, they will be automatically transported to another place.

#### Level 2

In the second level they will appear in a gaming center after having teleported from home, where the guide will explain that they must have arrived there because of having touched the fragment, since the power of it is not contained in the talisman. In this a group of young people will insist that the player plays with them, regardless of the actions of the player will end up losing, so he will have the choice to throw the controller to the ground. In that scene their influenceability, impulsivity and tolerance to frustration will be tested [14]. Following this, the guide will ask if humans are not taught to control those emotions to see if the player lacks psychological resources [14]. The player will be able to choose whether to respond politely, before which the guide will threaten to take he to an unknown dimension and leave he alone, this will help detect thoughtless behaviours and without measuring consequences [14]. Finally, they will get another fragment of the talisman.

#### Level 3

They will arrive at a high school where they will witness a bullying situation and the guide will question the player what is happening. By selecting answers, it will be checked if the player feels identified or has gone through a similar situation. This will

detect if he has suffered insults, exclusion, harassment, denigration, or persecution and whether he received help from teachers, risk factors for mental health, especially in adolescents [15]

[3]. They will then find the victim's phone and discover that his personal information had been disseminated, conversation through which the player will be asked if he has suffered impersonation or dissemination of personal aspects [15]. Next to the mobile phone they will also find another fragment.

#### Level 4

On level four they will be in front of a luxurious house in a wealthy neighbourhood, once again the guide will ask the player about it since in his short time on earth, he had not seen any other house like that and the player will be prompted to answer about what their own life is like in comparison, since having economic difficulties or belonging to low socioeconomic levels is a risk factor [19]. They will find another fragment of a talisman in a bush near a window, as they look through it they will witness a family discussion that will open the doors to a conversation about the relationship with his family compared to see if he suffers from family dysfunction [19] [3].

#### Level 5

On the fifth level they will be in a cafeteria and the guide will take advantage of that moment of tranquillity to talk about himself. First, they will decide whether to order something to eat, the guide will explain that he loves to eat and ask the player if he likes it, through this start of conversation it will be possible to detect if he can suffer from an eating disorder [17]. Below, the guide will mention that in his dimension they called him clueless because many times they spoke to him and did not realize to find his mind blank and will ask if it has ever happened to him; in this way dysphoria could be intuited [15]. As a result, the guide will explain that he had self-esteem problems because of it and will ask the player about his to check if it is negative [15].

Suddenly the cry of an angry customer will be heard, who will calm down immediately when the waitress brings him a coffee, bringing up the topic of sudden mood swings in conversation [15]. Finally, the waitress will bring them their order, among which will be a fragment of the talisman.

#### Level 6

They will arrive at a shopping center, which catches the attention of the guide and explain that he understood that humans like to go with friends very much, about what will question their experiences to the player to know if he has a lack of social skills that may affect his mental health [17] [10]. Then the guide will show a lot of concern about not knowing how to behave with so many people around and the player must express if he feels identified or if he believes that the guide is exaggerating to detect possible

social phobia [10]. The guide will ask if he would feel more comfortable with someone he knows and inquire about whether he has separation anxiety or suffer loneliness [10][12]. To leave the place the player will need to ask for help from a stranger, where social anxiety will also be valued [10]. Once outside the guide will mention that it seems to be cold because of how the people around are dressed and that in their dimension they do not notice the temperature, he will also ask the player how common temperature changes are to detect if he suffers them for no apparent reason [8]. They will locate the talisman fragment, but as soon as they approach, they will teleport.

### Level 7

The mall scenario will disappear because by having enough fragments of the talisman together, it will have more power, but being incomplete it is an unstable power. They will be in an open field where they will start a conversation of how pleasant or unpleasant that environment is to check if the player may suffer from agoraphobia (fear of being lost in open spaces) [8]. Then they will pick up the next fragment and be transported again.

### Level 8

They will appear on a bus that will soon have a traffic accident, after which the player must take decisions to get out of the shattered vehicle ignoring other stimuli such as annoying sounds; the time in which this is completed could give an idea of whether the player may suffer from difficulty concentrating [8]. Once completed a man will want, insistently, to take him with him to a safe place; however, the player must get rid of it to search for and pick up the next fragment. Depending on the abruptness of the answer chosen, it will be possible to detect if he has irritability [8]. When this fragment is found, they will disappear again.

### Level 9

After the adrenaline that is expected to generate in the previous level they will arrive at a hotel room, which they will decide to use to rest that night when they see it is unoccupied. First, they will notice that the television is on but does not work properly and produces strange sounds and colours, before which the guide will question the player and that kind of thing is fascinating or annoying. Because of this it will be possible to observe if he has sensory search, which is related to hyperactivity in autistic people, or sensory hyper reactivity that is related to depression [4].

Then they will talk about the accident that occurred and how the player has felt about it, in this way if he says he has experienced a similar situation before that he has gone through a near-death experience, or a lot of stress can be detected [8]. The player will not be able to sleep, and the guide will notice, so they will comment if they usually have problems for it, allowing to detect a sleep disorder [11]. The guide will explain that he feels sad to have dragged him and put him in danger, as well as that in their

dimension they do not usually feel that way and it is something new for him, thanks to this the player will have the opportunity to say if he has feelings of sadness frequently [11]. At dawn they will find a fragment in the bathroom.

### Level 10

They will appear in a hospital where, and only in case of having specified in the questionnaire to be pregnant, they will observe a nurse asking a pregnant woman question; as a result, the player will be able to give his opinion about it and talk about his personal experience: whether he had social and family support and interest in conceiving. Next, they will hear how the nurse explains that she must sign some papers to give it up for adoption, before which the guide will ask if he thinks it may be due to not being able to maintain it, thanks to which the player will be able to explain if the pregnancy brought with it economic problems or if he had medical coverage. In the end, the guide will also flatter the nurse's kindness and will question how his treatment was to detect possible obstetric violence [18].

By and by, or as a first scene for those who have not specified being pregnant, they will pay attention to another conversation of a woman with injuries trying to explain that she has been a victim of gender violence, but that she will be ridiculed. Here the player will have the possibility to talk to her and share some personal experience in case of having it, so that the player suffered domestic or intimate partner violence, or he felt ridiculed in health services could be checked [13]. To finish, they will locate the last fragment on the counter.

### Level 11

In the last level the guide will take the player back to his home, where they will talk about the experience: if he has felt that it was useful or if he has felt tired, which will check if he can suffer feeling of worthlessness or exhaustion [12] [5]. The guide will flatter him for his help and the player will be able to reject or accept it to identify if he has complications assuming compliments [5]. Finally, the guide will tell him that the trip has felt as if he were someone else because that is not his dimension and will ask the player if something similar has ever happened to him to detect any symptoms of depersonalization [5]. They will say goodbye and the narrative adventure will end up showing the player the results of the analysis of his answers.

## 4.4 GAME ART

### 4.4.1 Inspirations

During the game play there will be two built-in styles: one corresponding to the 2D visual part and another corresponding to the D fragment search mini-games. For the narrative part, the style of other visuals novels such as Cinderella Phenomenon [21] and Steins; Gate [22] has been taken as a reference (Figure 4.5).

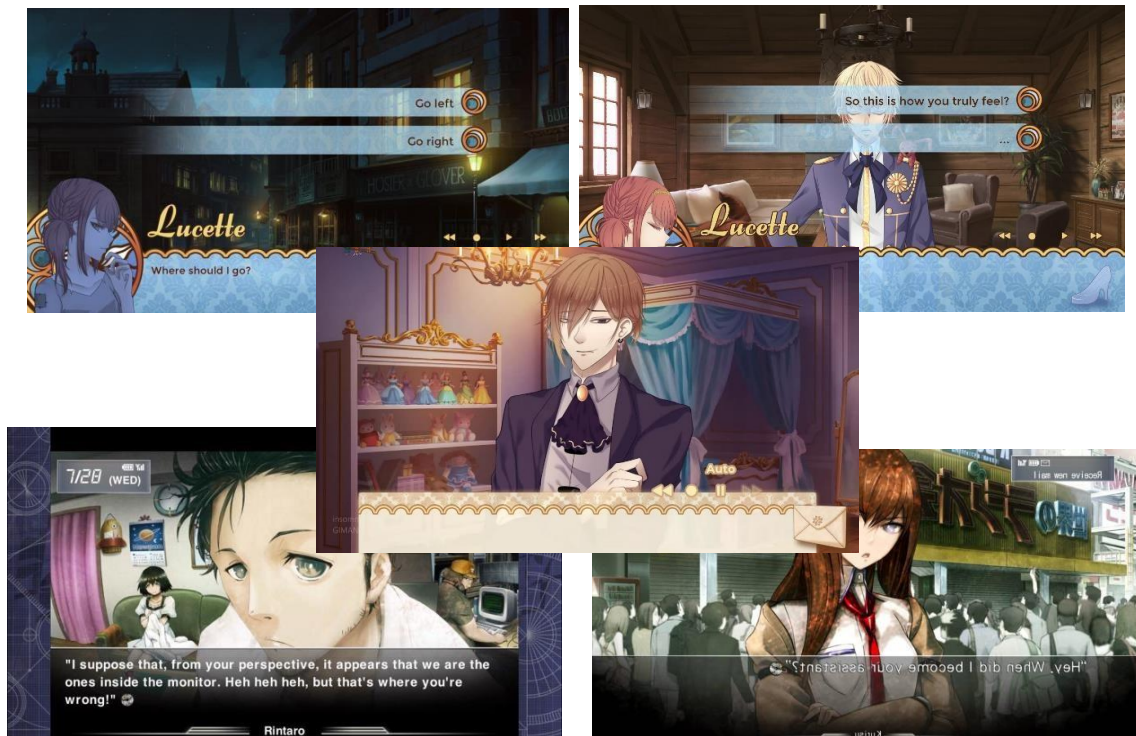


Figure 4. 5: 2D Art References

As for the mini-game part, the low-poly 3D art of The Stanley Parable [23] have been taken as a reference (Figure 4.6).



Figure 4. 6: 3D Arte Reference

#### 4.4.2 Concept Art

Here, a list of the resources used to carry out this project in order of highest usage: At the beginning of the project, the art style was started based on concept art of Kairi (Figure 4.7), so the art of the scenarios was created to go along with the friendly image it gave.



Figure 4. 7: Kairi Concept Art

### 4.4.3 Color palette

The color palette was created mainly by using the colors used in the concept art of Kairi (Figure 4.7) and adding others to go with them. In this way, a complete palette of colors was achieved, which could be used to create different scenarios with different settings (Figure 4.8).



*Figure 4. 8: Color Palette*

### 4.4.4 Music and Sounds

The game's music will be primarily inspired by the soundtrack of the visual novel Cinderella Phenomenon [39], since it has reassuring, sad and creepy melodies that adapt perfectly to each situation, which is exactly what is wanted to achieve.

# CHAPTER 5: WORK DEVELOPMENT AND RESULTS

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This chapter will explain how the work has been developed, in the hope that the above explanations will help the understanding of the process. It will review the three main stages seen in the planning (chapter 2: 2.1) and how they were carried out. It will also include the results obtained, whether they were what were envisaged at the beginning.

## 5.1 WORK DEVELOPMENT

### 5.1.1 The Research

The first stage that was carried out was the research stage. In this stage, the aim was to obtain information from reliable sources that would serve to give veracity to the background of the game and the project. To do this, we mainly used the Mendeley article bank [33], as all the articles it collects are from sources previously contrasted by the platform itself.

At the beginning, articles related to the wellbeing that video games can cause and the benefits they have on mental health were sought in order to overcome the negative ideas that potential customers might have about video games if the product were to be launched on the market. Although this was a hypothetical situation, the aim was to prevent young people from not having access to the product due to the reluctant ideas of their guardians. This also made the project more realistic. The articles found in this search [1][2][7] are the most prominent in the source section of the game settings and, if it were a product to be released, would be part of the promotion.

In order to continue, a search was started for scientific articles whose information could be used to extract risk factors to be tested in the player. The first results showed that the main victims of poor mental health were adolescents [6][10][14][14][15][17], which is why special attention was paid to this topic. However, other adult risk factors were also taken into account such as pregnancy [18][9], burnout [5], domestic violence [13] and adult loneliness [12]. The following table (Table 5.1)



Article	Risk Factors Extracted
<p>Anxiety and depression in university students: relationship with academic performance [19].</p>	<ul style="list-style-type: none"> <li>• Poor academic performance or dropout.</li> <li>• Substance abuse.</li> <li>• Suicidal behaviour.</li> <li>• Third-world or socially disadvantage country.</li> <li>• Female gender.</li> <li>• Compulsory travel.</li> <li>• Ourtside the family home.</li> <li>• Extra obligations such as working or caring for a dependent.</li> <li>• Economic difficulties.</li> <li>• Not being heterosexual.</li> <li>• Family dysfunction.</li> <li>• Traumatic event.</li> <li>• Family history of anxiety and depression.</li> </ul>
<p>Adolescence, cyberbullying and depression, risks in a globalised world [15].</p>	<ul style="list-style-type: none"> <li>• Suffering insults, harassment, denigration, impersonation, exclusion, persecution or dissemination of personal data.</li> <li>• Dysphoria.</li> <li>• Frequent variations in mood.</li> <li>• Negative self-esteem.</li> </ul>
<p>Suicidal risk and suicidal ideation and their relationship with impulsivity and depression in adolescent schoolchildren [14].</p>	<ul style="list-style-type: none"> <li>• Age between 15 and 34 years.</li> <li>• Low frustration tolerance.</li> <li>• Impulsivity.</li> <li>• Depression, depressive symptomatology or a clinical picture.</li> <li>• Lack of psychological resources.</li> <li>• Thoughtless, reckless, explosive and consequence-less behavior.</li> </ul>
<p>Rates of mental health symptoms and associations with serlf-reported sleepquality and sleep hygiene in adolescents presenting for insomnia tratment [6]</p>	<ul style="list-style-type: none"> <li>• ADHD.</li> <li>• Insomnia.</li> </ul>

Anxiety and depression in adolescents [17].	<ul style="list-style-type: none"> <li>• Migrant.</li> <li>• Family dysfunction or conflict.</li> <li>• Premature pregnancy.</li> <li>• Disorderly.</li> <li>• Lack of social skills or disaffection.</li> <li>• Teaching-learning process affected.</li> </ul>
Anxiety in adolescents [10]	<ul style="list-style-type: none"> <li>• School inadequacy.</li> <li>• Constant worry about family, health or minor issues.</li> <li>• Suffering from separation from someone attached.</li> <li>• Suffering from leaving home.</li> <li>• Fear of being embarrassed, rejected or humiliated during social interactions.</li> </ul>
Anxiety disorders [8]	<ul style="list-style-type: none"> <li>• Substance or medication abuse.</li> <li>• Anxiety.</li> <li>• Sudden changes in body temperatura.</li> <li>• Anguish.</li> <li>• Agoraphobia.</li> <li>• Panic disorder.</li> <li>• Near-death or life-threatening event.</li> <li>• Post-traumatic stress.</li> <li>• Feeling of being on the edge.</li> <li>• Fatigue.</li> <li>• Excessive anxiety about everyday situations.</li> <li>• Dificulty concentrating.</li> <li>• Sensation of going blank.</li> <li>• Irritability.</li> <li>• Muscle tension.</li> <li>• Sleep disturbance</li> </ul>
Autism, depression and suicide risk [11]	<ul style="list-style-type: none"> <li>• Autism spectrum diosrder.</li> <li>• Insomnia.</li> <li>• Feeling of sadness.</li> <li>• Age between 10 and 18 years.</li> <li>• Suffering from harassment.</li> <li>• Impediments to comunication social.</li> <li>• Adulthood.</li> </ul>
The relationship between sensory reactivity diferences and mentalhealth symptoms in preschool-age autistic children [4]	<ul style="list-style-type: none"> <li>• Sensory quest or fascination.</li> <li>• Sensory over-reactivity or sensitivity.</li> <li>• Use of few words.</li> </ul>

<p>Combined effects of mother's, father's and teacher's psychological distress on schoolchildren's mental health symptoms [3]</p>	<ul style="list-style-type: none"> <li>• Parents and teacher with or mental health.</li> </ul>
<p>Postpartum depression in primary care [18]</p>	<ul style="list-style-type: none"> <li>• Postpartum or pregnancy period.</li> <li>• Two to three weeks after giving birth.</li> <li>• First six months after birth.</li> <li>• State of impact on the family.</li> <li>• History of any disorder.</li> <li>• Anxiety or stressful events during pregnancy.</li> <li>• Lack of social support.</li> <li>• Domestic violence.</li> <li>• Lack of medical coverage.</li> <li>• Low socio-economic status.</li> <li>• Drug use.</li> <li>• Racialised person.</li> <li>• Obstetric history.</li> </ul>
<p>Postpartum anxiety [9]</p>	<ul style="list-style-type: none"> <li>• Perinatal or postpartum period.</li> </ul>
<p>Diabetes and depression [16]</p>	<ul style="list-style-type: none"> <li>• Type 2 diabetes mellitus.</li> <li>• Changes in metabolism.</li> <li>• Changes in diet or weight.</li> <li>• Physical inactivity.</li> <li>• Risk or history of cardiovascular or cerebrovascular accidents, high blood pressures, hypercholesterolemia, or hyperglycaemia</li> </ul>
<p>Depression and suicidal ideation in women victims of intimate partner violence [13].</p>	<ul style="list-style-type: none"> <li>• Suffering from domestic or intimate partner violence.</li> <li>• Guilt when attending health centers.</li> </ul>
<p>Epidemiology of depression in the elderly [12]</p>	<ul style="list-style-type: none"> <li>• Loneliness or history of depression.</li> <li>• Female.</li> <li>• Widowed.</li> <li>• Isolated.</li> <li>• Poor.</li> <li>• Institutionalised.</li> <li>• Stressed.</li> <li>• Cardiovascular or cerebrovascular disease.</li> <li>• Feelings of worthlessness or fragility.</li> <li>• Functional limitation.</li> <li>• Dementia, insomnia or isolation.</li> </ul>

	<ul style="list-style-type: none"> <li>• Affected by the financial crisis.</li> </ul>
<p>Mediating effect of burnout on the association between work-related quality of life and mental health symptoms [5]</p>	<ul style="list-style-type: none"> <li>• Emotional exhaustion.</li> <li>• Depersonalisation.</li> <li>• Cynicism.</li> <li>• Reduction of personal falltery.</li> <li>• Extreme tiredness.</li> <li>• Dysfunctionality.</li> <li>• Incability to regulate emotional and cognitive processes.</li> <li>• Mental detachment.</li> <li>• Stress at work.</li> </ul>

Table 5. 1: Articles and risk factors

### 5.1.2 The Approach

In the next stage, and with all the risk factors collected, a mechanic was sought to test whether the player suffered or could suffer from any of these factors. The first option that came to mind was to carry out a questionnaire asking about them directly; however, this formula was not very novel and did not meet the expected requirements of also providing entertainment to the player. Therefore, the visual novel style was chosen, as it allowed to ask questions directly, but giving that point of fun and playability that was sought.

Still, there were several problems with this idea. On the one hand, there were certain technical issues, such as history of disorders or medication taken, whose context was very difficult to fit into a visual novel narrative without being forced and spoiling the game experience. To address this, a very brief questionnaire was created prior to the start of the narrative experience, which included topics that were considered anticlimactic to the narrative. Although this was a format we wanted to avoid, it was considered a small price to pay to improve the subsequent game play.

On the other hand, the fact that the player was aware that the answer options he/she chose would be analyzed to present a conclusion about him/her could be the trigger that kept him/her alert and prevented him/her from enjoying the narrative experience. To avoid this, it was decided to add a 3D mini game in order to create a differentiation from other visual novels that would attract the player's attention; in this way, while the player was solving the puzzle he could not pay too much attention to the analysis of his answers, also helping the immersion of the game.

With these main ideas and mechanics already defined, it was time to create a narrative and a story to fit them together, so that their combination resulted in a game that fulfilled the objectives that were pursued. A story was needed that would allow the player to be tested by putting him in different situations and scenarios to see how he would act and think. At the same time, it could not be too long, as this would conflict

with the result being a tool that would allow answers to be obtained in an accessible and simple way. Taking these facts into account, it was concluded that the player should be transported from one place to another, so that specific scenarios could be created to test the risk factors without the need for them to be linked by a specific path.

At the same time, there was to be at least one character who was to have the role of guide, who would ask questions and talk about issues for which the player would have to select an answer. It was envisaged that one character per scenario would have this role; however, this would prevent the player from empathizing with any of them due to the fleeting nature of their presence. The only way to avoid this was for the guide to transport with the player through the different scenarios and, combining this conclusion with the previous one, the magical character of Kairi was created, who would not only be the guide, but also the one in charge of the transports.

At the same time, there was to be at least one character who was to have the role of guide, who would ask questions and talk about issues for which the player would have to select an answer. It was envisaged that one character per scenario would have this role; however, this would prevent the player from empathizing with any of them due to the fleeting nature of their presence. The only way to avoid this was for the guide to transport with the player through the different scenarios and, combining this conclusion with the previous one, the magical character of Kairi was created, who would not only be the guide, but also the one in charge of the transports.

At this point a motivation had to be found for the player to accompany Kairi. This is where the idea of the talisman and its fragments came up, as it was not only a good motivator, it was also perfect to add the 3D mini-game that had been planned, trying to find the fragments.

With the main narrative line created, the only thing left to do was to specify the ideal scenarios to test the risk factors without the player feeling forced or anticlimactic. To do this, common places were chosen that would give way to a specific topic of conversation: bedroom, to question lifestyle; gaming center, to provoke a confrontational situation; school, to question bullying and social life; luxurious house, to compare economic status; coffee shop, to talk about oneself calmly; shopping center, to discuss social anxiety and isolation; car accident, to question traumatic events; hotel, to question sleep disorders; and hospital, to talk about pregnancy or domestic violence. The reason for going to these would always be the same, to find the talismanic fragment found there.

To conclude this phase, the scores for the risk factors that were included in the narrative, item 4.3.3, and the questionnaire, item 4.2.3, were specified. These are associated with the response options of the game, including a score for anxiety and a score for depression from zero to ten. They can be seen in the following table (Table 5.2):

Risk factor	Score	
	Anxiety	Depression
Being a teenager	7	5
Being an adult	5	5
Being a woman	4	5
Being non-binary	5	6
Being a student	7	3
Being a worker	6	1
Average academic performance	3	0
Low academic performance	6	2
Average job dissatisfaction	4	2
High dissatisfaction with work	5	6
Inability to study or work	4	1
Defensive attitude	3	3
Previous substance use	3	1
Current substance use	7	7
Loneliness in the home	2	4
Second-world country	4	4
Third world country	7	7
Distance from the family home	0	1
Migrant	3	4
Influence	2	0
Impulsivity and intolerance to frustration	3	4
Lack of psychological resources	5	5
Unthinking and unconscionable behaviour	4	2
Bullying	10	10
Lack of support	3	5
Impersonation or dissemination of personal data	7	6
Economic difficulties	8	8
Family dysfunction	7	9
Eating disorder	10	7
Dysphoria	5	3
Negative self-esteem	7	4
Sudden mood swings	6	1
Lack of social skills	6	1
Social phobia	10	4

Separation anxiety	7	0
Sudden changes in body temperature	5	0
Agoraphobia	7	2
Difficulty concentrating	3	0
Irritability	5	2
Sensory hyper-reactivity	0	5
Sensory search	5	0
Traumatic experience	7	5
Sleep disorder	4	7
Frequent feelings of sadness	0	7
Obstetric violence	8	8
Domestic violence	10	10
Ridicule in health centers	9	4
Lack of resources during pregnancy	10	6
Feelings of worthlessness	4	7
Constant exhaustion	2	6
Depersonalization	6	6
Previously diagnosed anxiety disorder	10	0
Previously diagnosed depressive disorder	0	10
Family history of anxiety disorder	5	0
Family history of depressive disorder	0	5
ADHA	5	5
Medication with hormonal imbalances	5	7
Autism	4	7
Pregnancy or porstpartum period	8	4
Diabetes	2	7
Cardiovascular accident, stroke, high blood pressure, hypercholesterolemia or hyperglycemia	4	8
Dementia	10	10

Table 5. 2: Punctuation

### 5.1.3 The Development

#### 5.1.3.1 Artistic Development

The artistic part was the first with which the development began, since it was necessary to have some assets for its implementation in Unity. It began by designing and drawing the scenarios that had been decided in the previous stage, so that the style fit the proposed one and in order of appearance in the narrative (Figures 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10).



*Figure 5. 1: Bedroom (Made with Clip Studio Paint) [35]*



*Figure 5. 2: Gaming center (Made with Clip Studio Paint) [35]*





*Figure 5. 3: School (Made with Clip Studio Paint) [35]*



*Figure 5. 4: House (Made with Clip Studio Paint) [35]*



*Figure 5. 5: Coffee shop (Made with Clip Studio Paint) [35]*



*Figure 5. 6: Mall (Made with Clip Studio Paint) [35]*



*Figure 5. 7: Bus (Made with Clip Studio Paint) [35]*



*Figure 5. 8: Day Hotel (Made with Clip Studio Paint) [35]*



*Figure 5. 9: Night hotel (Made with Clip Studio Paint) [35]*



*Figure 5. 10: Hospital (Made with Clip Studio Paint) [35]*

The same series of steps were followed for the development of these scenarios:

1. Sketch and placement of elements.
2. Placement of spot colors of each element.
3. Creation of volume with a watercolor brush.
4. Creation of a layer in multiply mode and low opacity with color representative of the scene for the feeling of a unified atmosphere.
5. Tonal correction.
6. Global light and shadow effects.

The final version of the guide (Figure 5.11), Kairi, was then drawn based on the concept art that had previously been made during the design of the art style (Figure 4.4).



*Figure 5. 11: Kairi (Made with Clip Studio Paint) [35]*

In this one we can appreciate a differentiation with respect to the scenarios due to the implementation of a black outline, highlighting the character. With this, the objective was to separate the background from him in a more noticeable way, giving him more prominence. With this modification the list of steps that were followed would be the following:

1. Character sketch.
2. Creation of line art.
3. Placement of spot colors.
4. Creation of volume with a watercolor brush.
5. Tonal correction.



Next, to simultaneously start programming in an orderly fashion, the main menu of the home screen was designed and created (Figure 5.12). The aim was to achieve a menu that was simple and beautiful to look at, but at the same time represented the essence of the game. Then came the idea of using the scenarios themselves in its design, so that the player would already be familiar with them during the subsequent game play, giving them more confidence.

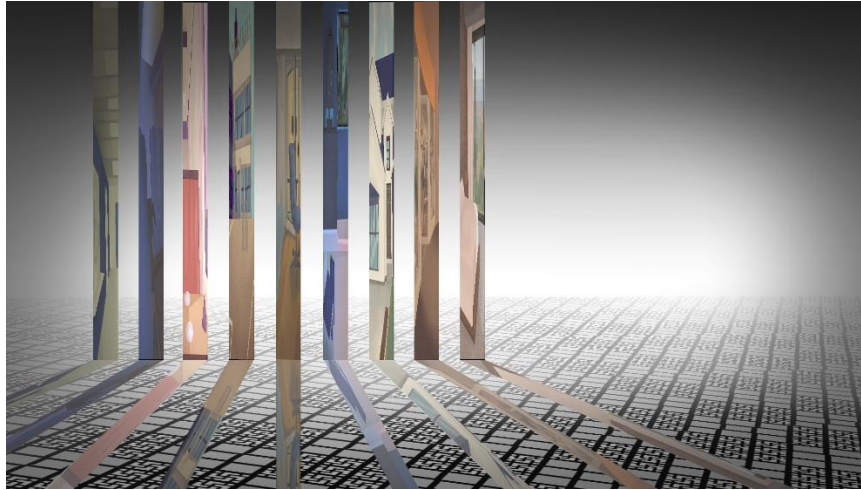


Figure 5. 12: Main menu (Made with Clip Studio Paint) [35]

Finally, the dialogue box and the name box were created (Figure 5.13). The latter, but scaled up, is the same as the one used for the answer choice boxes. Following the reference of Steins: Gate [22] they were made semi-transparent so that the scenery behind them was visible. But they wanted to give a more magical atmosphere, so the crystal decorations were added.



Figure 5. 13: Text and name box (Made with Clip Studio Paint) [35]

### 5.1.3.2 Technical development

After the development of the scenarios and the main menu and simultaneously with the development of the rest of the artwork, the programming and implementation in Unity was started.

#### Home screen

First of all, the main menu was implemented on the home screen. For this purpose, the artwork created for this purpose was used as a background and the main title and buttons were added using fonts obtained from DaFont [31] in the texts (Figure 5.14). It is worth noting that the *TextMeshPro* package was used on these, rather than Unity's default *Text* type, as it offered a higher level of customization and made for a much more eye-catching title.



Figure 5. 14: Main menu with texts

To manage the whole flow of this screen, a special script was created for it, called "Main Menu Manager". This contains the functions called by each button when they are pressed. In the following table you can see which function each one corresponds to, as well as a description of how it works and the code figure that corresponds to that function (Table 5.3):

Button	Function	Description	Figure
Start	<code>startGameplay()</code>	Starts the gameplay by transferring the player to the level 1 scene.	Figure 5.15
Questionnaire	<code>openQuestionnaire()</code>	Activate the object and functionality of the questionnaire.	Figure 5.16
Adjustments	<code>openSettings()</code>	Activates the object and menu functionality of the settings	Figure 5.17
Exit	<code>exit()</code>	Closes the application	Figure 5.18

Finalise questionnaire (saving changes)	<code>finalizeQuestionnaire()</code>	Deactivates the object and functionality of the questionnaire by saving the answers in variables	Figure 5.19
Exit questionnaire (without saving changes))	<code>closeQuestionnaire()</code>	Deactivates the object and functionality of the questionnaire by resetting the changes	Figure 5.20
Exit settings menú	<code>closeSettings()</code>	Deactivates the settings menu object and functionality.	Figure 5.21
Open references	<code>openReferences()</code>	Activates the object and functionality of the reference list	Figure 5.22
Close references	<code>closeReferences()</code>	Deactivates the object and the functionality of the reference list	Figure 5.23

Table 5. 3: Functions and buttons

```
public void startGameplay()
{
    if (completedQuestionnaire)
    {
        SceneManager.LoadScene(PlayerPrefs.GetString("currentLevel", "Level1"));
    }
}
```

Figure 5. 15: startGameplay()

```
public void openQuestionnaire()
{
    questionnaire = GameObject.Find("Canvas").transform.GetChild(6).gameObject;
    questionnaire.SetActive(true);
    GameObject.Find("Canvas/Questionnaire/Scroll View/Viewport/Content/Text (TMP)_Last/ButtonFinalice").GetComponent<Button>().interactable = false;
    activatedQuestionnaire = true;
}
```

Figure 5. 16: openQuestionnaire():

```
public void openSettings()
{
    GameObject.Find("Canvas").transform.GetChild(7).gameObject.SetActive(true);
}
```

Figure 5. 17: openSetting()

```
public void exit()
{
    Application.Quit();
}
```

Figure 5. 18: exit()



```

public void FinalizeQuestionnaire()
{
    GameObject[] dropdowns = GameObject.FindGameObjectsWithTag("DropDown");
    dropdownValues = new int[dropdowns.Length];
    int i = 0;

    foreach (GameObject drop in dropdowns)
    {
        dropdownValues[i] = drop.GetComponent<TMP_Dropdown>().value;

        if (i == 0)
        {
            diagnosedDisorders[0] = drop.GetComponent<TMP_Dropdown>().options[drop.GetComponent<TMP_Dropdown>().value].text;
            diagnosedDisordersValue[0] = drop.GetComponent<TMP_Dropdown>().value;
        }

        else if (i == 1)
        {
            diagnosedDisorders[1] = drop.GetComponent<TMP_Dropdown>().options[drop.GetComponent<TMP_Dropdown>().value].text;
            diagnosedDisordersValue[1] = drop.GetComponent<TMP_Dropdown>().value;
        }

        else if (i == 2)
        {
            antecedentDisorders[0] = drop.GetComponent<TMP_Dropdown>().options[drop.GetComponent<TMP_Dropdown>().value].text;
            antecedentDisordersValue[0] = drop.GetComponent<TMP_Dropdown>().value;
        }

        else if (i == 3)
        {
            antecedentDisorders[1] = drop.GetComponent<TMP_Dropdown>().options[drop.GetComponent<TMP_Dropdown>().value].text;
            antecedentDisordersValue[1] = drop.GetComponent<TMP_Dropdown>().value;
        }

        else if (i == 4)
        {
            medication[0] = drop.GetComponent<TMP_Dropdown>().options[drop.GetComponent<TMP_Dropdown>().value].text;
            medicationValue[0] = drop.GetComponent<TMP_Dropdown>().value;
        }

        else if (i == 5)
        {
            medication[1] = drop.GetComponent<TMP_Dropdown>().options[drop.GetComponent<TMP_Dropdown>().value].text;
            medicationValue[1] = drop.GetComponent<TMP_Dropdown>().value;
        }

        else if (i == 6)
        {
            pregnancy = drop.GetComponent<TMP_Dropdown>().options[drop.GetComponent<TMP_Dropdown>().value].text;
            pregnancyValue = drop.GetComponent<TMP_Dropdown>().value;
        }

        else if (i == 7)
        {
            diabetes = drop.GetComponent<TMP_Dropdown>().options[drop.GetComponent<TMP_Dropdown>().value].text;
            diabetesValue = drop.GetComponent<TMP_Dropdown>().value;
        }

        i++;
    }

    GameObject[] toggles = GameObject.FindGameObjectsWithTag("Toggle");
    togglesValues = new bool[toggles.Length];
    i = 0;

    foreach (GameObject toggle in toggles)
    {
        togglesValues[i] = toggle.GetComponent<Toggle>().isOn;

        if (i != 0)
        {
            if (togglesValues[i])
            {
                risks[i - 1] = toggle.transform.GetChild(1).GetComponent<Text>().text;
            }

            risksValue[i - 1] = toggle.GetComponent<Toggle>().isOn;
        }
        else
        {
            conditionValue = toggle.GetComponent<Toggle>().isOn;
        }

        i++;
    }

    questionnaire = GameObject.Find("Canvas").transform.GetChild(6).gameObject;
    questionnaire.SetActive(false);
    completedQuestionnaire = true;
    activedQuestionnaire = false;
}

```

Figure 5. 19: finalizeQuestionnaire()

```

public void closeQuestionnaire()
{
    if (dropdownValues == null && togglesValues == null)
    {
        GameObject[] dropdowns = GameObject.FindGameObjectsWithTag("DropDown");

        foreach (GameObject drop in dropdowns)
        {
            drop.GetComponent<TMP_Dropdown>().value = 0;
        }

        GameObject[] toggles = GameObject.FindGameObjectsWithTag("Toggle");

        foreach (GameObject toggle in toggles)
        {
            toggle.GetComponent<Toggle>().isOn = false;
        }
    }

    else
    {
        GameObject[] dropdowns = GameObject.FindGameObjectsWithTag("DropDown");
        int i = 0;

        foreach (GameObject drop in dropdowns)
        {
            drop.GetComponent<TMP_Dropdown>().value = dropdownValues[i];
            i++;
        }

        GameObject[] toggles = GameObject.FindGameObjectsWithTag("Toggle");
        i = 0;

        foreach (GameObject toggle in toggles)
        {
            toggle.GetComponent<Toggle>().isOn = togglesValues[i];
            i++;
        }
    }

    questionnaire = GameObject.Find("Canvas").transform.GetChild(6).gameObject;
    questionnaire.SetActive(false);
    activedQuestionnaire = false;
}

```

Figure 5. 20: closeQuestionnaire()

```

public void closeSettings()
{
    GameObject.Find("Canvas").transform.GetChild(7).gameObject.SetActive(false);
}

```

Figure 5. 21: closeSettigns()

```

public void openReferences()
{
    GameObject.Find("Canvas/Settings/References").SetActive(true);
}

```

Figure 5. 22: openReferences()

```
public void closeReferences()
{
    GameObject.Find("Canvas/Settings/References").SetActive(false);
}
```

Figure 5. 23: closeReferences()

As can be seen in the figures (Figure 5.15, 5.19), in order not to alter the planned order of play, it is only allowed to press the "Start" button once the questionnaire has been completed and finalised. On the other hand, the "Update()" function of this script controls that the questionnaire can only be completed if the checkbox on the understanding of data collection and use has been ticked (Figure 5.24).

```
// Update is called once per frame
void Update()
{
    if (activatedQuestionnaire)
    {
        GameObject[] toggles = GameObject.FindGameObjectsWithTag("Toggle");

        if (toggles[0].GetComponent<Toggle>().isOn)
        {
            GameObject.Find("Canvas/Questionnaire/Scroll View/Viewport/Content/Text (TMP)_Last/ButtonFinalice").GetComponent<Button>().interactable = true;
        }
        else
        {
            GameObject.Find("Canvas/Questionnaire/Scroll View/Viewport/Content/Text (TMP)_Last/ButtonFinalice").GetComponent<Button>().interactable = false;
        }
    }
}
```

Figure 5. 24: Update()

It is worth noting that the variables in charge of collecting the questionnaire information are stored in memory when the object is disabled (Figure 5.25) and loaded the next time it is enabled, either during the same game time or after closing and reopening the application (Figure 5.26).

```
private void OnDisable()
{
    PlayerPrefs.SetInt("diabetesValue", diabetesValue);
    PlayerPrefs.SetInt("pregnancyValue", pregnancyValue);
    PlayerPrefs.SetInt("medicationValue0", medicationValue[0]);
    PlayerPrefs.SetInt("medicationValue1", medicationValue[1]);
    PlayerPrefs.SetInt("antecedentDisordersValue0", antecedentDisordersValue[0]);
    PlayerPrefs.SetInt("antecedentDisordersValue1", antecedentDisordersValue[1]);
    PlayerPrefs.SetInt("diagnosedDisordersValue0", diagnosedDisordersValue[0]);
    PlayerPrefs.SetInt("diagnosedDisordersValue1", diagnosedDisordersValue[1]);
    PlayerPrefs.SetString("risksValue0", risksValue[0].ToString());
    PlayerPrefs.SetString("risksValue1", risksValue[1].ToString());
    PlayerPrefs.SetString("risksValue2", risksValue[2].ToString());
    PlayerPrefs.SetString("risksValue3", risksValue[3].ToString());
    PlayerPrefs.SetString("risksValue4", risksValue[4].ToString());
    PlayerPrefs.SetString("contidionValue", contidionValue.ToString());
}
```

Figure 5. 25: OnDisable()

```

private void toggleable()
{
    diabetesvalue = PlayerPrefs.GetString("diabetesvalue", 0);
    pregnancyvalue = PlayerPrefs.GetString("pregnancyvalue", 0);
    medicationvalue[0] = PlayerPrefs.GetString("medicationvalue", 0);
    medicationvalue[1] = PlayerPrefs.GetString("medicationvalue", 0);
    antecedentdisordervalue[0] = PlayerPrefs.GetString("antecedentdisordervalue", 0);
    antecedentdisordervalue[1] = PlayerPrefs.GetString("antecedentdisordervalue", 0);
    diagnoseddisordervalue[0] = PlayerPrefs.GetString("diagnoseddisordervalue", 0);
    diagnoseddisordervalue[1] = PlayerPrefs.GetString("diagnoseddisordervalue", 0);

    if (PlayerPrefs.GetString("riskvalue", "false") == "true")
        riskvalue[0] = true;
    else
        riskvalue[0] = false;

    if (PlayerPrefs.GetString("riskvalue", "false") == "true")
        riskvalue[1] = true;
    else
        riskvalue[1] = false;

    if (PlayerPrefs.GetString("riskvalue", "false") == "true")
        riskvalue[2] = true;
    else
        riskvalue[2] = false;

    if (PlayerPrefs.GetString("riskvalue", "false") == "true")
        riskvalue[3] = true;
    else
        riskvalue[3] = false;

    if (PlayerPrefs.GetString("riskvalue", "false") == "true")
        riskvalue[4] = true;
    else
        riskvalue[4] = false;

    if (PlayerPrefs.GetString("conditionvalue", "false") == "true")
        conditionvalue = true;
    else
        conditionvalue = false;
}

GameObject[] dropdowns = GameObject.FindObjectsWithTag("dropdown");
int i = 0;

foreach (GameObject drop in dropdowns)
{
    if (i == 0)
    {
        drop.GetComponent<MP_Dropdown>().value = diagnoseddisordervalue[0];
        diagnoseddisorders[0] = drop.GetComponent<MP_Dropdown>().options[drop.GetComponent<MP_Dropdown>().value].text;
    }
    else if (i == 1)
    {
        drop.GetComponent<MP_Dropdown>().value = diagnoseddisordervalue[1];
        diagnoseddisorders[1] = drop.GetComponent<MP_Dropdown>().options[drop.GetComponent<MP_Dropdown>().value].text;
    }
    else if (i == 2)
    {
        drop.GetComponent<MP_Dropdown>().value = antecedentdisordervalue[0];
        antecedentdisorders[0] = drop.GetComponent<MP_Dropdown>().options[drop.GetComponent<MP_Dropdown>().value].text;
    }
    else if (i == 3)
    {
        drop.GetComponent<MP_Dropdown>().value = antecedentdisordervalue[1];
        antecedentdisorders[1] = drop.GetComponent<MP_Dropdown>().options[drop.GetComponent<MP_Dropdown>().value].text;
    }
    else if (i == 4)
    {
        drop.GetComponent<MP_Dropdown>().value = medicationvalue[0];
        medication[0] = drop.GetComponent<MP_Dropdown>().options[drop.GetComponent<MP_Dropdown>().value].text;
    }
    else if (i == 5)
    {
        drop.GetComponent<MP_Dropdown>().value = medicationvalue[1];
        medication[1] = drop.GetComponent<MP_Dropdown>().options[drop.GetComponent<MP_Dropdown>().value].text;
    }
    else if (i == 6)
    {
        drop.GetComponent<MP_Dropdown>().value = pregnancyvalue;
        pregnancy = drop.GetComponent<MP_Dropdown>().options[drop.GetComponent<MP_Dropdown>().value].text;
    }
    else if (i == 7)
    {
        drop.GetComponent<MP_Dropdown>().value = diabetesvalue;
        diabetes = drop.GetComponent<MP_Dropdown>().options[drop.GetComponent<MP_Dropdown>().value].text;
    }
    i++;
}

GameObject[] toggles = GameObject.FindObjectsWithTag("toggle");
i = 0;

foreach (GameObject toggle in toggles)
{
    if (i == 0)
    {
        toggle.GetComponent<Toggle>().isOn = riskvalue[i - 1];

        if (toggle.GetComponent<Toggle>().isOn)
        {
            risk[i - 1] = toggle.transform.GetChild(1).GetComponent<Text>().text;
        }
    }
    else
    {
        toggle.GetComponent<Toggle>().isOn = conditionvalue;
    }
    i++;
}
}

```

Figure 5. 26: OnEnable()

For the implementation of the questionnaire, this code was used together with a scroll Rect element whose content consisted of text Mesh Pro - text, toggles and dropdowns elements (Figure 5.27), with the aim of making the answers broad but limited. This would provide a much more comfortable handling of information, but without major response limitations for the player.



Figure 5.27: Questionnaire

To finish with the initial screen, all that remained was the settings menu (Figure 5.28), whose options, except for the one to view the references (Figure 5.22, 5.23), are controlled by its own script, called "Settings Manager". The decision was made to separate the functionality of the menu options from the rest because they are also found in the pause menu, thus favoring the reusability of the code.

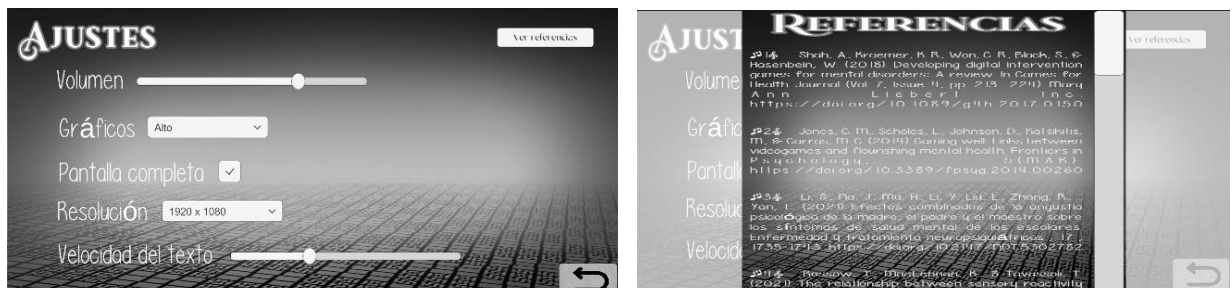


Figure 5.28: Settings

This script is mainly based on functions associated to the options dynamically. Thus the slider, checkbox and dropdown elements call these functions automatically every time they are modified. In the following table you can see the correspondence of each option to its function together with a brief description and its code figure (Table 5.4):

Option	Function	Description	Figure
Volume	SetVolume()	Modifies the volume of both music and sounds.	Figure 5.29
Graphics	SetQuality()	Modifies the image quality to high, medium or low.	Figure 5.30
Fullscreen	SetFullscreen()	Enables or disables the fullscreen resolution of the game.	Figure 5.31
Resolution	SetResolution()	Modifies the screen resolution	Figure 5.32
Text speed	SetTextSpeed()	Modifies the speed at which text appears in the visual novel.	Figure 5.33

Table 5. 4: Functions and options

```
public void SetVolume(float volume)
{
    audioMixer.SetFloat("volume", volume);
    this.volume = volume;
}
```

Figure 5. 31: SetVolume()

```
public void SetQualityLevel(int qualityIndex)
{
    QualitySettings.SetQualityLevel(qualityIndex);
    this.qualityIndex = qualityIndex;
}
```

Figure 5. 30: SetQuality()

```
public void SetFullscreen(bool isFullscreen)
{
    Screen.fullScreen = isFullscreen;
    this.isFullscreen = isFullscreen;
}
```

Figure 5. 29: SetFullscreen()

```

public void SetResolution(int resolutionIndex)
{
    Resolution resolution = resolutions[resolutionIndex];
    Screen.SetResolution(resolution.width, resolution.height, Screen.fullScreen);
    resolutionWidth = resolution.width;
    resolutionHeight = resolution.height;
}

```

Figure 5. 32: SetResolution()

```

{
    this.textSpeed = textSpeed;
}

```

Figure 5. 33: SetTextSpeed()

As in the main menu script, the modified settings are stores in memory when the corresponding settings menu object is disabled and reloaded when it is enabled again. (Figure 5.34).

```

private void OnDisable()
{
    PlayerPrefs.SetFloat("volume", volume);
    PlayerPrefs.SetInt("qualityIndex", qualityIndex);
    PlayerPrefs.SetString("isFullscreen", isFullscreen.ToString());
    PlayerPrefs.SetInt("resolutionWidth", resolutionWidth);
    PlayerPrefs.SetInt("resolutionHeight", resolutionHeight);
    PlayerPrefs.SetFloat("textSpeed", textSpeed);
}

```

```

private void OnEnable()
{
    volume = PlayerPrefs.GetFloat("volume", 0f);
    qualityIndex = PlayerPrefs.GetInt("qualityIndex", 2);
    if (PlayerPrefs.GetString("isFullscreen", "true") == "true")
    {
        isFullscreen = true;
    }
    else
    {
        isFullscreen = false;
    }
    resolutionWidth = PlayerPrefs.GetInt("resolutionWidth", 1920);
    resolutionHeight = PlayerPrefs.GetInt("resolutionHeight", 1080);
    textSpeed = PlayerPrefs.GetFloat("textSpeed", 0.01f);

    Screen.SetResolution(resolutionWidth, resolutionHeight, Screen.fullScreen);
    audioMixer.SetFloat("volume", volume);
    QualitySettings.SetQualityLevel(qualityIndex);
    Screen.fullScreen = isFullscreen;
}

```

Figure 5. 34: Enable and disable settings

## Game screen

Once the main screen was finished, the first level and game screen were started. After placing each asset where it belonged, the stage in the background and the dialogue box, the name box and Kairi's character on top of it, the dialogue system was developed.

In order to make the sentences appear as naturally as possible, a dedicated script called "Dialog" was created, where a function and a coroutine are in charge. On the one hand, the NextSentence() function (Figure 5.35) receives a list of the sentences to be displayed, the writing speed letter by letter and the objects referring to the mentioned assets, which are enabled or disabled in the function itself depending on whether the last sentence has been reached. As long as the latter is not the case, the function calls the coroutine by scrolling through the list of sentences.

On the other hand, the `corrutinType()`(Figure 5.36) writes to the dialog box. It receives as parameters the list of phrases to access the corresponding phrase, the typing speed, the text box and the continue button, whose size coincides with the text box, since the next phrase appears when the left mouse button is clicked on it. Here you type the sentence in the dialogue box letter by letter waiting for the specified time between each letter and enabling the continue button only when you have finished.

```
public void NextSentence(List<string> sentences, float typingSpeed, GameObject textBox, GameObject nameBox, GameObject continueButton, GameObject kairi)
{
    if (index < sentences.Count() - 1)
    {
        textBox.SetActive(true);
        nameBox.SetActive(true);
        continueButton.SetActive(true);
        kairi.SetActive(true);
        index++;
        textBox.transform.GetChild(0).gameObject.GetComponent<TextMeshProUGUI>().text = "";
        StartCoroutine(Type(sentences, typingSpeed, textBox, continueButton));
        lastSentence = sentences[index];
    }

    else
    {
        index = 0;
        nameBox.gameObject.SetActive(false);
        textBox.SetActive(false);
        continueButton.SetActive(false);
        kairi.SetActive(false);

        sentences.Clear();
    }
}
```

Figure 5. 35: `NextSentence()`

```
private IEnumerator Type(List<string> sentences, float typingSpeed, GameObject textBox, GameObject continueButton)
{
    continueButton.SetActive(false);

    if (sentences[index] == "")
    {
        yield return null;
    }

    else
    {
        foreach (char letter in sentences[index].ToCharArray())
        {
            textBox.transform.GetChild(0).gameObject.GetComponent<TextMeshProUGUI>().text += letter;
            yield return new WaitForSeconds(typingSpeed);
        }
    }

    continueButton.SetActive(true);
}
```

Figure 5. 36: `Type()`



This script is accessed by each level's own script, which control the flow of the game and, although they are different due to changes in dialogue and characters, they all follow the same skeleton, so in the following figures this will be shown together with comments instead of the source code, in order to understand how they work without the need to explain each of the eleven scripts individually.

The main functions of these scripts are as follows:

- `return To Visual Novel()`(Figure 5.37): returns the player from the 3D setting of the quest mini-game to the visual novel, disabling camera movement. It is associated with pressing the arrow button that appears in the first one
- `continue Chat()`(Figure 5.38): examines the last sentence written to find out the next set of sentences to write based on it, to enable the player's choice of response options or to activate the mini-game, then accesses the `Next Sentence()` function of the "Dialog" script. It is called at the start and after events that break the dialogue, such as returning the novel visual from the mini-game or selecting a response.
- `Select Option1()`(Figure 5.39): associated with the button corresponding to the first option of the answer selections is called when it is pressed. It stores the answer and the score associated with it. Other functions called `select Option2()` and `selectOption3()` have the same operation for the rest of the answer choices.
- `check Selections()`(Figure 5.40): is called from the response selection methods and checks which one has been selected to perform certain actions in specific cases, such as adding certain phrases.
- `Update()`(Figure 5.41): detects when any of the spaces to be investigated have been clicked during the mini game, handles the mouse cursor image change and checks when the talisman fragment has been clicked.

```
public void returnToVisualNovel()
{
    //Returns the player to the visual novel and disables camera movement.
}
```

Figure 5. 37: `returnToVisualNovel()`

```

public void continueChat()
{
    //The last sentence is examined to know how the conversation should continue

    if (dialog.lastSentence.Contains("Example sentence"))
    {
        //Actions
    }

    else if (dialog.lastSentence.Contains("Example sentence"))
    {
        //According to the last sentence it can mean that it is time for the player to make a choice

        nameBox.SetActive(false);
        textBox.SetActive(false);
        continueButton.SetActive(false);
        foreach (GameObject option in options)
        {
            option.SetActive(true);
            if (option.name == "option1")
            {
                //Modify the text of the option box
                //Specify the score corresponding to this option
            }
            else if (option.name == "option2")
            {
                //Modify the text of the option box
                //Specify the score corresponding to this option
            }
            else if (option.name == "option3")
            {
                //Modify the text of the option box
                //Specify the score corresponding to this option
            }
        }
    }

    else
    {
        //If there is no specific action to perform, the dialog simply continues.

        dialog.NextSentence(sentences, typingSpeed, textBox, nameBox, continueButton, Kairi);
    }
}

```

Figure 5. 38: continueChat()

```

public void selectOption1()
{
    //The selected option is checked and stored

    foreach (GameObject option in options)
    {
        if (option.name == "option1")
        {
            selections.Add(option.transform.GetChild(0).gameObject.GetComponent<TextMeshProUGUI>().text);
        }

        option.SetActive(false);
    }

    punctuation += option1Punctuation;

    //The checkSelections() function is called and the dialog continues.
    checkSelections();
    dialog.NextSentence(sentences, typingSpeed, textBox, nameBox, continueButton, Kairi);
}

```

Figure 5. 39: selectOption1()

```
private void checkSelections()
{
    //It checks which option has been selected

    if (selecctions.Contains("Example sentence"))
    {
        //The sentence that corresponds to the answer to said selection is added
    }
}
```

Figure 5. 40: checkSelections()

```
void Update()
{
    //ONLY LEVEL 1: wait for the blinking effect to end and add the following phrases

    //Change the cursor to a magnifying glass if it is on a space to investigate
    //Detect if the mouse has been clicked on any of the spaces available to investigate,
    //whose collider is only available during the search mini-game,
    //and transport player to it enabling camera movement

    //Check if the talisman fragment has been clicked
}
```

Figure 5. 41: Update()

When the search mini-game is activated and one of the 3D scenarios is accessed, a new script called "camera Movement" comes into play, which is in charge of managing the camera movement. We wanted the player to be able to look around, but in a limited area without being able to look beyond the selected space, for example, if the bed was selected, the player could look within its limits, but without being able to see any other element of the room. Therefore, the movement is limited to modifying the rotation of the camera with certain limits, so that if the mouse cursor is at the top of the screen the camera will tilt slightly upwards, if it is on the right it will tilt to the right, etc. In this script there is only one Fixed Update() method (Figure 5.42), which detects the mouse position and rotates the camera accordingly

```
// Update is called once per frame
void FixedUpdate()
{
    Vector2 mousePos = Input.mousePosition;
    if (mousePos.y > resolution.height-200 && actualX > (initialX - 10))
    {
        m_Timer += Time.deltaTime;
        if(m_Timer >= 0.03)
        {
            actualX--;
            transform.eulerAngles = new Vector3(actualX, actualY, actualZ);
            m_Timer = 0;
        }
    }
    else if (mousePos.y < resolution.height/3 && actualX < (initialX + 10))
    {
        m_Timer += Time.deltaTime;
        if (m_Timer >= 0.03)
        {
            actualX++;
            transform.eulerAngles = new Vector3(actualX, actualY, actualZ);
            m_Timer = 0;
        }
    }

    if (mousePos.x > resolution.width - 200 && actualY < (initialY + 10))
    {
        m_Timer += Time.deltaTime;
        if (m_Timer >= 0.03)
        {
            actualY++;
            transform.eulerAngles = new Vector3(actualX, actualY, actualZ);
            m_Timer = 0;
        }
    }

    else if (mousePos.x < resolution.width/3 && actualY > (initialY - 10))
    {
        m_Timer += Time.deltaTime;
        if (m_Timer >= 0.03)
        {
            actualY--;
            transform.eulerAngles = new Vector3(actualX, actualY, actualZ);
            m_Timer = 0;
        }
    }
}
```

Figure 5. 42: FixedUpdate()

### Pause screen

The pause screen was developed after the first level was created and simultaneously with the creation of the second level. The pause screen was implemented so that the player would have access to the same options from the home screen settings menu (Figure 5.43) on the game screen. It would also be useful for the player to be able to save the game and return to the main menu. For the shared options the same "Settings Manager" script was used, while for activating and deactivating the menu and buttons a new script called "Pause Menu Manager" was created. Although it was also possible to include these functions in the "Settings Manager" script, they would not be used in the main menu, so this decision was made so that the code written to read the application would always be fully functional and performance would be as good as possible.

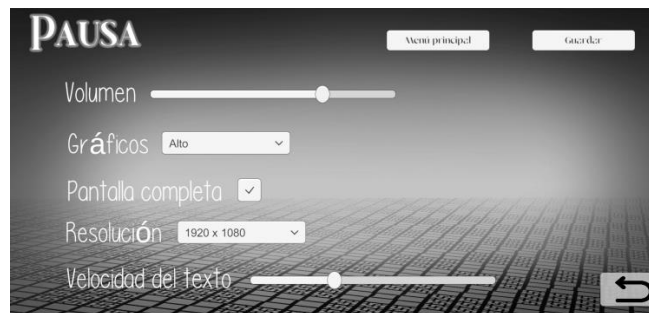


Figure 5. 43: Pause menú

In the following table (Table 5.5) the correspondence of the buttons of this menu to their function together with a brief description and their code figure can be seen:

Button	Function	Description	Figure
Main menu	<code>returnToMainMenu()</code>	Returns player to main screen	Figure 5.44
Save	<code>saveGame()</code>	Saves current level and accumulated score	Figure 5.45
Arrow	<code>closePauseMenu()</code>	Disables the pause menu	Figure 5.46

Table 5. 5: Pause menu buttons

```
public void returnToMainMenu()
{
    SceneManager.LoadScene("MainMenu");
}
```

Figure 5. 44: `returnToMainMenu()`

```
public void saveGame()  
{  
    PlayerPrefs.SetFloat("punctuationX", punctuationToSave.x);  
    PlayerPrefs.SetFloat("punctuationY", punctuationToSave.y);  
    PlayerPrefs.SetString("currentLevel", SceneManager.GetActiveScene().name);  
}
```

Figure 5. 45: saveGame()

```
public void closePauseMenu()  
{  
    pauseMenu.SetActive(false);  
    pauseMenuEnable = false;  
}
```

Figure 5. 46: closePauseMenu()

## 5.2 RESULTS

In the end, if we go back to the objectives set out in chapter one, we see that both the main goals and the objectives regarding the development of the game itself have been met.

Thanks to the research phase, a solid base on which to build the project was achieved, so that each risk factor that is questioned in the game has a contrasted source behind it. In this way, it was possible to create the intended tool that could serve as a support for mental health professionals, that offers answers to those who cannot access professional diagnoses, that pays attention to the resources used and that is capable of helping players to recognize signs indicative of mental illness.

In terms of development goals, the main challenge was to create a narrative that was not forced and could test the risk factors collected, this was achieved thanks to the idea of eliminating paths from one place to another, putting the player in the right situations at each moment. Based on this we were able to design the friendly art style we were looking for and combine Unity2D and Unity3D to move away from what would have been a simple visual novel. Although this was a risky idea because it could have cut the atmosphere of the game, a good result was achieved by editing the post-processing options of the 3D scenes, making them fit with the atmosphere of the 2D scenes as much as possible. Finally, the scoring system designed made it possible to interpret the player's answers and draw conclusions based on them in a simple way.

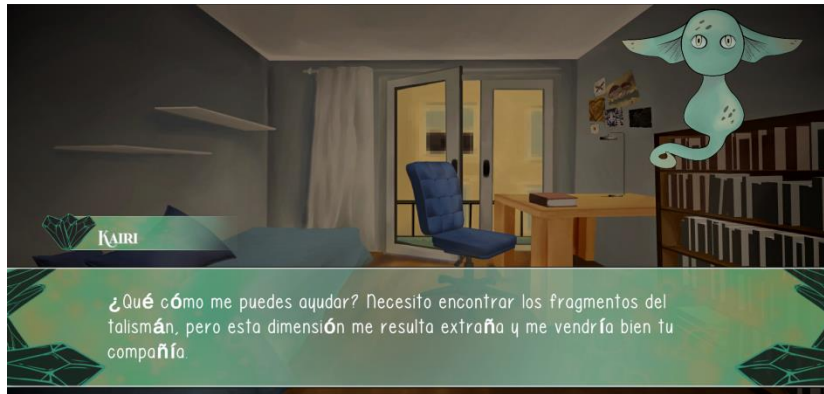


Figure 5. 47: Gameplay Dialog

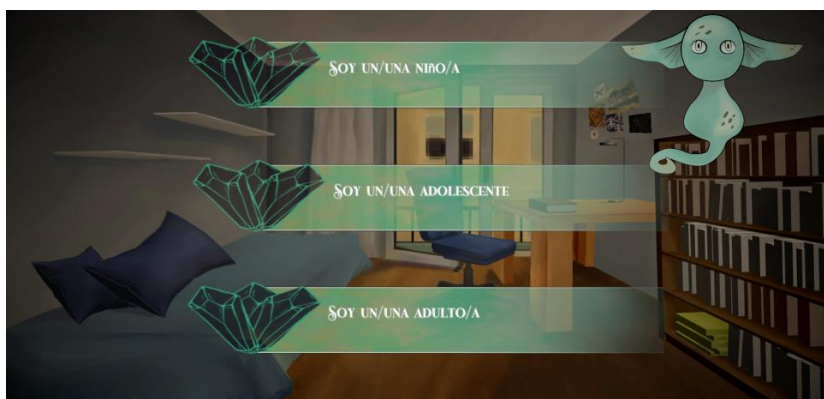


Figure 5. 48: Gameplay Options

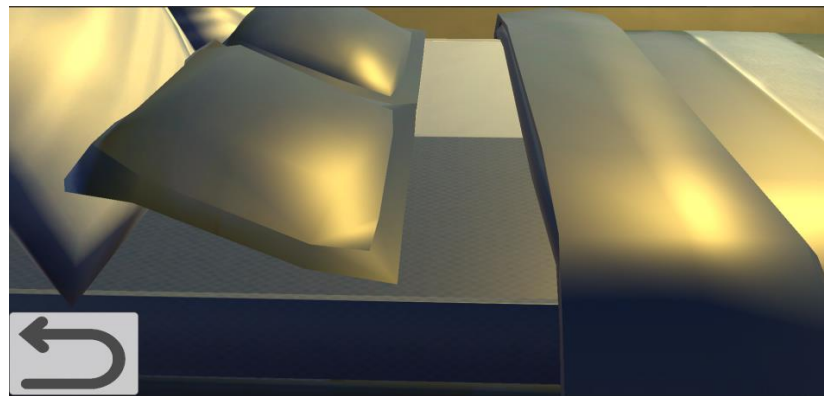


Figure 5. 49: 3D Scene

# CHAPTER 6: CONCLUSIONS AND FUTURE WORK

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This chapter discusses the conclusions drawn from the development of this Project, as well as well as the future work that would be considered necessary for its improvement

### 6.1 CONCLUSIONS

The idea of developing a TFG related to mental health had been in my mind since I started my degree, as videogames have been a great support for my own and I wanted to create one whose intention was to help others.

Even so, a videogame could not replace the psychiatric and psychological therapy that most people who suffer from a disorder need, so this project was focused on being the trigger that would recommend therapy to those players who seemed to need it, as well as a support for those who could not access it, but never a substitute.

In the end, doing this project has not only been a help for the players, but it has also helped me to learn about mental illnesses, their symptoms and, although it was not part of the game, how to be a support for those who suffer from them thanks to the research stage. Undoubtedly, I consider that choosing this theme was the right decision, as I have received multiple benefits in return.

In conclusion, the result obtained has been very satisfactory and not only have the objectives been fulfilled, but I have learned more than expected. Since the relationship between videogames and mental health has not yet been developed to a large extent in the industry, I was left with the idea of continuing to work on it for the common good. These months of development have given me the confidence to do so.

The project can be reviewed in the following repository:

<https://github.com/AnniDin/Life-helper>



## 6.2 FUTURE WORK

Although the final result was satisfactory, it is true that there were certain aspects that could be polished in more depth. The first difficulty encountered was that there was not enough time to do the modeling of the 3D scenes, so models available from other sources were used. Although the result of these scenes was satisfactory thanks to the post-processing and the lighting implemented, it is true that I would have liked to make them myself so that they were completely original and matched the 2D version of these elements on a higher level.

On the other hand, the narrative was very well thought out and fulfilled the objective of unifying the mechanics with the story; however, as more priority was given to testing the risk factors it is a bit rushed, I would like to keep working on it to develop it at a higher level and in a more leisurely way.

Finally, although the research phase was in itself very elaborate, I would like to return to it in order to broaden the sources and achieve more reliability.

## REFERENCES

- [1] Shah, A., Kraemer, K. R., Won, C. R., Black, S., & Hasenbein, W. (2018). Developing digital intervention games for mental disorders: A review. In *Games for Health Journal* (Vol. 7, Issue 4, pp. 213–224). Mary Ann Liebert Inc. <https://doi.org/10.1089/g4h.2017.0150>
- [2] Jones, C. M., Scholes, L., Johnson, D., Katsikitis, M., & Carras, M. C. (2014). Gaming well: Links between videogames and flourishing mental health. *Frontiers in Psychology*, 5(MAR). <https://doi.org/10.3389/fpsyg.2014.00260>
- [3] Li, S., Na, J., Mu, H., Li, Y., Liu, L., Zhang, R., ... Yan, L. (2021) Efectos combinados de la angustia psicológica de la madre, el padre y el maestro sobre los síntomas de salud mental de los escolares. *Enfermedad y tratamiento neuropsiquiátricos*, 17, 1735-1743. <https://doi.org/10.2147/NDT.530278>
- [4] Rossow, T., MacLennan, K., & Tavassoli, T. (2021). The relationship between sensory reactivity differences and mental health symptoms in preschool-age autistic children. *Autism Research*, 14(8), 1645-1657. <https://doi.org/10.1002/aur.2525>
- [5] Pereira, H., Feher, G., Tibold, A., Costa, V., Monteiro, S., & Esgalhado, G. (2021). Mediating effect of burnout on the association between work-related quality of life and mental health symptoms. *Brain Sciences*, 11(6). <https://doi.org/10.3390/brainsci11060813>
- [6] van Dyk, T. R., Becker, S. P., & Byars, K. C. (2019). Rates of mental health symptoms and associations with self-reported sleep quality and sleep hygiene in adolescents presenting for insomnia treatment. *Journal of Clinical Sleep Medicine*, 15(10), 1433-1442. <https://doi.org/10.5664/jcsm.7970>
- [7] Poppelaars, M., Wols, A., Lichtwarck-Aschoff, A., & Granic, | (2018). Explicit mental health messaging promotes serious video game selection in youth with elevated mental health symptoms. *Frontiers in Psychology*, 9(OCT). <https://doi.org/10.3389/fpsyg-2018.01837>
- [8] Powers, L., Farinde, A., & Smith-East, M. (2020). Anxiety disorders. In *Handbook of Geropsychiatry for the Advanced Practice Nurse: Mental Health Care for the Older Adult* (pp. 63-80). Springer Publishing Company. <https://doi.org/10.1891/9780826157515.0005>
- [9] Zappas, M. P., Becker, K., & Walton-Moss, B. (2021) Postpartum Anxiety. *Journal for Nurse Practitioners*, 17(1), 60-64. <https://doi.org/10.1016/.nurpra.2020.08.017>

- [10] Garcia, I., & O'Neil, (2021). Anxiety in Adolescents. *Journal for Nurse Practitioners*, 17(1), 49-53. <https://doi.org/10.1016/j.nurpra.2020.08.021>
- [11] Ruggieri, V. (2020). Autismo, depresión y riesgo de suicidio. *Medicina (B.Alres)*, 80, 12-16. <http://www.scielo.org.ar/pdf/medba/v80s2/v80s2a04.pdf>
- [12] Calderón M., D. (2018). Epidemiología de la depresión en el adulto mayor. *Revista Medica Herediana*, 29(3), 182 <https://doi.org/10.20453/rmh.v29i3.3408>
- [13] Depresión e ideación suicida en mujeres víctimas de violencia de pareja. (2019). *Psicología, Conocimiento y Sociedad*, 9(1). <https://doi.org/10.26864/pcs.v9.n1.1>
- [14] Tabares, A. Núñez, C., Osorio, M., & Aguirre, A. (2020). Riesgo e Ideación Suicida y su Relación con la Impulsividad y la Depresión en Adolescentes Escolares. *Revista Iberoamericana de Diagnóstico y Evaluación — e Avallacá Psicología*, 54(1) <https://doi.org/10.21865/ridep54.1.12>
- [15] Alvites Huamaní, C. G. (2019). Adolescencia, cyberbullying y depresión, riesgos en un mundo globalizado. *EtioQnet. Revista Científica Electrónica de Educación y Comunicación En La Sociedad Del Conocimiento*, 19(1), 210-234. <https://doi.org/10.30827/eticanet.v19i1-11867>
- [16] Escobar, J., & Escobar, M. (2016). Diabetes y depresión. *Acta Méd. Colomb*, 41(2), 96-97. <http://www.scielo.org.co/pdf/amc/v41n2/0120-2448-amc-41-02-00096.pdf>
- [17] Basantes Moscoso, D. R., Villavicencio Narvaez, L. del C., & Alvear Ortiz, LF. (2021). Ansiedad y depresión en adolescentes. *Revista Boletín Redipe*, 10(2), 182-189. <https://doi.org/10.36260/rbr.v10i2.1205>
- [18] Malpartida Ampudia, M. K. (2020). Depresión postparto en atención primaria. *Revista Medica Sinergia*, 5(2), e355. <https://doi.org/10.31434/rms.v5i2.355>
- [19] Arévalo García, E., Castillo-Jimenez, D. A., Cepeda, I., López Pacheco, R. (2020). Ansiedad y depresión en estudiantes universitarios: relación con rendimiento académico. *Interdisciplinary Journal of Epidemiology and Public Health*, 2(1). <https://doi.org/10.18041/2665-427x/jeph.1.5342>
- [20] Orland, K., 2022. Don't look now, but the PC is the world's biggest gaming platform. [online] *Ars Technica*. Available at: <https://arstechnica.com/gaming/2016/01/dont-look-now-but-the-pc-is-the-worlds-biggest-gaming-platform/> [Accessed 7 February 2022].
- [21] Novel, C., 2022. Cinderella Phenomenon - Otome/Visual Novel on Steam. [online] *Store.steampowered.com*. Available at: [https://store.steampowered.com/app/568770/Cinderella\\_Phenomenon\\_OtomeVisual\\_Novel/](https://store.steampowered.com/app/568770/Cinderella_Phenomenon_OtomeVisual_Novel/) [Accessed 14 February 2022].

[22] Store.steampowered.com. 2022. STEINS;GATE on Steam. [online] Available at:<https://store.steampowered.com/app/412830/STEINSGATE/> [Accessed 14 February 2022].

[23] Galactic Cafe., 2013. The Stanley Parable on Steam. [online] Store.steampowered.com. Available at:[https://store.steampowered.com/app/221910/The Stanley Parable/](https://store.steampowered.com/app/221910/The_Stanley_Parable/)[Accessed 14 February 2022].

[24] En España hay 0,55 psicólogos por cada mil habitantes. (2021, 5 julio). Colegio Oficial de Psicología de Navarra. Accessed 15/04/2022, Available at:<http://www.colpsinavarra.org/noticias/en-espana-hay-055-psicologos-por-cada-mil-habitantes>.

[25] Unity Technologies. Unity download archive. <https://unity3d.com/es/get-unity/download/archive>[Accessed 15April 2022].

[26] Microsoft. Visual studio download archive. <https://visualstudio.microsoft.com/es/vs/older-downloads/>[Accessed 15April 2022].

[27] Unity Technologies. Unity Asset Store. <https://assetstore.unity.com/>[Accessed 15April 2022].

[28] SketchFab. SketchFab.<https://sketchfab.com/>[Accessed 15April 2022].

[29] Blender Foundation. Blenderdownload archive.<https://www.blender.org/download/> [Accessed 15April 2022].

[30] GitHub. Github desktop download archive. <https://desktop.github.com/> [Accessed 15April 2022].

[31] Dafont. Dafont. <https://www.dafont.com/es/> [Accessed 15April 2022].

[32] Microsoft. Microsoft Word download archive. <https://www.microsoft.com/es-es/microsoft-365/word> [Accessed 15April 2022].

[33] Mendeley. Mendeley discovery. <https://www.mendeley.com/> [Accessed 15April 2022].

[34] Mendeley. Mendeley Reference Manager for Desktop download archive. <https://www.mendeley.com/download-reference-manager/linux> [Accessed 15April 2022].

[35] Clip Studio. Clip Studio Paint download archive. <https://www.clipstudio.net/es/dl/> [Accessed 15April 2022].

[36] Lucid. Lucidchart. <https://lucid.app/documents#/dashboard> [Accessed 19April 2022].

[37] Unity. Unity Documentation. <https://docs.unity3d.com/2020.1/Documentation/Manual/system-requirements.html#player>[Accessed 20April 2022].

[38] Dia. Dia download archieve. <http://dia-installer.de/index.html.es>[Accessed 20April 2022].

[39] Novel, C., 2022. Cinderella Phenomenon - Otome/Visual Novel Soundtrack on Youtube. [online] Available at:[https://www.youtube.com/watch?v=B\\_I5dwnZCj0&list=PLIdMEhu\\_a1C3CpRL2AjXaximdy-p-OxKkD&index=1&ab\\_channel=%E9%95%B7%E8%B0%B7%E5%B7%9D%E5%A4%95%E5%AE%9F](https://www.youtube.com/watch?v=B_I5dwnZCj0&list=PLIdMEhu_a1C3CpRL2AjXaximdy-p-OxKkD&index=1&ab_channel=%E9%95%B7%E8%B0%B7%E5%B7%9D%E5%A4%95%E5%AE%9F)[Accessed 14 February 2022].

[40] Salario para Programador .net en España - Salario Medio. (2022). Talent.com. Recuperado 8 de junio de 2022, de <https://es.talent.com/salary?job=programador+.net#:~:text=El%20salario%20programador%20.,hasta%20%E2%82%AC%2036.575%20al%20a%C3%B1o.>

[41] Sueldo artista 2D – Salario Medio. (2022). Glassdoor.htm. Recuperado 8 de junio de 2022, de [https://www.glassdoor.es/Sueldos/2d-artist-sueldo-SRCH\\_KO0,9.htm](https://www.glassdoor.es/Sueldos/2d-artist-sueldo-SRCH_KO0,9.htm)

[42] Sueldo level designer – Salario Medio. (2022). Glassdoor.htm. Recuperado 8 de junio de 2022, de [https://www.glassdoor.es/Sueldos/game-designer-sueldo-SRCH\\_KO0,13.htm](https://www.glassdoor.es/Sueldos/game-designer-sueldo-SRCH_KO0,13.htm)

[43] Sueldo analista de datos – Salario Medio. (2022). Talent.com. Recuperado 8 de junio de 2022, de <https://es.talent.com/salary?job=analista+de+datos#:~:text=El%20salario%20analista%20de%20datos.,hasta%20%E2%82%AC%2028.950%20al%20a%C3%B1o.>

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