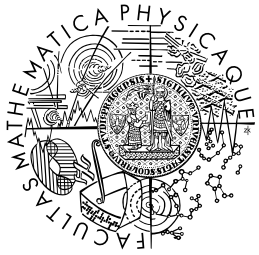

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MASTER THESIS

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Game Portraying Obsessive-Compulsive Disorder

Department of Software and Computer Science Education

Supervisor of the master thesis: Ing. Radek Richtr, Ph.D.

Study programme: Visual Computing and Game Development

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I would like to thank my supervisor, Ing. Radek Richtr, Ph.D., for his guidance and advice. I am thankful for consultations with NIMH, Mgr. et Mgr. Iveta Hocko Fajnerová, Ph.D., and Mgr. Bc. Karolína Zuzánková, who patiently answered my various questions. I would also like to thank Mgr. Tereza Hannemann, Ph.D., for her knowledge about testing. I am always grateful for the support of my family.

Title: Game Portraying Obsessive-Compulsive Disorder

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Abstract: Obsessive-compulsive disorder (OCD) is one of the most prevalent psychiatric disorders in the world. Its symptoms are highly heterogeneous, so that each person can experience it differently. However, the unpleasant feelings connected to the disorder are common for everyone. This thesis aims to educate a broader audience about OCD through a series of mini-games. These games try to simulate symptoms related to numbers and symmetry, which is one of the symptomatic dimensions of this disorder. They also try to induce negative feelings (such as anxiety) associated with it to explain the topic further.

Keywords: Obsessive-Compulsive Disorder, simulation, serious game

Název práce: Hra zobrazující obsedantně-kompulzivní poruchu

Autor: Alžběta Mrkvová

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Abstrakt: Obsedantně-kompulzivní porucha (OCD) je jedna z nejrozšířenějších duševních poruch na světě. Její symptomy jsou vysoce heterogenní, tedy každý člověk ji může prožívat jinak. Avšak všichni pociťují nepříjemné pocity spojené s touto poruchou. Má diplomová práce cílí na informování širšího publika o OCD prostřednictvím série miniher. Tyto hry se snaží simulovat symptomy týkající se čísel a symetrie, což je jedna ze symptomatických dimenzí této poruchy. Dále by měly navodit u hráčů negativní pocity (jako je například úzkost), aby více přiblížily celou problematiku.

Klíčová slova: Obsedantně-kompulzivní porucha, simulace, serious game

Contents

Introduction

This thesis aims to educate the broader public about Obsessive-Compulsive Disorder (OCD). It is a common psychiatric disorder and people suffering from OCD can be found throughout the world. Many of them might not even know about the existence of OCD or the possibility of treatment.

This disorder includes a large scale of symptoms. Each person experiences it differently. The common element is the repetitive pattern of manifestations – like intrusive thoughts privately in one's mind or visible acts driven by said thoughts. Common are also negative feelings, like anxiety or distress, that stem from the intrusive thoughts.

People sometimes think that OCD is just some personality quirk. Unfortunately, the disorder is not so innocent. Another common misconception is that people with OCD love cleaning and need everything tidy and orderly. Although cleaning and organising can be one of OCD's manifestations, the affected individuals feel strong and hard to resist urges to perform those activities, rather than enjoyment to perform those activities.

It is important to educate people about this topic. With OCD, as with countless other mental illnesses, stigma goes hand in hand. Media often help to spread skewed views about these topics further because it is a deviation from a norm. And if these views are the only source of information for some people, it makes sense that they have cultivated them into their understanding of the illnesses.

I decided to create a video game to spread information about OCD. Video games are suitable media for education. Players directly interact with the game world, observe the impacts of their actions on the world and learn from this experience. Players can learn how to play the game through trial and error, but games have a good potential to show the players how some principles work by providing players with clues or hints in the game world or other narratives, or explaing the rules of the game outright.

The game consists of three mini-games trying to illustrate the difficulties someone suffering from OCD might experience. The players are encouraged to empathise with the game character and help overcome the OCD episodes. Throughout the game, the players learn more about the disorder. The information is presented in smaller chunks that should serve as a hint for the mini-game that is to come. The mini-games are then puzzle games. The players can complete them only after finding the correct rules of the OCD ritual that helps the person calm his mind from anxiety. The game gives the players feedback that tells them if their actions are incorrect (the level of anxiety rises) or correct (anxiety subsides).

The players can read about more manifestations of OCD after completing th last mini-game. Many symptoms are omitted from the introductions, so the players would not be overloaded with much novel information. Solving the puzzles

can be difficult, given the varsity of OCD, and the players could certainly use a nudge in some direction while searching for the correct solution to the ritual.

The thesis structure can be divided into six parts: Theory, analysis, game design, implementation, testing and conclusion. The theoretical part introduces some key concepts for the thesis (mental disorders, stigma, serious games, simulation) and defines OCD. Games featuring mental disorders or used for therapy are analysed in the following chapter. Game design and implementation sections describe the conceptual and practical development of the game. Impact of the game on the players is noted in the testing section.

1 Theoretical Background

In this section, I will introduce the terms of mental disorders and stigma, as well as serious games and simulations. I will also provide information about Obsessive-Compulsive Disorder, which is key to the game's development.

1.1 Important Concepts

Before introducing obsessive-compulsive disorder in more detail, I want to mention several key concepts as they directly link to the development of a game about OCD.

1.1.1 Mental Disorders

According to the World Health Organization (WHO), one in eight people in the world lives with a mental disorder [62]. Mental disorders affect one's thinking, emotions, and behaviour. They can disturb one's social life or work and are often connected with negative emotions like distress. The most prevalent disorders in the population are Major Depressive Disorder and anxiety disorders, with phobias as the most common [23] (Figure 1.1).

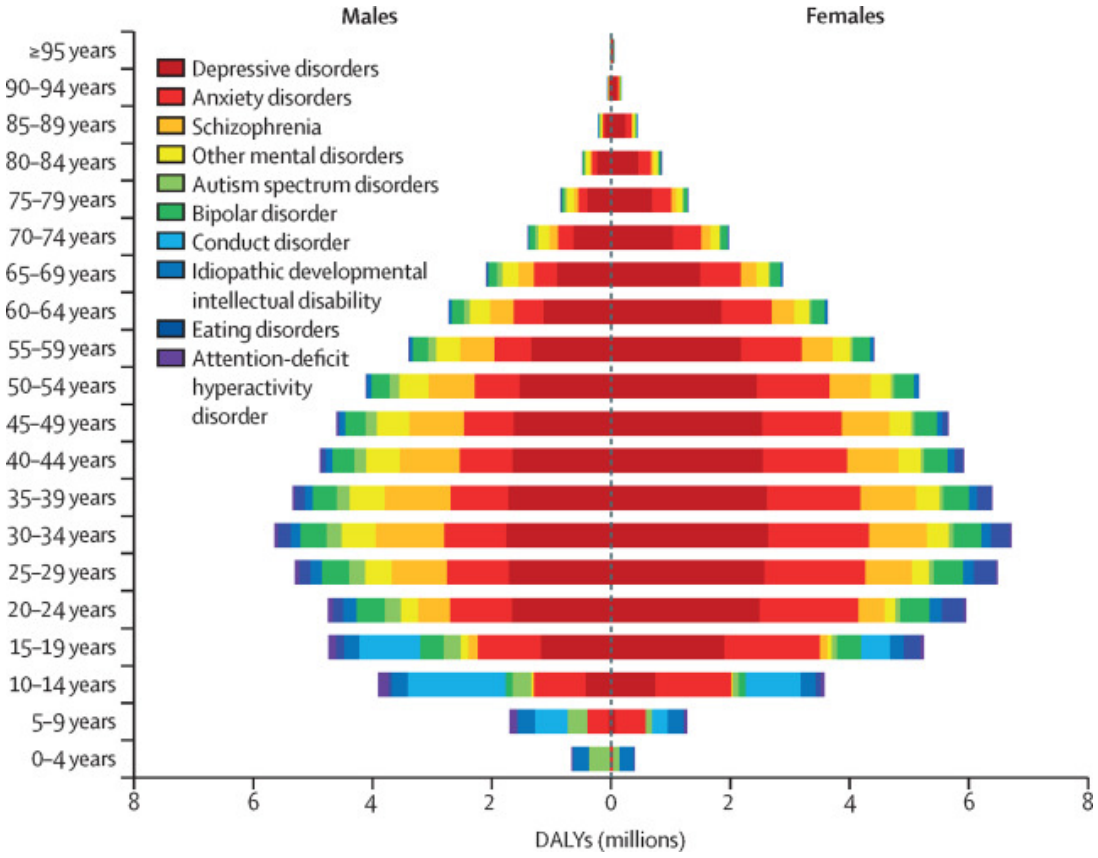

Figure 1.1 Global DALYs (disability-adjusted life-years) by mental disorder, gender, and age, data from 2019 [18]

There are many different types of mental disorders, and some treatments for them exist. However, for various reasons, the treatment is not accessible to everyone. People living with health disorders can experience stigma, and they can even experience their human rights being violated [9].

1.1.2 Stigma

Stigma involves discrediting people based on their differences, like those with mental disorders. It usually instils shame or worthlessness in them and their family. Those labels can come from stereotypes, lack of understanding, and fear. For example, misunderstanding others can label those simply seeking help from a therapist as crazy.

There are three types of stigma. Public stigma is a discriminatory attitude that other people have. In contrast, self-stigma is an internal negative attitude, like shame about one's condition, that can keep one from seeking professional help. And due to systemic stigma in organisation policies, people can be denied a job because of their diagnosis.[40]

Media largely contribute to the inaccurate and misleading portrayals of mental disorders. Discrimination has been observed to have worse consequences on the human psyche than the health conditions themselves [51]. Informing people about the true nature of the disorders helps breaking misconceptions and stereotypes.

To illustrate the video game industry's impact, a team of psychologists and psychiatrists analysed successful video games published from 2002 to 2021. They found that around one-tenth of the top-selling games feature someone with a mental disorder. In the final 54 games, 75 % of the titles portray the afflicted negatively [7] (e. g., as a villain).

1.1.3 Simulation

We can find several entries when searching the term *Simulation* in the Cambridge Dictionary [47]. Two of them are of greater importance in the context of computer games and mental health:

1. "A situation or event that seems real but is not real, used especially in order to help people deal with such situations or events."

2. "A model of a real activity, created for training purposes or to solve a problem."

For comparison, the first entry is suitable for describing therapeutic tools, such as virtual reality applications for exposure therapy. Section 2.3 provides some examples.

The second entry is a more fitting definition of simulation for the computer games created as part of this thesis. The game tries to show anxiety symptoms in several situations in case the player does not adhere to the unwritten rules of rituals.

1.1.4 Serious Games

> *"Games that do not have entertainment, enjoyment or fun as their primary purpose."*

This sentence is one of the simplest definitions of serious games by Micheal and Chen [33]. However, we can find games that fall into this category much earlier.

The definition is broad. For that reason, we can find games that focus on education, training, raising awareness, research, etc. There are serious games used in healthcare or by the military.

The long history of serious games begins in the 1950s. Scientists created several games in which computers played against humans on a chessboard [29]. They used these games to research artificial intelligence [35].

A large part of this genre includes simulators, be it applications for training public safety (e. g., *Hazmat: Hotzone* [8]) or used for military training or recruitment (e. g., *America's Army* [33]), to name a few examples. These simulators have a first-person perspective and (most often) realistic graphics that immerse the player in the experience. The player feels more engaged and motivated [11, 29] – excellent tools for learning and training.

Games have also proven successful in treating depression [26], anxiety disorders [57], and other disorders [14]. These games are designed for specific treatments or existing games whose purpose has shifted [25] (e. g., *Tetris* [20]). There are also serious games for mental health created to increase the literacy of disorders and diseases [27].

The game designed and developed as part of this thesis shares the properties of serious games, as it exists mainly to educate or intrigue players about Obsessive-Compulsive Disorder.

1.2 Obsessive-Compulsive Disorder

Obsessive-compulsive disorder shares symptoms of repetitive thoughts and behaviours with several other disorders [61], such as body dysmorphic disorder, hypochondriasis and olfactory reference disorder. I will focus on the group's flagship disorder in the following section.

1.2.1 Definition of OCD

The International Classification of Diseases (ICD) is the global standard for diagnostic health information. Its eleventh revision came into effect on January 1, 2022, and has been gradually implemented worldwide since then. Before this revision, there were two main definitions for OCD diagnosis (ICD-10 [60] and DSM-5 [1]). However, ICD-11 merged them into one.

According to ICD-11 [61], OCD is characterised by the presence of obsessions or compulsions, or most commonly both. Obsessions are repetitive, persistent thoughts or images or impulses/urges; they are intrusive and unwanted and are commonly associated with anxiety. The affected individual attempts to ignore, suppress, or neutralise the obsessions by performing compulsions. Compulsions are repetitive behaviours or rituals that individuals feel driven to perform in response to an obsession, according to rigid rules, or to achieve a sense of "completeness". To be diagnosed with OCD, the obsessions and compulsions must be time-consuming (taking at least an hour per day) or significantly disrupt the individual's life. The symptoms should not also be a manifestation of another medical condition or due to the effects of substance or medication, including withdrawal.

OCD is a highly heterogeneous disorder. The content of obsessions and compulsions varies widely among individuals. Symptoms are classified in several dimensions (in a nutshell: cleaning, symmetry, forbidden thoughts, possibly hoarding). The exact contents of obsessions and compulsions, and the severity of the symptoms, can also vary throughout life.

Individuals also differ in the degree of insight they have about the beliefs that stem from their symptoms. Many admit that their objects of distress and behaviours are excessive, but a small portion may appear to be delusional in their conviction. The severity of symptoms and insight may vary over time in individuals. The fluctuations can be associated with the individual's current stress level.

1.2.2 Overview of Obsessions and Compulsions

Because obsessions and compulsions are core terms in OCD, I will use them more often also later in the text. I summarise these terms into bullet points for a quick overview.

Obsessions

- intrusive thoughts, ideas, impulses
- accompanied by increased anxiety, distress, possibly fear, disgust, anger
- often seen as unacceptable by the individual
- problematic to ignore
- sometimes linked with avoidant behaviour: avoidance of places or situations that could trigger obsessions (then, in turn, anxiety and compulsions to neutralise them)

Compulsions

- lead to a temporary reduction of anxiety or distress
- neutralising behaviour, performed until the tension subsides
- mental acts, like substituting one thought for another, imagining, praying, and magic acts (e. g., knocking on wood)
- rituals, stereotyped behaviour according to set rules, if interrupted or done incorrectly, the whole ritual needs to be repeated
- compulsions can be corrective (most common, e. g., washing), preventive (e. g., checking stove), or reassuring [39]

  > Compulsive acts are not for pleasure. Most often, they are completed to ease the uneasiness that results from obsessions. [61]

1.2.3 Symptom Dimensions and Examples

OCD is associated with negative emotions, such as anxiety, distress, fear, disgust, or anger. These emotions result from obsessive thoughts or compulsions. The symptoms tend to be seriously time-consuming. People may feel the need to know everything about some subject (obsessions) or constantly do rituals to alleviate their anxiety. They then feel frustrated that they do not have time for anything else.

Psychiatrists classify the contents of obsessions into several dimensions: cleaning, symmetry, forbidden thoughts, possibly hoarding, and related compulsions [61].

To explain the symptomatic dimensions, several examples inspired by various literature [39, 38, 32] are provided next. Note that OCD is very heterogeneous, and many views and symptoms are possible.

Cleaning obsessions are very common. A man can fear contamination. His compulsive ritual is undressing upon returning home from outside, putting his clothes into the washing machine, and taking a long shower. He can also demand this behaviour from his wife and children. Alternatively, he might avoid going outside altogether.

The symmetry dimension includes arranging of objects, number obsessions, various repetitions, and something akin to perfectionism [38]. A boy can arrange the books in his bookcase until he feels they are "just right." A woman feels uneasy, annoyed, or irked if one of her picture frames is a little crooked. A girl needs to count her steps. She has to walk by doing sets of five steps at a time and stopping for a few seconds.

To illustrate forbidden thoughts, a woman can fear hurting her little son with a knife. She has intrusive images of grabbing the knife and stabbing him, or fear that he finds and hurts himself, etc. She develops rituals in response to these "forbidden" thoughts that are unacceptable to her. She can constantly check knives in the kitchen, lock her cupboards, repeat in her mind: "It's OK, it's OK, it's OK", or even urge someone from her family to supervise her when she is with her son in the same room.

Checking behaviours are also a prevalent manifestation of OCD. A man can have trouble leaving his house without checking several times that he turned the gas off, closed all the windows, properly locked the main door and put the keys into his usual pocket.

Hoarding is classified as a separate disorder [61]. It can overlap with OCD if there are connected thoughts that it could help someday to save someone and refuse to throw it away, or they can compulsively accumulate objects.

1.2.4 In Population

Several studies [16, 44, 42] were conducted to understand whether compulsions and obsessions also exist in the population. They found out that around 90 % of people experience unwanted intrusive thoughts, and some of them try to neutralise them through some rituals. The difference was in the interpretation of these thoughts (related to the patients), and it is possible that placing great importance on them could elevate them to obsessions.

A significant [15, 49] percentage of the population, 2 - 3 %, is estimated to be suffering from OCD. This disorder is associated with considerable comorbidity [49], most commonly with anxiety, mood, and impulse-control disorders, as can be seen in Figure 1.2.

The onset is typically in childhood or adolescence, with men usually having an earlier onset [43]. However, women are more likely to suffer from OCD than men. Although in 40 % of cases [39], the triggers are unknown, OCD symptoms usually start after some traumatic [46] or stressful event [41].

80 % of people experience improvements [48], and almost 50 % a complete recovery. But a chronic episode is also typical, with very burdening or disabling manifestations. The disorder does not burden only the patient but often the whole family [2].

Many people seek help only when their life with OCD is unbearable, and the obsessions and compulsions take up a large portion of the day [39]. Still,

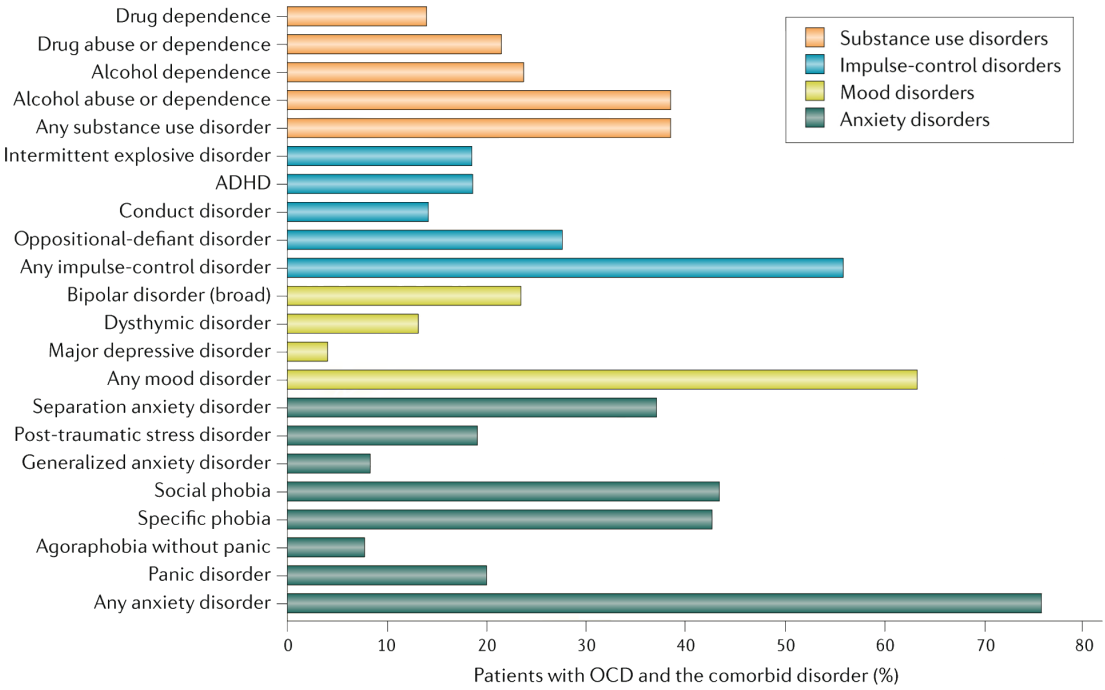

Figure 1.2 Comorbidity of OCD [49]

many people avoid seeking professional help due to self-stigma and shame in their symptoms [50].

1.2.5 Treatment

Treatment of OCD includes mainly pharmacologic treatment and psychotherapeutic treatment. Medication given for OCD patients are most commonly antidepressants, e. g., Selective Serotonin Reuptake Inhibitors (SSRIs). The standard psychotherapeutic treatment is Cognitive Behavioural Therapy (CBT) with Exposure and Response Prevention (ERP). Often, medication with CBT is most effective.

During ERP, patients are incrementally exposed to objects that trigger their obsessions or compulsions. Patients should withdraw their response to the trigger. With time, they learn that not doing the rituals results in nothing terrible as they feared.

Discussions have been led on what type of treatment is superior. Even though only a few head-to-head studies of CBT versus medicines exist, a notable finding is that "ERP may reduce the risk for relapse once medication is discontinued."[45]

There are also severe cases that don't respond to this traditional treatment. For example, Transcranial Magnetic Stimulation (TMS) has shown some promise recently. It is a non-invasive treatment. The patient has a wire coil placed against their head, and the generated magnetic pulses stimulate the patient's nerve cells and change brain activity. The stimulation session can take 5 to 40 minutes, depending on the protocol.[53]

2 Analysis

In this chapter, I will analyse several games portraying mental disorders and comment on their specific aspects and suitability for my developed game about OCD. Finally, I will mention applications for treating OCD.

2.1 Games Depicting Mental Disorders

I will now introduce two of the most famous video games about mental disorders (other than OCD): a game about psychosis – one of the most [7] portrayed disorders, and a journey with a hopeful ending.

2.1.1 Hellblade: Senua's Sacrifice

Hellblade [36] is a 3D action adventure with realistic graphics. The story is shrouded in Norse mythology . The main character, Senua, suffers from psychosis, and her hallucinations and voice-hearing are core parts of the storytelling (Figure 2.1). Senua's delusions talk to her, telling the player what is happening. The player gradually understands that not everything is as it seems at first.

The developers asked a professor of Neuroscience [55] to help them understand more about psychosis and who gave them examples that became part of the game. And through the game, the professor now has illustrative material to show his medical students in his lectures.

I aim for this educative aspect in my game, although as a short introduction of OCD with a simulation of anxiety, not as a professional tool for medics.

Figure 2.1 *Hellblade: Senua's Sacrifice*, hallucinations during a puzzle-solving [36]

2.1.2 Celeste

The main character of *Celeste* [30] suffers from anxiety and low self-esteem. As she has nothing to lose, she accepts the challenge of climbing a mountain. The game is a platformer with a strong narrative. Initially, the two parts of her personality are in discord. Her self-doubt constantly discourages her from her quest. But throughout the journey, she accepts both parts of herself (Figure 2.2). This introspection is an essential aspect that can help even the players with their problems, as we can see in this video[1] that analyses the gameplay. At the same time, many people enjoy playing the game for its challenging levels.

Celeste is a great example of an entertaining game about mental disorders with a hopeful ending.

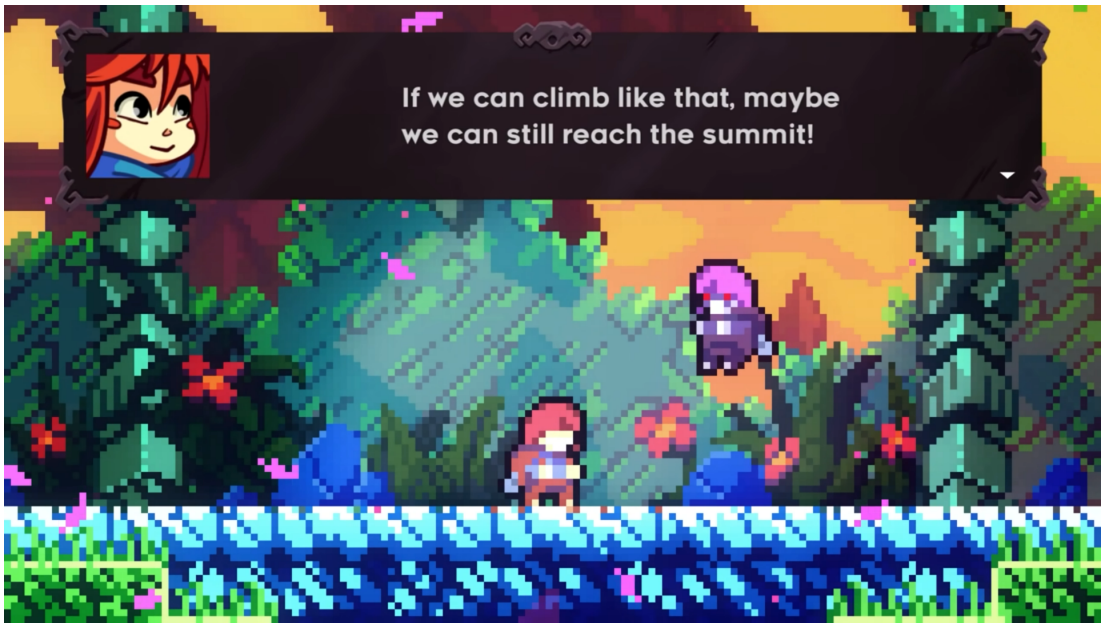

Figure 2.2 *Celeste*, featuring the moment of acceptance and reconciliation [30]

2.2 OCD in Games

The following section is about games featuring OCD or similar to OCD in some aspects but only on an surface level that is visible to other people.

2.2.1 Neverending Nightmares

Neverending Nightmare [21] is a horror game that was, to a certain extent, inspired by its developer's experience [58]. According to an explanatory video[2], the main character cannot escape from a cycle of nightmares featuring the dead body (and other forms) of a woman or a girl (Figure 2.3 shows her doll form). Also, a few verses from the Bible keep showing up, most of the time written on walls with blood.

[1]Video by Leadhead: `https://youtu.be/JSFkpr_psJs?si=dWF61ZTd1249Hci5`
[2]Video by GamerSault: `https://www.youtube.com/watch?v=QX88Qry_pLY`

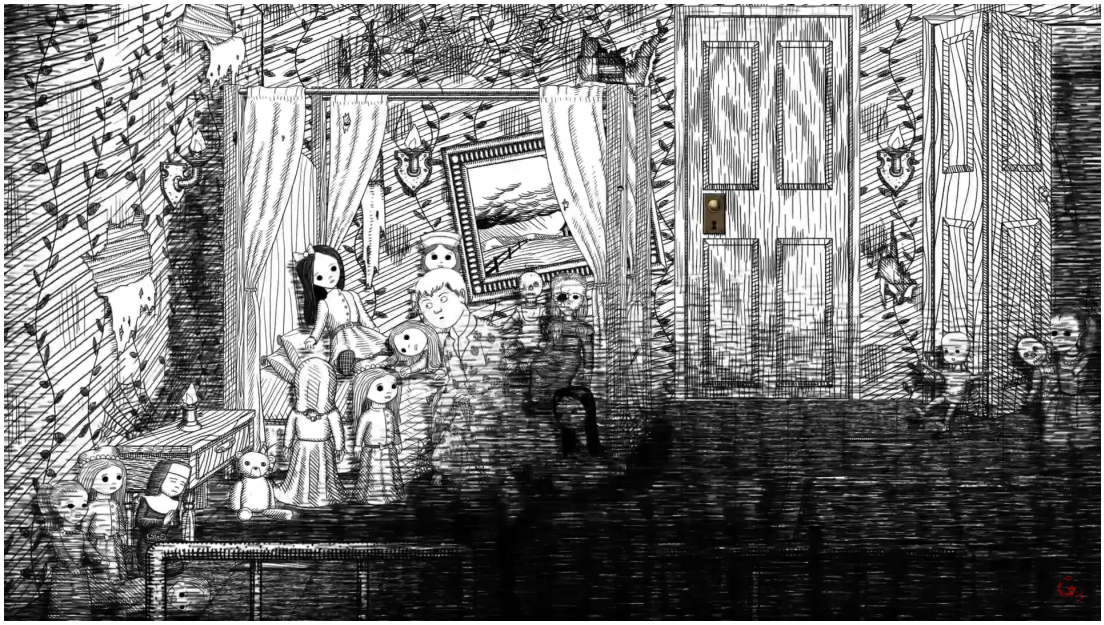

Figure 2.3 *Neverending Nightmares*, during one of the depression episodes [21]

The main character suffers mainly from depression, OCD, and possibly alcohol delusions. Depression and OCD are commonly co-present (Figure 1.2). The repeated images of people, connected to the sense of dread of hurting them, can be seen as a symptom of OCD. The same applies to the excessive religious thoughts visualised as scrawled verses from the Bible in blood throughout the game.

This game simulates many negative aspects of mental disorders, such as the hopelessness of depression. Although a horror game, it may help people with similar experiences to realise that they are not alone and others like them exist.

I do not want to paint OCD so drastically negatively in my game. There is a fine line between artistic interpretations of a mental disorder and stigmatising it. I want to showcase the disorder in a more playful setting, as puzzles to solve to get to know the main character.

2.2.2 Compulsion

A group of university students created *Compulsion* [4] to demonstrate life with OCD. The game is played in first-person perspective of a woman. The player can move freely in her house but needs to listen to her inner voice to be in relative peace. The objective is to prepare dinner for her date.

The inner speech and floating instructions in the house are intrusive thoughts. If the player ignores these thoughts, the woman becomes anxious. The creators visualised her discomfort by blurring the camera momentarily and in more severe stress, accompanied by a black vignette for tunnel vision. The floating text of the compulsion starts pulsating, depending on its urgency (Figure 2.4). The sound effect of a short breath underlines the visual effect.

Figure 2.4 Screenshot from the game *Compulsion* [4]

Among the portrayed symptoms of OCD are checking compulsions, such as turning on and off each knob on the stove or flipping a light switch three times, straightening objects, and washing compulsions. The woman says everything has to be perfect to welcome her guest.

I liked their anxiety visualisation and took inspiration from it. I also considered whether to use rapid breathing but decided not to. I wanted the players to immerse themselves in the main character; a stranger's breath could rip them from the illusion.

2.2.3 Application for Raising Awareness of OCD

Last year, a preliminary study [28] on a game raising awareness of OCD was published. This application features symptoms of contamination and repeated checking. The player navigates sequentially through a house and, in each room, must perform compulsions related to the room (Figure 2.5). The player can read dialogues from various stages of life and listen to information about the disorder.

I gathered from the paper that anxiety was not portrayed in any way in the game. They suggest in the discussion that blurring the screen could help increase the player's distress. For me, the visualisation was a problem I contemplated right from the start as I saw it as a crucial part of the simulation.

2.2.4 Cleaning and Ordering Games

Many games exist in which the player can arrange objects or clean rooms. Although the manifestation of OCD may be similar, there is a fundamental difference. These games bring a sense of satisfaction to the player upon seeing the job well done. But people suffering from OCD feel driven to clean or arrange to alleviate the stress they would feel otherwise.

Figure 2.5 Application for raising awareness of OCD, contamination scene [28]

Take *A Little to the Left* (Figure 2.6), for example. The game has "satisfying messes to tidy" [31]. It lets the player solve the puzzle by searching for the correct placement of the objects, and a pleasing sound effect underlines the resolution of each mini-game.

Figure 2.6 *A Little to the Left*, mini-game with straightening picture frames [31]

Cleaning and re-arranging are very common themes for satisfying games. Ironically, it is also a prevalent manifestation of OCD. We can find games like *Unpacking* [59], *Dustforce DX* [19], *House Flipper* [12], or *PowerWash Simulator* [17] (Figure 2.7). The players play them for pleasure or fun. There is no suggestion of anxiety that would link them to OCD.

Figure 2.7 *Unpacking*, *Dustforce DX*, *House Flipper*, *PowerWash Simulator*, [59, 19, 12, 17]

2.3 Therapeutic Applications

There are many applications designed for clinical use. Their purpose is to trigger OCD symptoms to administer ERP in a controlled and safe environment – or possibly to use it for diagnosis [5, 24]. The following section will mention several of the therapeutic ones.

2.3.1 Triggering the Need For Order

A team from Portugal [52] developed a puzzle game for triggering the need for symmetry and order in a modern home environment (Figure 2.8). Its creators consulted its content with mental health professionals during the development. Each game started with a screen with the task description, including where the player should look for the clues to a puzzle.

The puzzles involved sorting objects in an unnatural or unpleasing order, and the clue would tell the player the correct arrangement (e. g., colourful books and an order based on stripes on a monitor screen).

They had an interesting perspective on triggering the symptoms. Their application involved the same dimension I am interested in in my game, but they took an opposite direction than I did.

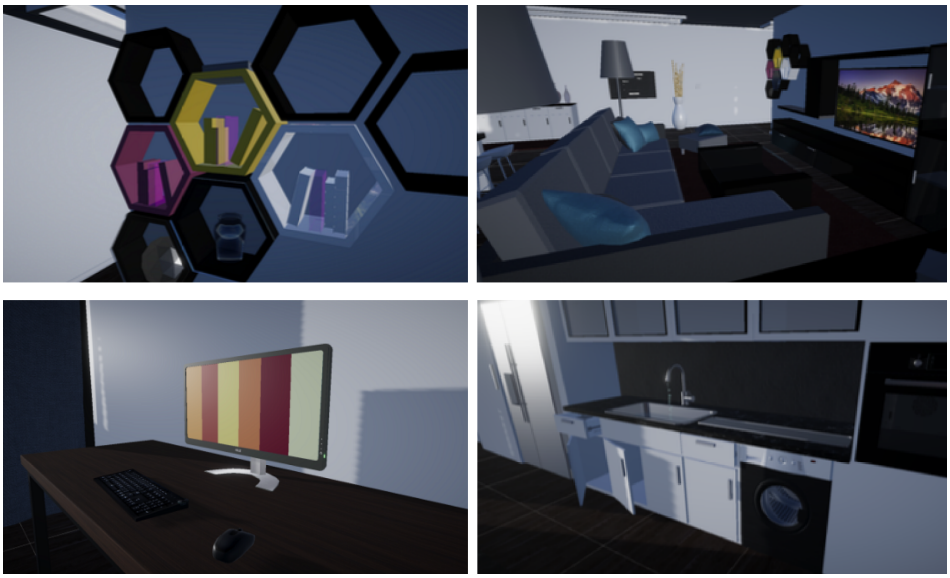

Figure 2.8 Screenshots of the VR puzzle game for breaking ordering rituals [52]

2.3.2 Triggering Disgust

One of the studies [22] used VR to trigger fear of contamination, washing compulsions, and disgust. The participants, with high contamination anxiety, participated in several exposure sessions set in a dirty virtual house (Figure 2.9). They were to asked to refrain from avoiding the task and from performing any neutralising rituals. Blocked water taps also prevented virtual washing. The experiment succeeded in decreasing the feelings of disgust and fear in the experimental group.

Figure 2.9 Four scenarios of the VR game for triggering disgust, fear of contamination, and urge to wash [22]

2.3.3 Comparing *in vivo* and VR

Cullen et al. [10] were the first to directly compare two ERP methods used on participants – *in vivo* and VR (Figure 2.10). The participants attended the two different types (in a randomised order) of ERP sessions in one day. They chose one environment (kitchen or bathroom) to use in both sessions, which were participant-paced and designed to heighten anxiety, as in standard ERP.

The gathered self-reported and physiological data were comparable. However, their heightened engagement and lower anticipatory anxiety before the VR session suggest that this could be a solution to a high rate of dropout [37] from the therapy.

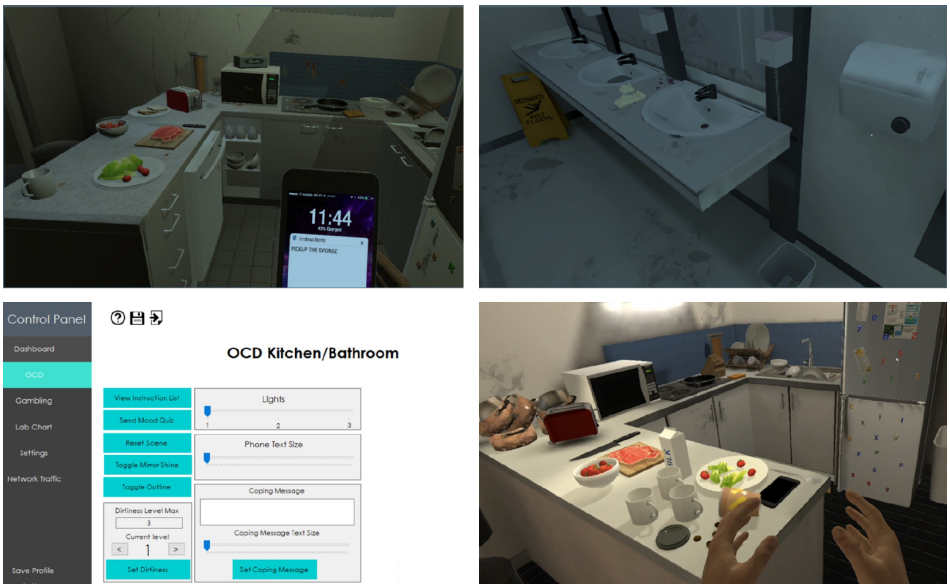

Figure 2.10 VR tool for dealing with symptoms around contamination [10]

2.3.4 Addressing the Main Dimensions of OCD

Researchers at NIMH in Klecany developed a VR tool with various kinds of OCD triggers and are now using it for ERP. They set the environment into a family house and created stimuli in these four themes: contamination/cleaning, symmetry, fear-of-harm/checking, and hoarding (Figure 2.11). Their study [13] validated that it triggers OCD symptoms (with participants encountering stimuli in a predetermined order) and is thus usable for ERP. Outside the study, the participants can freely choose what situations or stimuli make them anxious and in what quantity, directly enabling participant-paced gradation of anxiety.

I had the opportunity to try this application for a few minutes. Each room has a controller to select and load stimuli. For example, if a person needs perfectly straightened picture frames, he can set up the house full of frames askew and try to resist straightening them. He can freely add different stimuli, as having symptoms from multiple dimensions is usual. The application enables the users to interact with any object, so the only way to prevent the participants from performing the rituals is to resist them themselves.

Figure 2.11 Screenshots of OCD house with triggers of four main subtypes of OCD (fear of contamination, symmetry, checking, hoarding) [13]

3 Game Design

An essential part of this diploma thesis was to create a game illustrating several symptoms of Obsessive-Compulsive Disorder, which would give the players an idea or some insight into this disorder. Because the disorder has infinite variations in manifestations, I chose to introduce only one symptomatic dimension – symmetry.

As mentioned in Section 1.2.3, the symmetry dimension contains obsessions with arranging, counting objects or time, and repetitions. It can also manifest as perfectionism with the sense of "just right."

3.1 Goals

I have set several goals for the game:

Education: The game should educate players about OCD. Many people do not know about this disorder at all, or they may have misconceptions. Therefore, short educational texts would accompany the players throughout the game.

Entertainment: The mini-games would be puzzles. The main character has rituals, which the players need to learn somehow to help him get over potentially anxious events. The puzzles themselves could entice the players to learn more about the disorder.

Minimalism: The game would use a minimalistic design [34] without unnecessary features, buttons, objects, and sounds. Simple controls with one mouse button should help the players concentrate on the tasks. Anxiety pictured in the game would steer them to the correct solution, hinting when making an incorrect move.

3.2 Educational Aspect

I needed a way to present information about OCD to the players. In the end, I decided on educational texts between the mini-games. The players are asked to try empathising with someone with OCD from the start to encourage them to stay engaged with possibly frustrating puzzles.

The texts gradually, and in airily spaced paragraphs and screens, introduce the disorder so the players are not overwhelmed by much new information at once. It starts with short definitions of obsessions and compulsions, as these terms are the key concepts for OCD, followed by talking about numbers, symmetry and feeling "just right." People compulsively do rituals to calm their minds, and ignoring the intrusive thoughts causes anxiety and distress.

The texts also act as hints for the upcoming mini-game or a clarifying look back on the previous one. I do not wish to explain explicitly what the players should do in these episodes. Instead, examples are provided to assist the players

to solve the puzzle. There are more examples than needed for the solution, but still relevant to the topic.

After completing the last game, the players learn how many different facets the disorder has and how widespread it is. They also learn about possible treatments for the disorder, with the exposure and response prevention technique being the opposite of these mini-games.

A mouse click switches to the next page. After one second, the players can change the screen, illustrated by an arrow appearing. The delay is set to prevent accidental or hastened clicks.

Alongside the educational texts, the players have hints to the mini-games hidden in a pause menu. These texts not only guide the players on what to focus on but also put the games into the context of OCD. The hint for the third episode is more detailed than others because it describes a knight's move in chess in case some players need clarification of this game mechanic.

3.3 Episodes

The idea was to create several mini-games, short episodes from a typical day, simulating some possible symptoms of OCD for the players to experience. The main character has compulsions and obsessions, mainly concerning counting and walking. These episodes follow in succession, leaving character's home and heading to a shop. Each mini-game is a puzzle (a ritual to an obsession), and the players need to find a rule to continue the journey.

I wanted to create a 3D game with a first-person perspective. The player could walk freely in the game world, but after triggering the symptoms, the player's view would change in a predetermined way (e. g., view from above), and controls would be restricted. Ultimately, I decided to keep it more straightforward, with only the problematic episodes, for better illustration and explanation.

3.4 First Episode: Stairs

The journey begins at home. People experience their OCD symptoms most often in familiar places, like at home or in the office [5].

Main Idea

The plot of the first mini-game is to count stairs. Counting stairs is one example of counting and walking obsessions and compulsions.

Stairs are not prone to change as they are stationary, and their owner can be sure their count will not suddenly change. However, the motives behind the disorder do not necessarily make sense, even for the person having them.

It could be, for example, a calming ritual that he always does before leaving the house so nothing terrible happens, and because it has always worked so far, why change it?

Creative Process

At the beginning of the design process, I wanted to let the player wander more freely in the game world.

The first level should look like this: You are standing behind your closed main door inside your house. A side table with your wallet, house keys, and possibly a shopping list stands next to the door. After you take all these items, you can go out the door and down the staircase. Arrows on the keyboard would control the character's movement.

To go down the stairs, you would need to make a step and, at the same, click a button to represent the mental act of counting the just-stepped-on stair. However, I encountered several problems, including needing substantially more explanation about the ritual and controls. Ultimately, goals for a more straightforward game emerged.

The core of the game changed. Instead of handling both navigating the character and performing side actions for the rituals, I let the players deal only with the ritual, and the movement would happen naturally based on the actions. Or we could look at it as moving the character, which would contribute to the ritual's solution. This aspect repeats in the following episodes.

I played with the idea of time and tempo. I wanted to place a wristwatch on the left side of the screen so the players could always see and hear it. But this way, each mini-game would need to use the wristwatch, which would constrain me in creating more episodes and compelling me to have all rituals tightly coupled with time.

Final Design

I changed the ritual so that the puzzle is to go down the staircase in one steady tempo (instead of stepping on each step while counting). The counting happens automatically with each click on a stair, triggering the move to the selected stair.

As a short introduction to the situation, the episode starts with the character standing upstairs in his house. There is a visible and audible clock ticking in the background (Figure 3.1). A clock is an object not out of place at one's home, and here, it serves as a hint to the players. After clicking on the mouse, the ritual starts.

The core game loop is as follows: You stand at the top of the staircase and see only the stairs below you. You can only go down (i. e., click on visible stairs), and a mental counter (visible to the player) increments automatically when you step on a stair. You can jump over several stairs (i. e., click on the stair not directly below you). But then you cannot step down on the floor below the staircase because

Figure 3.1 The first episode starts above the staircase with a visible ticking clock. The pictogram of the left mouse button blinks for four seconds to hint at the episode's controls.

the counted number does not equal the number of stairs, which the character knows is 16. The counter should also serve as a hint, starting with $0 \neq 16$.

A crucial element of this game is rhythm. The ticking in the background indirectly tells the players what to do. They can try to follow each tick or only each second one. This decision is left entirely to the players because there are countless solutions, and having valid only one could be impossible for the players to find. The players choose their tempo. The time between the first two steps is the deciding factor. The players should be precise with their clicking as there is only a tiny leeway for deviations in the tempo.

A pictogram of the controls (left mouse button) blinks for several seconds from the start of the episode in the bottom right corner of the screen to further help the players. This placement would be consistent for all the episodes, so they would know where to look.

The episode ends with a look back on the staircase. While descending, the stairs are painted in an alternating pattern of black and white, underlining the sense of symmetry (Figure 3.2).

I wondered about creating more game variations, such as letting the player choose the number of stairs to jump over every time or changing the final sum on the counter to step only on some stairs. I have only kept this version for now, as it is a more straightforward introduction to the whole game and possibly also closer to the actual experiences of people with OCD.

Figure 3.2 Look back at the just descended staircase

Indicating Mistakes

If the players go down in a non-uniform tempo or jump over a stair, the game shows them their mistake as a visual effect of gradually blackening the screen/vision. For this effect, I chose a vignette filter, which games sometimes use to indicate dizziness, sleepiness, or injuries (in red). In these mini-games, this effect simulates the anxiety when not conforming to the compulsions.

First, the anxiety starts with a short black pulse to hint that something is wrong. After more errors without enough good moves, the effect escalates, and it can result in blurred vision and total blackout – transition back to the first stair. In this mini-game, player action that results in the most severe punishment and visual indication is jumping over stairs. Clicking slightly off-tempo is recoverable, but jumping over several stairs is not.

3.5 Second Episode: Street

After descending the stairs, the scene changes to a quiet street outside the house.

Main Idea

> *"Compulsive counting is one of many manifestations of OCD.*
>
> *People can prefer some numbers or avoid other numbers for fear. They may feel urged to count how long something takes or count objects around them."*

The quoted text is used in the game before the second episode. It refers back to the first episode as a short explanation. It also introduces the next mini-game by listing several examples. Compulsive counting is also the core idea of the second mini-game.

Creative Process

One of the first ideas for the second game was to use the resulting number of stairs as an obsession. The obsession would take up a significant portion of one's vision and disperse only after finding objects and counting this exact sum (e. g., sixteen ravens) – or finding the number somewhere directly written (e. g., as a house number or on a car licence plate).

The players would have to search around a portion of a street and click on objects. After deciding on mouse controls, clicking on the floor would move the players to a slightly different location, enabling them to see the scene from a different angle.

However, similar to the earlier idea with the wristwatch, this follow-up would restrict the topic of the episodes to only compulsions with numbers. I needed to create a different puzzle, but I still wanted to build on the previous idea of obsessions as persistent images in front of one's eyes. They would signify the type of objects to count, not the resulting number.

Final Design

To be consistent with the first episode I only let the player handle the ritual. Thus, the ritual would consist of one static scene or multiple angles that would change depending on the ritual's progress. Object placement could add to the players' frustration, as finding or clicking on all the objects could be more challenging.

The final game loop is as follows: You stand on a quiet street with several multi-storey houses. Cars are parked around the road, and on the right side, there is a hint of a park or garden. After a moment, an image of a car appears before your eyes (Figure 3.3). If you ignore it and do nothing, the obsession blinks, attracting your attention. The only thing that you can do is click on objects

Figure 3.3 Compulsive car counting, the start of the second episode

in the street to count them. A counter increments by one if the subject of obsession matches the clicked object. However, the counter resets when counting the same object twice or clicking on a different object type, encouraging players to act with precision.

First, the players count the cars, the houses, then the house windows. The complexity increases as there are many windows with different shapes, and clicking on them without any order makes it difficult for the players to keep track of what they have already counted. After counting the windows, the episode continues with a view of the park with trees and blackbirds that often hide behind branches.

This ritual is dependent on the players' speed and accuracy. Anxiety will appear when they ignore the prompt (either by doing nothing for a few seconds or clicking on the wrong items). Correctly counting calms the obsessions and makes the images invisible.

Indicating Mistakes

The errors in this mini-game are counting the incorrect objects or doing nothing for long period of time. Similar to the first episode, the black tunnel vision of anxiety follows both cases (Figure 3.4). The anxiety calms down with quick, correct clicks – as the players certainly know the ritual and try to complete it.

The first type of error is additionally followed by blinking of the subject of obsession to draw attention to itself. Doing nothing leaves the image fully visible the whole time.

Figure 3.4 Anxiety during counting birds in the second episode

3.6 Third Episode: Tiles

The journey continues to the shop. The pavement on the way has a nicely regular grid of big square tiles. Another ritual with walking approaches.

Main Idea

Obsessions related to one's walk are quite frequent. To a certain extent, they are a recurrent theme. It is a variation to the concept used in the first episode.

People might need to step into every room with their left leg or avoid stepping on gaps between tiles. This is also a common superstition. Magical thinking (e. g., performing rituals to prevent disasters) is a big part of OCD. Even thought superstitions and OCD may seem similar at a glance, one of the distinguishing factors is the severity of distress caused to the subject when breaking the unwritten rules.

Creative Process

The scene in this episode consists of pavement made out of square tiles. Several mechanics were considered: precision in gap avoidance, walking in patterns or a combination of these two.

Gap avoidance would consist mainly of the most centred step on each tile. The rate of imprecision would raise the anxiety level along with the time it took to take the step (in short, be fast and precise). The hint for the ritual could be depicted with red crosshairs extending from the tile's border (above which the mouse would hover) to the mouse position. The players would have to estimate the centre without additional measurements. Rocks and trash on the pavement could break the uniformity, forcing the players to move only to clean and empty tiles.

However, I had more ideas for walking in a pattern that could serve as entertaining puzzles. I liked the idea that the main character would try to follow the pattern of a chess piece because the scene's appearance could elegantly hint at this. The tiles in the pavement could transform into a chessboard, and the main character would turn into a game piece, hinting to the players on how to move.

How would the players control the chess piece? Only clicking on the valid tile seemed dull, as there would be no challenge. Sliding with the piece could be more fun. The players would need to paint the correct pattern with the mouse drag. Obstacles on the board could add to the challenge, frustrating the character or players. If these obstacles were dynamic, it would be even better.

Final Design

This episode depicts the final walk to the shop. The pavement is a regular grid of square tiles (Figure 3.5) that, with some imagination, could transform into a chessboard. And so the game begins: The long stretch of grey tiles recolours

to black and white. The camera slides back to show the main character that is currently represented by a model of black knight chess piece.

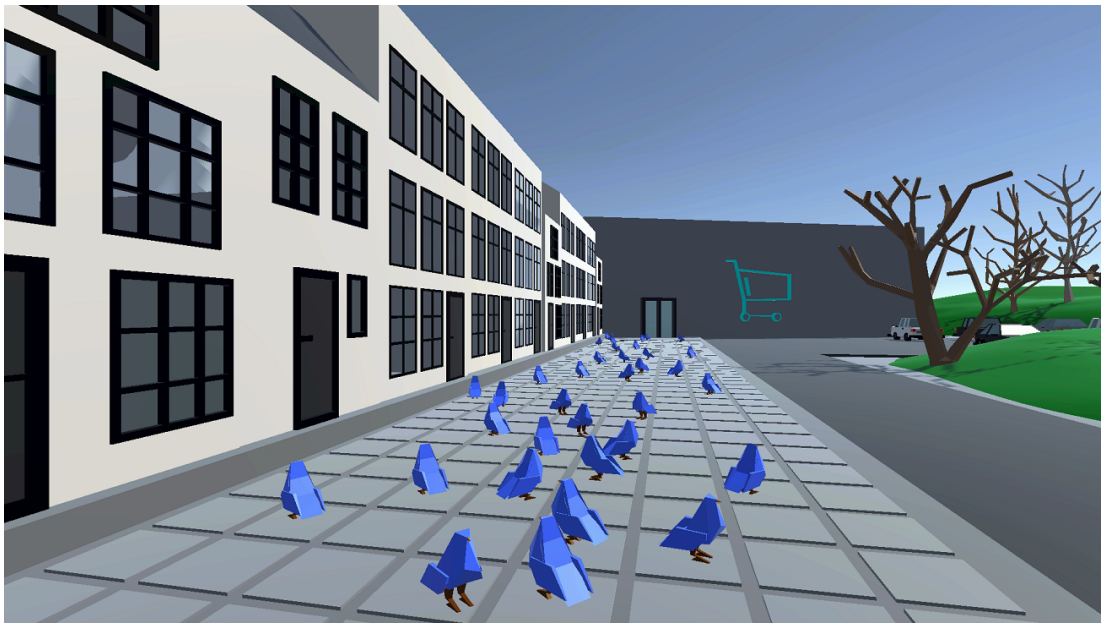

Figure 3.5 The final episode starts with a view of grey tiles full of birds.

The core game loop is as follows: You look at the chessboard from above, with your chess piece in the bottom row on the screen (Figure 3.6). This placement forces you to move only forward. Around you meander numerous birds, each stopping for a few moments on a tile before moving to a neighbouring one.

You can drag your chess piece across the board, painting a pattern connecting the subsequently touched tiles in their centres. You can connect a maximum of four tiles each time, so you cannot recklessly run across the whole pavement when searching for the solution. The chess piece follows the line to each tile while drawing the pattern. After letting go of the mouse, the pattern gets evaluated. The chess piece stays on a tile after a correctly drawn pattern, and the camera follows, so the next move starts again from the bottom of the screen. In case of an incorrect move, the chess piece returns to the last correct position.

However, knowing the correct solution does not automatically lead to a happy ending. The birds on the pavement have their agenda and are often getting under your feet. If you are in the middle of drawing the pattern, the birds can block you for several moments. This waiting frustrates (or distresses) the character, as would the player.

This puzzle shows the two different views of OCD, possibly the most of the three episodes. On one hand, it is a peculiar walk that some people sometimes do just for fun. On the other, people suffering from the disorder cannot help themselves. Because they have it connected to some need or urgency, they are distressed when they do not complete the ritual as they would want to.

These mini-games illustrate the need because you, as the player, cannot do anything else except conform to the nonsensical ritual (or rules of the puzzle in

this instance). Otherwise, you have to reset the whole episode. That is how it is: if they are interrupted while doing some ritual or make a mistake, they often begin anew. It would not feel right, and the problem would not be averted.

This final episode stepped up the challenge, throwing birds under your feet to frustrate you as you have to repeat a game you know how to solve, but they are stopping you from moving. You could be similarly frustrated as someone with OCD when needing to repeat the same ritual because something disturbed their progress. They are frustrated because it takes so much time, but they cannot help themselves.

In this episode, you find yourself in a safe space after correctly completing the knight's move. On that tile, you (and the character) are safe from raising anxiety and can plan your next move in peace. Moving fast in the pattern calms the anxiety, so not walking into an annoying stream of birds is a good choice.

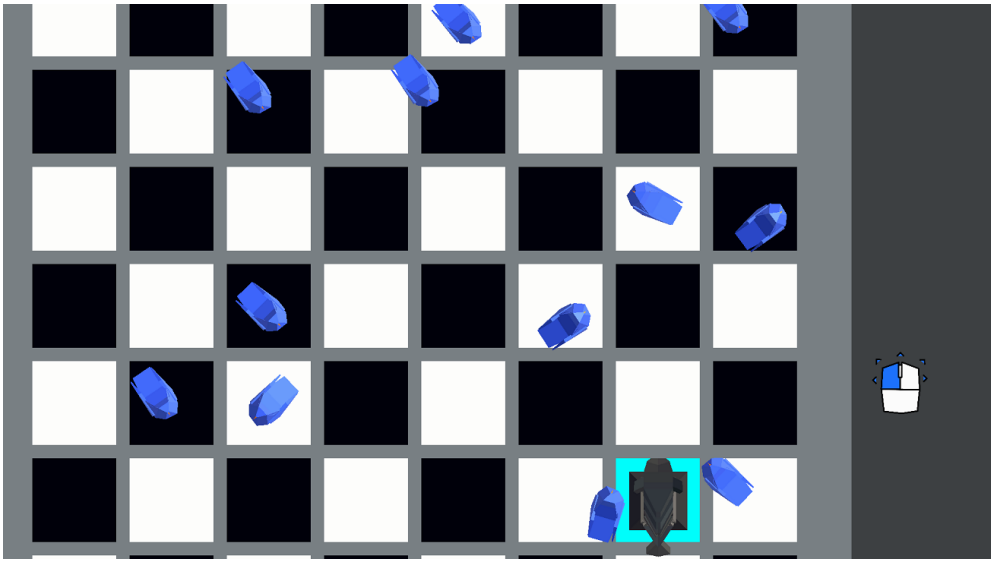

Figure 3.6 The final game loop starts with the top view of a chessboard. The blue pictogram of a moving mouse is visible until the player clicks on the chess piece and tries dragging it.

Indicating Mistakes

The stressing factors in this episode are walking in the wrong pattern and holding the mouse button for a long time, for example, when waiting for a tile to clear up.

The players are drawing patterns to move in. However, each line between tiles is definite and cannot be erased by returning the mouse to the previous tile. The drawn pattern gets evaluated after the players let go of the mouse button. Before ending the dragging action, the players can create a wrong pattern – but only holding the mouse for a long time increases anxiety. In case of a wrong move, anxiety increases aside from the chess piece returning to the last valid position. The anxiety, in the form of black tunnel vision, goes down with every quickly completed move of the chess piece.

3.7 Future Episodes

I want to create even more episodes for the game in the future. I designed a possible following episode for the symmetry dimension. But this does not have to end here. There are plenty of other symptoms of OCD that could be introduced to the players through puzzle games.

Shopping

The whole journey could end with an episode played in the shop. Following the first idea with numbers linking all the episodes, the character could notice an interesting number somewhere before entering the shop, like on a car licence plate. This number would bother him, similar to the second episode's obsession. The puzzle would lie in gathering items whose total cost would sum up to this number. Because this puzzle is an NP-hard problem, the player would have a short shopping list with items that are certainly part of the solution. They would get the shopping list before the first ritual with stairs.

The scene would consist of several views of shelves full of products with price tags under them. The players could shuffle between these scenes, place items into their baskets, or return them to the shelves. I debated how to display the total sum. Showing only the total sum would not be very helpful. Perhaps more useful would be displaying the whole history of price additions and removals, let's say, on the right side of the screen. Or I could create a notepad for the players to note their notes by hand (or on the keyboard instead).

In every episode, I visualise anxiety to show whether the ritual is on the right track. But this puzzle would also be complex for the character, and he could not be sure if the currently selected items are part of some valid solution. The anxiety could rise with the time this task takes to complete and calm down when finally paying the desired sum.

This episode would further show the time-consuming nature of the disorder. It is much more puzzle-y than the rest of the episodes and could take up the most time while playing the game. If I were targeting replayability, the initial conditions could be random each time (i. e., receiving a different shopping list and final price). However, as I do not randomise the content of the rest of the episodes, I would instead focus on fully designing the puzzle.

Other Symptomatic Dimensions

Symmetry dimension is only a portion of OCD. I can expand the game to feature more subtypes, such as cleaning and washing, compulsive, repetitive checking, or intrusive thoughts.

People fearing contamination can have their particular way of hand washing. One episode could focus on this. The players would see a pair of hands in a wash basin and need to find the correct order to wash the fingers. They would start with some level of anxiety and need to calm down entirely by repeatedly washing. The solution could be from the left hand from the thumb to the little finger,

followed by the same order of fingers on the right hand. Or perhaps from the left-hand little finger to the thumb and from the right-hand thumb to the little finger. They could need to repeat this order several times to end the episode.

An episode about washing could feature a sink full of dirty dishes. The players would need to wash everything in the sink, dry it with a dish towel and place it in a cupboard. The placement could also follow some rules, like stacking the plates or sorting colourful cups.

You can also see the need for order in these two drafted episodes. It is common to suffer from multiple subtypes at once. And this little twist could serve for more interesting puzzles.

Another episode could be about a rainy day. The players would have to clean up the muddied floor as fast as possible. Other people in the scene would constantly hinder the task by passing by and getting it dirty.

Compulsive checking and intrusive thoughts could feature the feared outcomes that the players would try to repel. Perhaps an episode with a stove and the effect of fire could show the character's fear of burning down the house if he did not check the knobs frequently. The imagery could replace the spoken word, as I want to keep the game more about symbols and not the voiced concerns.

These are some drafts of possible episodes explaining the OCD symptoms. Before building more episodes, though, I need to test whether this game concept would interest the players.

3.8 Game Modes

These episodes link into one game. Depending on the selected game mode, the players can play the Edu mode with educational texts about OCD.

Another option is to play it as a series of individual episodes without these additional texts or just individual episodes. However, if they get stuck in a puzzle, they can pause the game and read a hint, along with an explanation of the episode in the context of OCD, so they can learn something new even when playing just for entertainment. The explanation can interest the players to learn more about the disorder, and they may choose to play the wordy game next time.

The second game (counting objects in the street) differs in the Edu mode, where repeating the episode does not make the game harder. In the other modes, this mini-game has a more game feel, as the time to correctly find and click on the objects gets shorter and shorter, stressing the players with the need to be precise and fast. This gradual hardening of the conditions was removed from the Edu mode so the players do not quit the game prematurely from frustration. On the other hand, the incrementally more challenging conditions are to put more stress on the player. The scene does not change during the game, and the players would surely learn the positions of objects after several repetitions. The third game has a dynamic component of blue pigeons that intentionally bother the players but can be outrun when they correctly follow the ritual.

Figure 3.7 shows the logic of the game modes, as they are accessible from the menu.

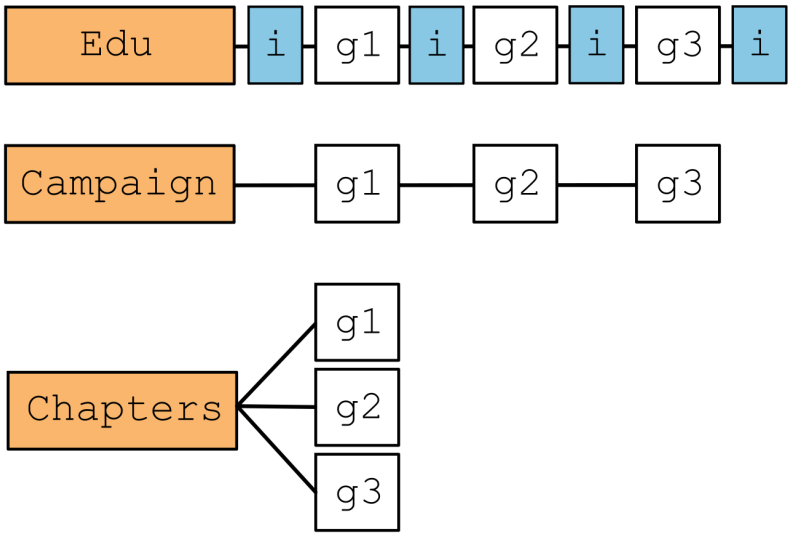

Figure 3.7 Diagram of game modes: educational game, puzzle campaign, and individual chapters. The educational mode consists of game episodes (g1-g3) interspersed with informative texts (i).

3.9 Graphics

The graphics are composed of low-poly models using simple textures, which suit the concept of an educational puzzle game. This visual style is manageable and allows for creating models as needed without searching for suitable assets from third parties.

3.10 Sound Design

To maintain minimalism, I wanted to use only necessary sound effects. Stable rhythm is the core of the mini-game with stairs. A ticking clock – with a regular tempo – is usual in one's house, and I hoped it would serve as a hint. The tick-tocking can also be stressful, as the players directly hear how the time passes. Other sounds (e. g., evaluating each step) could disrupt this set tempo. Therefore, for the first episode, I used only the ticking. It serves as background noise and aids a unified tempo for stepping down the stairs.

Without any background music or sound, the game would feel empty. The other two episodes are outside the house, on quiet streets with some nature and birds. That is why I chose a loop of birds singing.

The second episode focuses on object counting with fast mouse clicking. The players can easily click inaccurately or get lost in counted objects, repeatedly

counting an already counted object. The in-game counter resets with each wrong click. I chose distinct sound effects for the correct and incorrect moves to make them more noticeable to the players. And to add some playfulness to this dull task, the correct moves would create a simple melody.

The third episode is about a knight moving on a chessboard. Here, the only suitable and necessary sounds are the sound effects of sliding the chess piece, hinting at the player that the connected tiles must be directly neighbouring, and setting the piece on the board – if the pattern is incorrect.

I wondered whether to include sound effects for anxiety accompanying the visual depiction of tunnel vision. I considered loud breathing and a speeding heartbeat. he sound of breath could break immersion as this would be the only sound the character makes and would feel out of place. The heartbeat accelerates quite slowly and gradually and calms down even slower. Using it for immediate reaction when doing something wrong would not be suitable. For these reasons, I used mainly the visual effect to show the errors.

4 Implementation

The game (Attachment A.2) was developed in Unity [56], a cross-platform engine for creating games in 2D and 3D. Unity's main building block is `GameObject`. These objects, for example models, create hierarchies in the scenes and can carry custom scripts describing game logic.

This section will discuss the implementation of the game, starting with fundamental concepts used throughout the application, followed by the project's structure, a description of the anxiety simulator script, the topic of bird logic, and ending with the implementation of in-game texts and graphics.

4.1 Key Functions

In this section, I will introduce key concepts used in the game. These functions assemble all mini-games, and the necessary logic completes them.

Coroutines

The game depends on time and precise timing. Timing is crucial mainly because in-game anxiety gets triggered when a step in a ritual is not completed in time.

Coroutines can spread the execution of one function into several frames, allowing the creation of timings. To list some examples, I used them in the third mini-game for the introductory cutscene and waiting calls of birds on the pavement, asking if they could move to some next destination.

The `Update` function could do the same thing. However, `Update` is executed each frame, which is unnecessary for most usages and would call the code unnecessarily often. That is why I use coroutines frequently in the game.

Tweening

Tweening (short for in-betweening) is a powerful tool for various animations. I used the `DOTween` library[1], which was created and optimised for Unity.

Tweens create keyframes between initial and ending states. They are helpful not only for movement animations. They use easing functions that specify how a particular parameter should behave in time.

That is why the animation of camera rotation can use tweens, let's say, to rotate around the y-axis in 3 seconds from the initial angle of 2 degrees to 90. Tweens can also animate the anxiety effect or hopping on the stairs; they only modify different parameters.

[1] `https://dotween.demigiant.com/`

Object Tags

The game is controlled by a computer mouse. I use a system of tags and colliders to recognise the clicked objects. The game can determine whether the click was a mistake based on the tag type or its accompanying indicator.

The first mini-game uses tags to distinguish stairs and the floor. Each stair has a number indicator to determine whether the move was correct. In the second mini-game, each object type (e. g., car, house, tree) has a tag, and every countable object has an indicator of whether it has been counted. After a wrong move, the counter and these indicators are reset. The third episode uses two labels: for the knight chess piece and tiles. The tile has an indicator for its position in the grid, so the correctness of the pattern can be validated.

4.2 Project Structure

The project is included as an electronic attachment (see Attachment A.1). The game's assets are placed in the project's `Assets` folder. The folder `Scenes` has the main menu and the three mini-games. `Materials`, `Models`, `Prefabs`, and `Scripts` are divided further into folders named after each mini-game. The scripts used by the whole game are in the `Systems` folder. Then, there are `Resources` with text files and `Sprites` for 2D assets.

Each mini-game has a `SceneManager` script that sets and resets the scene with each repetition. Additional scripts implement further game logic. The first mini-game, for example, has a script for walking down the staircase and managing the step counter. The second mini-game has separate scripts that keep track of the counted objects and display the object of the obsession. The scene of the third mini-game uses scripts for automatic paving, assigning indices to the tiles, and bird logic, among others. I will explain the bird logic later in the text.

4.3 Anxiety Simulation

The script `AnxietyPulse` simulates anxiety and is essential to the game. It displays the current level of anxiety by getting numbers from other scripts. These numbers modify the current value of anxiety – either adding to it or decreasing it.

The severity of symptoms can be roughly broken into three degrees: none, mild, and severe. Mild symptoms begin with the first mistake and show a single pulse of black vignette effect. Severe pulsating starts after exceeding a certain threshold for errors. The black pulses are faster and quickly accompanied by blurred vision. No anxiety is displayed when the mini-game starts or when the players calm the symptoms by correctly doing the ritual.

Vignette and blur are two post-processing effects in Unity's Universal Render Pipeline (URP), which allows developers to create and modify visual effects using a scriptable pipeline. In this game, timed sequences of tweens modify the effects' values to make the anxiety simulation.

After five consecutive severe pulses, the script invokes an event to reset the current level. All manager scripts for the mini-games listen to this event to reset the state of the current scene, with all the significant changes (e. g., character's position) hidden behind a black transition. The players then proceed directly to the ritual without the introductory scene of the episode.

4.4 Bird Intelligence

The third mini-game uses the element of chance. The players should know by now what to expect, and the game will work against them. Walking birds are essential to the last episode to increase frustration and simulate daily occurrences.

Their movements are driven mainly by chance but depend also on the knight's position (or `horseTile` in the pseudocode). I wanted the birds to be an annoying or frustrating element in the game. The birds should move from one tile to a neighbouring tile, where they would stay for a few moments.

I tried several options for choosing their neighbours: classic 4-neighbourhood, 8-neighbourhood, and only diagonals. When the birds moved perpendicularly to the tiles, they could move in the exact directions as the players and crowd the knight very often. Moving diagonally across the tiles forces a bird to move out of a path. In the editor, I left all three movement possibilities to choose from, which can be checked in and out in the script `BirdManager`. I also contemplated their chance of crowding, i. e., the probability of selecting the closest tile to the knight. In the end, I use a 25 % chance of deliberate crowding.

At the start of the third mini-game, `BirdManager` instantiates birds from a prefab and places them on tiles from a given list. If the mini-game repeats, the manager resets the bird positions.

Each bird moves according to the script `BirdBehaviour`. At the beginning, a random number of seconds from the interval $\langle 1, 3.5)$ gets assigned to a bird. This number signifies the number of seconds the bird will stop on each tile. After that time is up, the bird asks the `BirdManager` for a new tile. If no tile is available, the bird waits for 0.2 seconds and then asks again.

The `BirdManager` assigns the next tile according to the following pseudocode:

```
function NextTile(birdTile)
    freeTilesList ← FreeNeighTiles(birdTile)          ▷ check diagonals
    closestTile ← ClosestTo(freeTilesList, horseTile)
    if birdTile.y > horseTile.y + 3 then              ▷ bird is behind the horse
        return closestTile
    end if
    if Random⟨0, 3⟩ < 1 then
        return closestTile
    else
        return RandomTile(freeTilesList)
    end if
end function
```

The movement of the birds and the chess piece is based on a reservation system. The players draw across tiles, reserving them (script `Tile`) for the chess piece. For the bird, only the unoccupied and unreserved tiles are considered free. When the bird gets a new tile, it frees its current tile and occupies the new tile, preventing the players from reserving it while the bird moves there. Figure 4.1 shows a particular tile occupied by a bird, as can be seen from the editor.

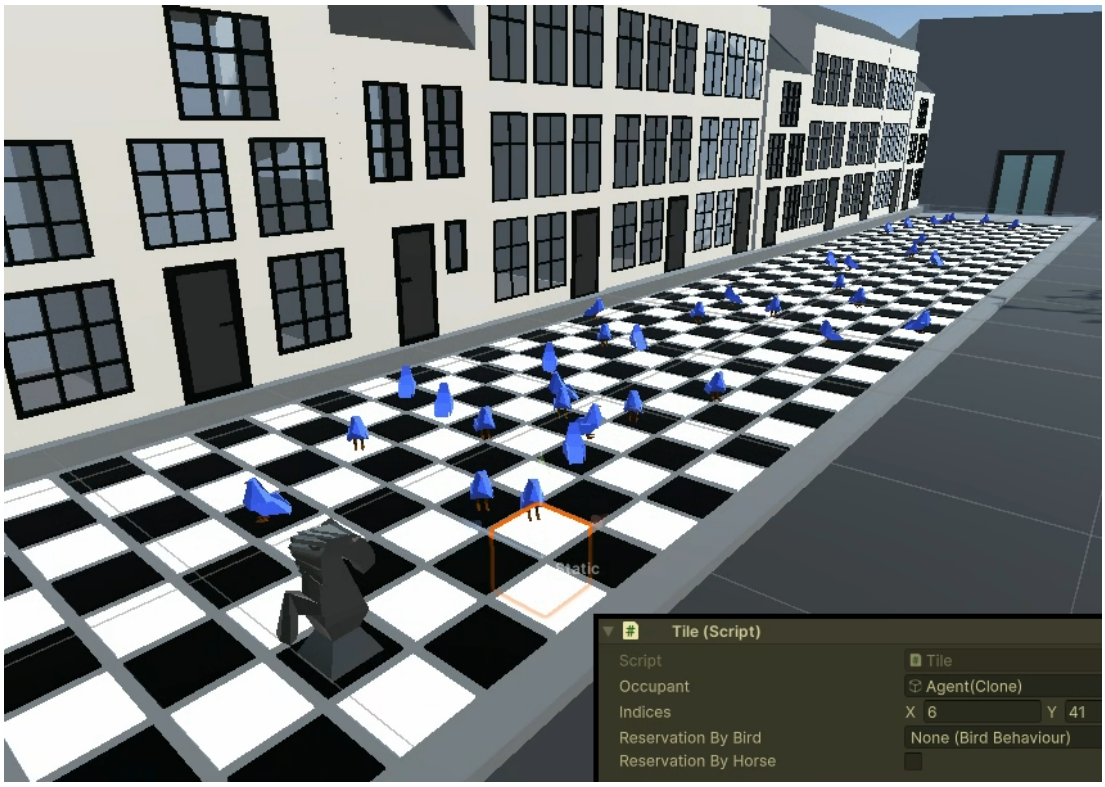

Figure 4.1 Tile occupied by a bird, view from the editor

If the players follow the ritual rules, they can outrun the birds. The birds could be even more annoying, but I decided to reward the players when they do what they should. But in the end, it is only a matter of changing the crowding probability or changing the selection of neighbouring tiles for the birds.

4.5 Texts

Texts and hints are supplied to the game as JSON files. This format is simple to use and edit, with user-defined named fields for values that can be assigned to variables in the game.

The game uses two kinds of informational texts: educational screens for Edu mode and hints accessible from the pause menu. The files with educational texts are placed in the asset folder `Resources/Texts` and inputted into the list of the script `HintSystem` in the desired order of showing. Hints are in `Resources/Hints`, with only one text file per mini-game. Educational texts can be more with the same header, resulting in multiple text screens before the episodes.

The script first fills the content of the text files into dictionaries for each episode based on the field `sceneName` in the file. There is also logic for changing the text screens in Edu mode. The players can go only further in the texts and are enabled to switch the page after one second of the last page turn. The whole screen serves as a button, and the appearance of an arrow indicates the possibility of going further. I selected the time delay to encourage the players to read the texts and prevent accidental double clicks when flipping to the next page.

The hints are accessible from the pause menu, which asks for text to fill its screen at the beginning of each mini-game. This pausing screen is made up of a button "Show hint" that, upon clicking on it, changes to the title "Hint" with a hint or solution to the ritual and a short explanation of the symptoms (Figure 4.2). The hint remains uncovered for the rest of the mini-game in the pause menu.

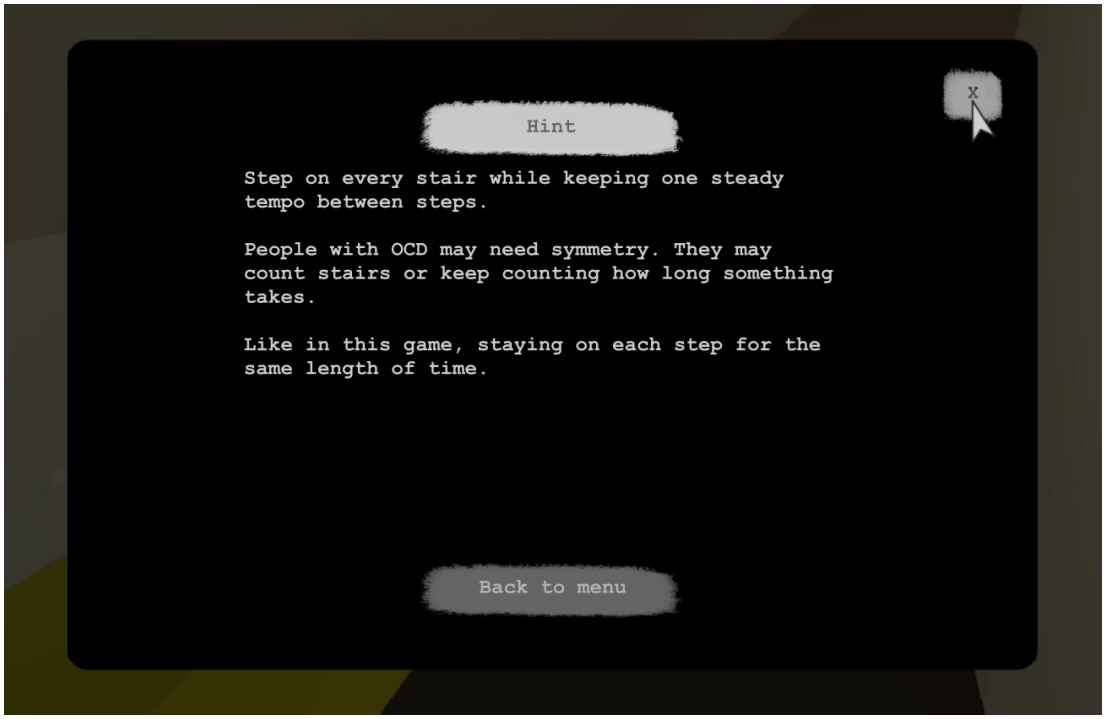

Figure 4.2 Hint for the first mini-game, accessible from the pause menu

4.6 Graphics

I modelled all the assets in Blender [6]. The desired visual style was colourful and low-poly, suitable for short puzzles. Figures 4.4 and 4.5 provide some examples; the game screenshots are throughout Section 3.3.

For the first version of the stairs mini-game, I created a character with animation of going down the stairs (Figure 4.3). Alas, it was very problematic to adjust the complex animation for much more dynamic usage in the game, as I saw it as essential that the players could jump over multiple stairs at once. Ultimately, I decided to go for a more stylised version, with only shoe soles visible.

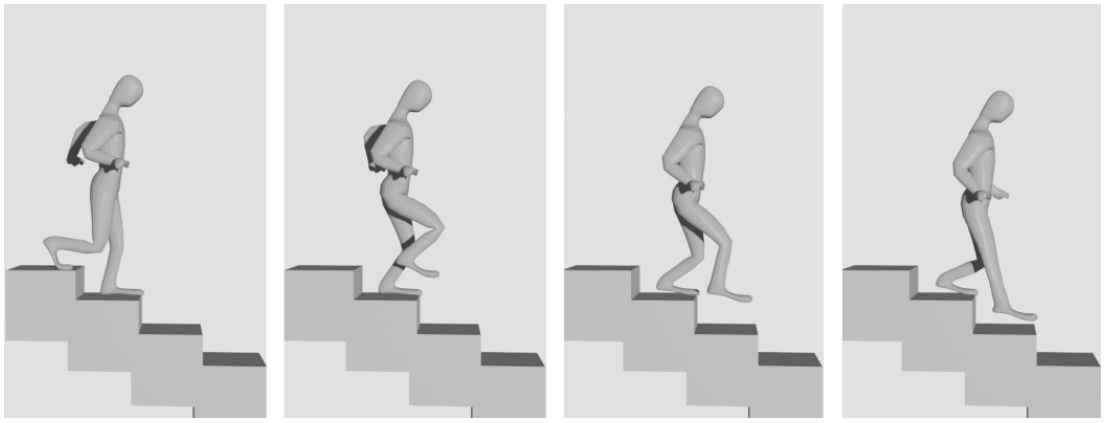

Figure 4.3 Draft of animation descending stairs for the first mini-game, side view but meant to be seen from the character's perspective

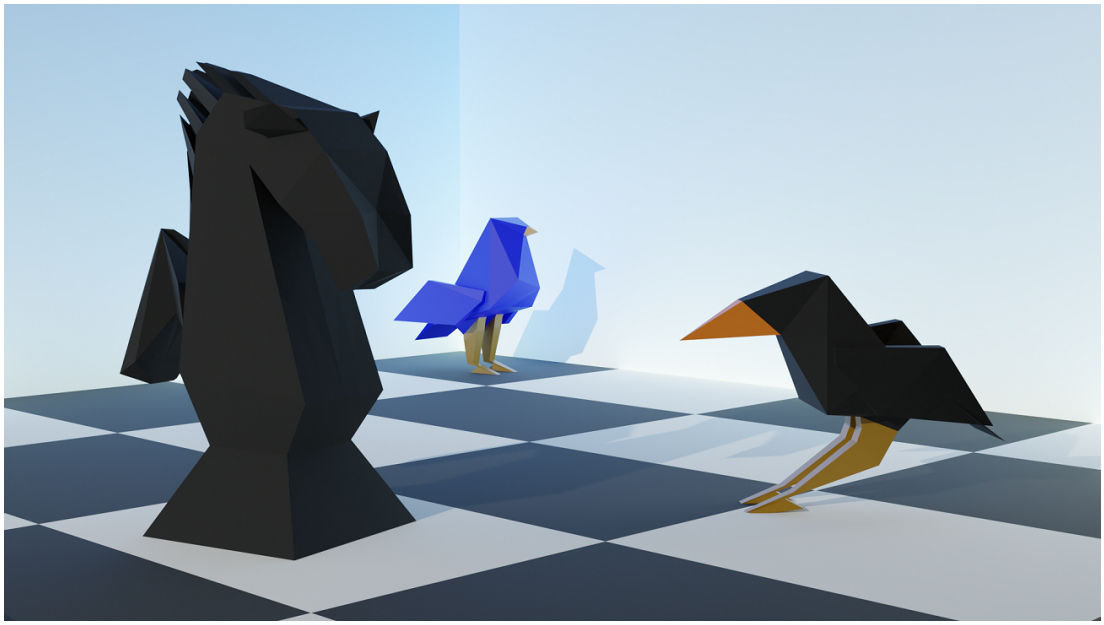

Figure 4.4 Models of birds and knight chess piece

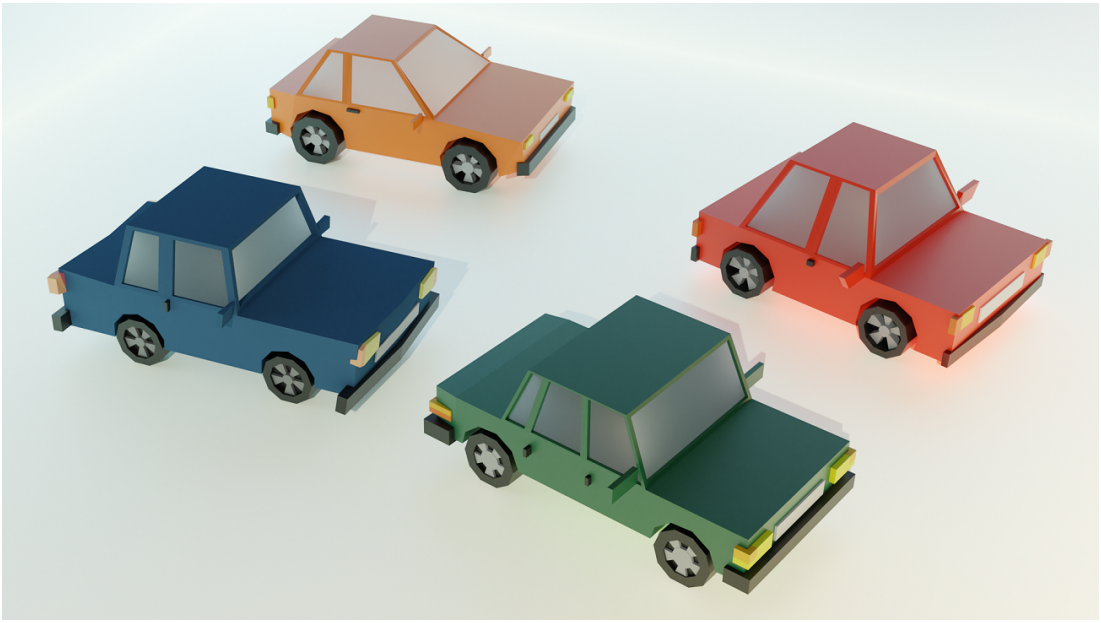

Figure 4.5 Models of cars for the second episode

5 Playtesting

Since developing the first mini-game, I have let several testers verify its playability. After the whole game was ready, I organised a formal playtesting with different participants to gather answers to my hypotheses.

5.1 During Development

During the game's development, several offline testing sessions were held to verify its playability and game logic. Each participant ($N = 7$) went to the testing without prior information about the game's mechanics, and they were introduced to the game right before they played.

This early testing revealed an issue in the second game when the players needed to count houses. The counting slightly increases in difficulty, starting with a few cars and houses, followed by many windows on the houses. In the first version, when a player clicked on a window during the house-counting phase, it was taken as a mistake. However, they could not have known they would also need to count the windows, so it was a logical assumption that a window is part of a house. As it would confuse the players otherwise, I fixed it for the game's next version. Figure 5.1 is a comparison of the first scene.

Another interesting remark from the testers concerned the object counters, which were initially textual fields. The players reported inconsistency with the rest of the 3D graphics and took it as a temporary solution. Creating 3D models for the numbers and symbols was a helpful suggestion.

After the development, a pilot run for the official testing was held online with participants ($N = 4$) who were also newly introduced to the game during their testing. They tested the clarity of the formulation in the questionnaires.

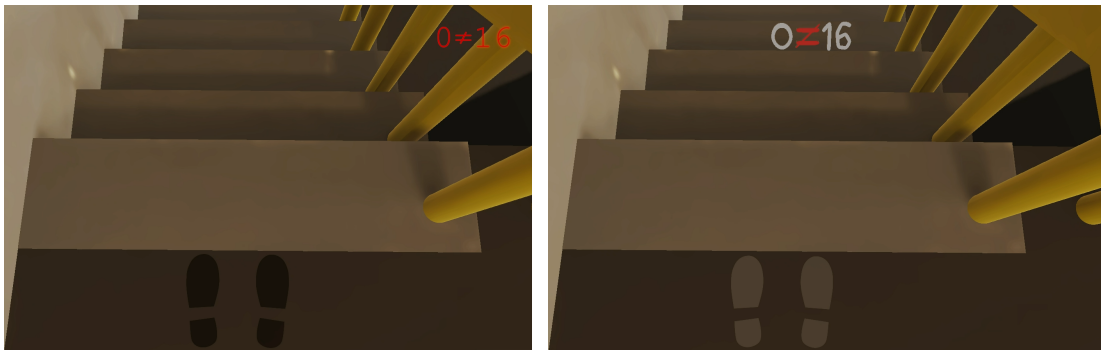

Figure 5.1 Stair counter with text field (left) vs. 3D models (right)

5.2 Final Testing

After completing the application, the final testing took place. A version of the game in Czech (in addition to an English version) was created because the playtesters would be from Czechia. This version had additional screens with instructions for the testers, reminding them to fill out a part of a questionnaire after each mini-game. The participants played the educational game mode during the testing session.

5.2.1 Null Hypotheses

The null hypotheses and research questions were about the game design and the game's effects on the players:

Education: The game has the potential to assist people in understanding certain aspects of OCD.

Texts: Dividing texts into smaller parts and graphical structures will help not to discourage players from reading them. Players prefer multiple shorter paragraphs split across the screens rather than one longer text.

In-Game Cues: Some players can find the solution to the mini-game (the procedure for the ritual) from the visual or audio feedback of the mini-game without using the text hints.

Distress: Will players experience unpleasant feelings (e. g., anxiety or frustration) while playing the mini-games? What role does the visual effect of the beating black vignette play in this?

Relief: Players will be distressed if they repeat a mini-game many times. This frustration will subside when they finally complete the mini-game.

5.2.2 Method

Volunteers sent me a signed informed consent (Attachment A.3), and we arranged the testing session. The session started with an online call between one tester and me and lasted about one hour. First, I introduced the project, explained when to fill out the questionnaires (before, during, and after playing) and invited them to join me for an after-game interview about their playing experience.

Before-Playing Questionnaire: The testers would fill out this questionnaire right before playing the educative version of the game. Its questions were to establish the participant pool: the highest level of education attained, their understanding of OCD, and their age and gender. Finally, they would set a baseline for their mood with a short-form of State-Trait Anxiety Inventory (STAI-6).

Between-Games Questionnaire: After they completed each of the three mini-games, the testers filled out a section in this questionnaire. The questions were a Likert scale of how much frustration and anxiety they felt during playing and completing the mini-game. Definitions for frustration and

anxiety were at the beginning of the form to help unify the view of these terms to the players.

After-Playing Questionnaire: The third questionnaire started with another STAI-6. It asked them to rate their anxiety during playing, the usefulness of texts, and the entertaining value of the mini-games. There were also closed-ended, multiple-choice, and open-ended questions to test their understanding of OCD. It ended with a System Usability Scale (SUS) to get their view of the game's usability.

The content of the questionnaires was consulted with NIMH in Klecany. The Czech questionnaires used during the testing are in Attachment A.4. Their English translation is in Attachment A.5.

5.2.3 Participants

The testers ($n = 11$) were recruited mainly from among the students ($N = 8$), and the rest were working ($N = 3$). The participants differed from the testers during the development, and they were only introduced to the game during their sessions. There were nine males and two females. All had completed at least secondary education. They were aged 20 to 35 (mean = 25.5). Most participants reported playing considerably more than two hours a week ($N = 7$), three people around two hours per week, and only one playing video games rarely or never.

These values are summarised in Table 5.1.

male / female	9 / 2
uni students	8
mean age	25.5
age range	20-35
gamed per week 0 h / 2 h / more	1 / 3 / 7

Table 5.1 Participants

5.2.4 Results

Players' Understanding of OCD

Before the testers started playing the game, they rated in the questionnaire how much they knew about OCD and could write what they thought the disorder was. All the testers filled in that they had some or almost no knowledge about OCD, though two of the respondents had a reasonably good understanding of OCD before playing. The most common opinions were that people with OCD required everything to be orderly or perfect and that they needed to do unreasonable rituals or repeat some activity.

After playing the game, they reported increased insight into the topic of OCD. One tester was amazed that "the obsessions can be so severe that a therapy would be necessary", and another wrote that "OCD could have more forms" than they

thought. The testers often talked or wrote about the ERP therapy mentioned in the text. Four people mentioned that the information about 2 % of people searching for help with OCD has stuck in their memory, and they were surprised by the high number.

Many testers reported that they realised that the rituals are connected to anxiety and fear, and their completion reduces the distress. One mentioned that they could better "absorb the information they had about the disorder and be able to define it better now".

Five testers noted their experience of the game with texts like they could "imagine how it can feel" in the mini-games, that they could "better understand the disorder after being exposed to both the texts and games", that "the texts introduced something and they could try it then for themselves", or that "game can evoke the feelings that someone with OCD can have". "You come out on the street, and it is suddenly coming at you, and you have to do the compulsions while the time is running away from you, and you cannot move from the place without feeling somehow okay", this tester said along with how it came upon them how constraining and time-consuming the disorder could be.

The after-playing questionnaire had more questions testing the participant's understanding of OCD. Obsessions and compulsions were defined at the very start of the game. Testers could choose only one most fitting answer.

What are obsessions?

- misconceptions that are believed to be true
- intrusive and unwanted thoughts
- fear of losing something

All respondents correctly answered the first question as "intrusive and unwanted thoughts".

What is the purpose of compulsions?

- to ward off boredom
- it is a ritual to improve one's mood
- to drive away intrusive thoughts

The best-fitting answer to the second question is "to drive away intrusive thoughts", and ten testers voted for this. One voted for "a ritual to improve one's mood", which is only partly true.

What can be symptoms of OCD? This last question was a multiple-choice question to which the testers saw the possible answers in scrambled order without information on how many answers were correct. In Figure 5.2, the answers are ordered and counted – starting with six correct and ending with six incorrect.

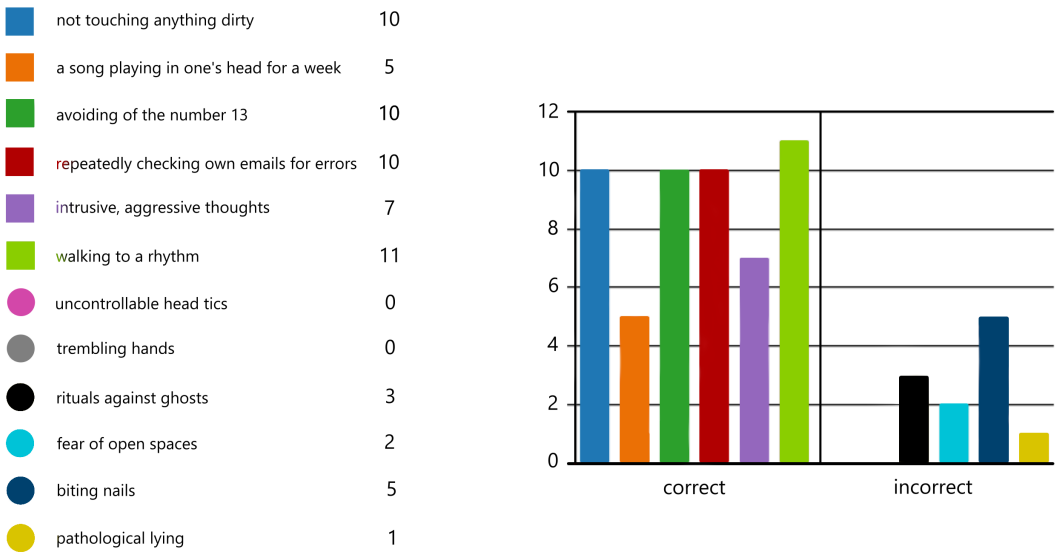

Figure 5.2 Histogram of answers to the question about possible symptoms of OCD

Texts and Puzzles

In the after-playing interview, the testers reported that they found the texts between mini-games engaging and that their length was just right. They went to the testing that they would learn something, so they expected some reading. One tester appreciated the text's bite-sized format, making orienting themselves in it easy. Three testers noted that the content is "to the point", "not unnecessarily lengthy", and that "it is clear from the texts what they are trying to convey".

After being asked if they referred to the knowledge gained while solving the puzzles, nine testers responded yes. The remaining two said they started solving the puzzle independently on the texts, even though they read them. Some said the mini-games were thematic to the textual introduction and hinted at the purpose and what to expect.

Six testers reported the texts as the most important or interesting aspect of the whole game, four talked about the combination of texts and puzzles, and one suggested having students play it at school and then talk about their experiences and feelings.

Figure 5.3 shows a histogram of how they found the texts interesting. Their entertainment with the puzzles is in Figure 5.4. Both scales ranged from 0 to 4, with 4 as the highest possible score.

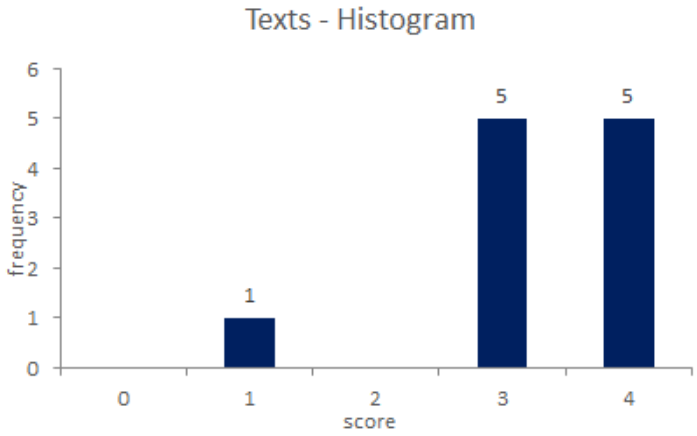

Figure 5.3 Histogram with a score of how players found educational texts in the game interesting

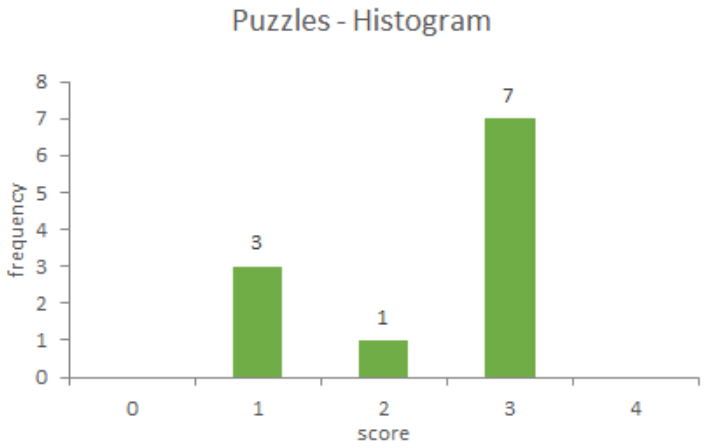

Figure 5.4 Histogram with a score of how players found puzzles entertaining

In-Game Cues

Six testers answered that they did not need to use hints. Three read a hint, and only to the last puzzle. The remaining two admitted they had forgotten about them.

All testers completed the whole game without quitting. They said that the black effect of tunnel vision hinted that something was wrong and pushed them to action.

Five respondents mentioned walking to the rhythm of the ticking clock in the first mini-game. Four completed the first puzzle on their first or second try without knowingly referring to the sound. This solution resulted in their confusion, as they were surprised that the mini-game was already over.

Five testers also mentioned that they liked the second game's audio feedback. They enjoyed the simple ascending and descending melody; two even tried to count the objects to a rhythm.

Distress

A comparison of STAI-6 scores before and after playing was performed with the Mann-Whitney U Test, a nonparametric test for comparing differences between two independent samples of small size. A one-tailed hypothesis with a significance level of 0.05 was used. I worked with the data from ten respondents because one respondent's answers were contradictory within one form. A significant difference was found, with $U = 23.5$ and $p = 0.024$.

Definitions from the Cambridge Dictionary [47] introduced the Between-Games Questionnaire:

> ***Frustration*** – *an unpleasant feeling when something does not go well*

> ***Anxiety*** – *nervousness or worries about a situation, may be accompanied a feeling of nausea*

The testers rated after each mini-game how frustrated and anxious they were while playing it and after completing the puzzle. Figure 5.5 shows the average frustration among the players, with standard deviations in Table 5.2. Figure 5.6 shows average anxiety with the SDs in Table 5.3. Figure 5.7 shows the histogram of their anxiety from the games as they rated in the After-Playing Questionnaire.

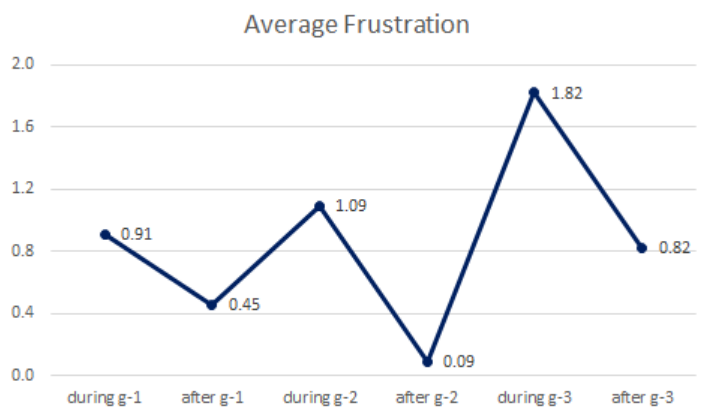

Figure 5.5 Frustration among players, reported after each mini-game (g-1 to g-3)

	during g-1	after g-1	during g-2	after g-2	during g-3	after g-3
average	0.91	0.45	1.09	0.09	1.82	0.82
SD	0.83	0.69	0.94	0.3	0.87	0.98

Table 5.2 Frustration during and after playing all three mini-games (g-1 to g-3)

The pulsating black vignette pushed most testers to do something or even stressed them. Two testers saw it only as feedback to their play indicating errors

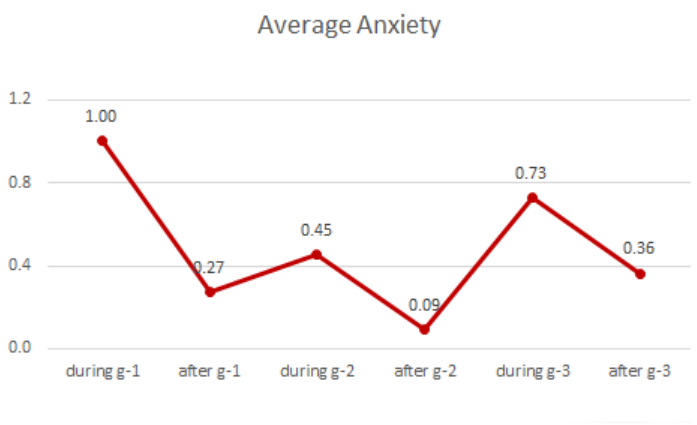

Figure 5.6 Anxiety among players, reported after each mini-game (g-1 to g-3)

	during g-1	after g-1	during g-2	after g-2	during g-3	after g-3
average	1	0.27	0.45	0.09	0.73	0.36
SD	1.1	0.47	0.69	0.3	0.79	0.67

Table 5.3 Anxiety during and after playing all three mini-games (g-1 to g-3)

(e. g., similar to the health bar or effect of injuries in first-person shooters) without any additional emotional connotations.

Five testers reported increased stress, nervosity, or anxiety due to the black vignette. One of them saw things differently — as if they had responsibility for the game character who sees the situations as problematic. The incorrect solution to the ritual distressed the character and, in response, the tester.

The clock-ticking in the first mini-game distressed one tester strongly; another tester enjoyed themselves because of the clock.

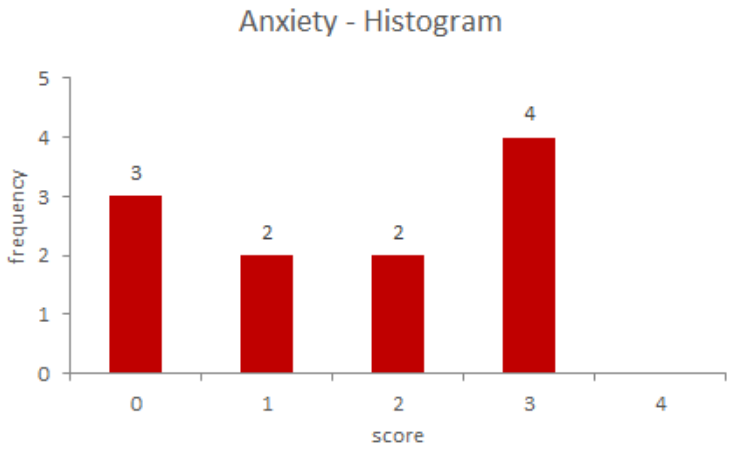

Figure 5.7 Histogram of felt anxiety, how players reported it after playing

Relief

Figures 5.5 and 5.6 show decreased frustration and anxiety after each mini-game. The testers described in their interviews that they felt joy, satisfaction or relief after finally completing a mini-game they had to repeat several times. One felt still upset that they should have been quicker to complete the puzzle.

Completing the puzzle lowered their frustration and anxiety, but not always perfectly. Instead, it tended to subside by one or two points on the scale.

Usability

Testers rated their experience with a 10-item SUS form in the After-Playing Questionnaire. This form has scores from 1 to 5, with 5 as strongly agreeing with a claim. After processing the data, the final score lies in the interval $\langle 0, 100 \rangle$. Figure 5.8 shows the results. Most of the testers chose 3 or 2 to use the game frequently. However, they rated the game as highly consistent and easy to use.

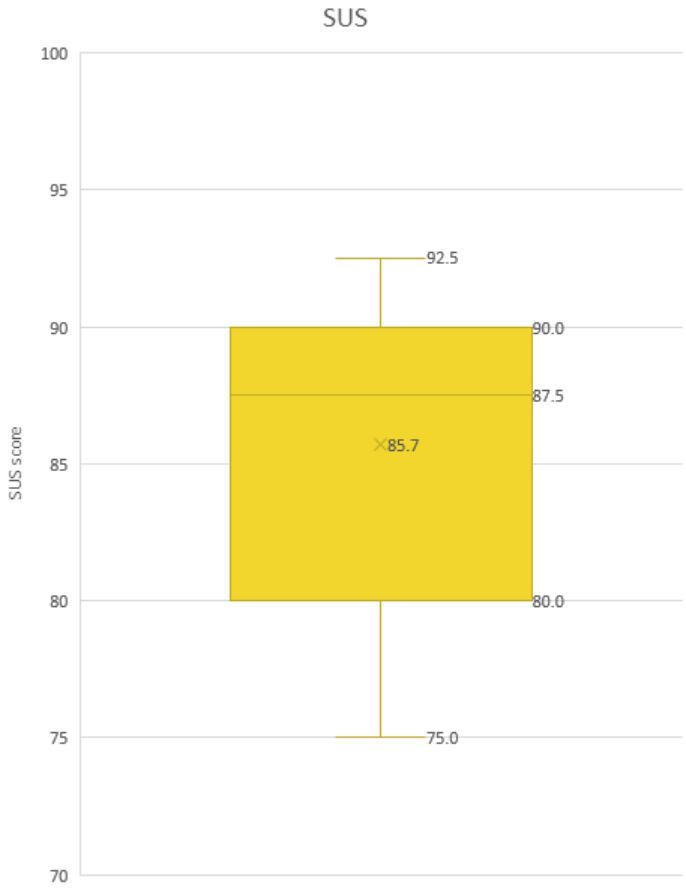

Figure 5.8 Results of the System Usability Score

5.2.5 Discussion

Education: Before playing the game, the testers saw OCD as excessive orderliness, perfectionism, or the need to repeat an activity. The media commonly spreads these views. After the game, they understood that OCD has many more facets than they thought before and could better define it. Some could even empathise during the game and feel distressed from not doing the ritual correctly thanks to the depiction of tunnel vision.

In the multiple-choice question, as can be seen in Figure 5.2, every tester correctly voted for walking to a rhythm as a possible symptom of OCD, which they experienced for themselves in the game. Ten of eleven also voted for avoiding a particular number, repeatedly checking one's emails and aversion to anything dirty. The game uses the mechanic of repeating the episode when the ritual has many errors, and there are visualised numbers in two of the mini-games. I would say that the game influenced the player's view of OCD and has the potential to help them understand more about the disorder.

The less voted correct symptoms included aggressive thoughts, voted by seven participants, and songs on repeat in one's head, voted by five. Intrusive thoughts were mentioned only in the text and not in the puzzles. Musical obsessions [54] can be a symptom of OCD, but this topic is particularly new, as it was until recently neglected or diagnosed as a different disorder [61]. However, earworms are common in the population and do not cause emotional distress for most people.

The most common wrong answer to the multiple-choice question was biting nails, which was voted for by five. Nail-biting could be seen as a secondary symptom of anxiety, which some of the respondents also confirmed as their reasoning. One interesting explanation of why the tester voted for fear of open spaces (also known as agoraphobia) was that they imagined avoiding places that could trigger the OCD symptoms. Avoidance of places or activities can be part of OCD, but fear of open spaces is a separate disorder.

In conclusion, according to their answers to the multiple-choice question, the players learned about some possible symptoms of OCD, but there is room for improvement.

Texts: The testers confirmed that the length of the texts was well chosen.

In-Game Cues: Most of them were able to solve the puzzles without using any text hints. The visual effect of tunnel vision served as an indicator for errors.

Some players registered the clock sound during their solution; some may have gone in a unified tempo from the start without actively realising the driving force of sound, or it could be natural to them. However, there is no cap to the tempo in the first game, allowing the players to run down the staircase without skipping over the stairs, which could then puzzle them.

Several testers playfully used the melody feedback in the second mini-game, completing the ritual based on music.

Distress: From the graphs and testers' testimonies, they could feel anxiety or frustration during playing. The distress also helped some players empathise with someone with OCD.

Relief: The distressing feelings somehow subsided in the testers after completing the mini-game.

Usability: According to [3] (Figure 5.9), the results (mean = 85.7, $q_1 = 80$, $q_3 = 90$) are acceptable. The game was designed and tested as an educational game for single use, and this was reflected in the testers' answers, as they rated low on frequent usage.

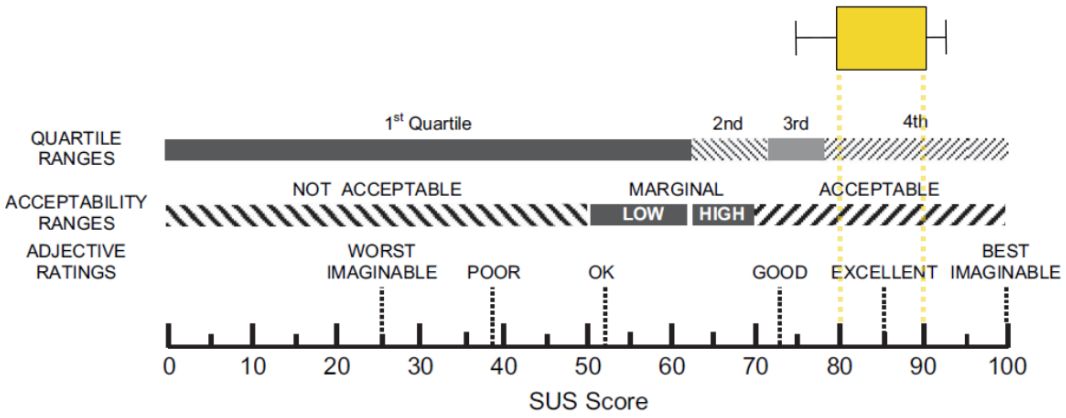

Figure 5.9 Possible interpretations of SUS, modified [3]

5.2.6 Limitations and Future Work

The testing was conducted with a small sample of players. A larger sample would be needed to reach more objective conclusions.

Educational texts could include the possibility of returning to previous pages (three players accidentally skipped a page), and the text size could be adjustable by the players for better accessibility. The hints to the puzzles could be more visible in the game (e. g., via a light-bulb button) and not accessible only through a pause menu as they are now.

There is certainly room for more episodes. Some players even expressed they wanted to play more puzzles. The game could include mini-games illustrating the more overlooked manifestations, such as intrusive thoughts or obsessions with cleaning.

The first mini-game could have a minimal tempo for going down the staircase. However, what is the fastest acceptable tempo? For example, someone can go down in a unified tempo consciously but click five times per second. There is also a small margin for error in tempo, as there will always be some imperfections. Having the subsequent steps be one second apart could solve this problem, but testing from more people is needed to confirm this decision.

Conclusion

Mental health is an important facet of human life that is often overlooked. Mental disorders that have a profound impact on the quality of an individual's life are surprisingly common and varied. Informing people about them is one step toward better health, either to erase stigma or to introduce them to the possibility of help.

As a part of this thesis, I created a game simulating several symptoms of OCD to dispel various connotations or misunderstandings that follow this disorder and tried to highlight how large is the portion of the population affected.

The game incrementally introduces the disorder to the players, letting them experience facsimile of symptoms on their own. The players admitted that the game helped them learn more about the disorder or realise its severity.

Based on the gathered data the game helps players to gain insight into this disorder. There was a demonstrable shift in their mindset observed after finishing the game. However, the effects were observed in a small sample size of $n = 11$ and might not be indicative of the results observed in a larger population.

This topic is far from exhausting the possibilities for games. And I would like to continue in their creation.

Bibliography

1. AMERICAN PSYCHIATRIC ASSOCIATION. Obsessive-Compulsive and Related Disorders. In: 5th ed. American Psychiatric Publishing, Inc., 2013, pp. 235–242.
2. AMIR, Nader; FRESHMAN, Melinda; FOA, Edna B. Family distress and involvement in relatives of obsessive-compulsive disorder patients. *Journal of anxiety disorders*. 2000, vol. 14, no. 3, pp. 209–217.
3. BANGOR, Aaron; KORTUM, Philip T.; MILLER, James T. An Empirical Evaluation of the System Usability Scale. *International Journal of Human–Computer Interaction*. 2008, vol. 24, no. 6, pp. 574–594. Available from DOI: 10.1080/10447310802205776.
4. BARTON, Caden; DUROS, Lucas; HAYES, Adam; JALAN, Pinak; MINKEL, Cameron; PIRIGAS, Domas; ZACHERY, Caughey. *Compulsion* [video game]. 2018. Available also from: https://cocochanel972.itch.io/compulsion.
5. BENNEKOM, Martine J. van; KONING, Pelle P. de; GEVONDEN, Martin J.; KASANMOENTALIB, M. Soemiati; DENYS, Damiaan. A Virtual Reality Game to Assess OCD Symptoms. *Frontiers in Psychiatry*. 2021, vol. 11. Available from DOI: 10.3389/fpsyt.2020.550165.
6. BLENDER FOUNDATION. *Blender, v. 3.6* [comp. software]. 2023. Available also from: https://www.blender.org/.
7. BUDAY, Jozef; NEUMANN, Miroslav; HEIDINGEROVÁ, Jana; MICHALEC, Jirí; PODGORNÁ, Gabriela; MAREŠ, Tadeáš; POL, Marek; MAHRÍK, Jakub; VRANKOVÁ, Stanislava; KALIŠOVÁ, Lucie; ANDERS, Martin. Depiction of mental illness and psychiatry in popular video games over the last 20 years. *Frontiers in Psychiatry*. 2022, vol. 13. ISSN 1664-0640. Available from DOI: 10.3389/fpsyt.2022.967992.
8. CARLESS, Simon. *Feature: "SGS 2005: Hazmat: Hotzone - first-person First Responder Gaming"* [online]. Game Developer, 2023. Available also from: https://www.gamedeveloper.com/game-platforms/feature-sgs-2005-i-hazmat-hotzone-i---first-person-first-responder-gaming-. Accessed: 2024-07-14.
9. CHIEZE, Marie; CLAVIEN, Christine; KAISER, Stefan; HURST, Samia. Coercive measures in psychiatry: a review of ethical arguments. *Frontiers in psychiatry*. 2021, vol. 12, p. 790886.
10. CULLEN, Alison J.; DOWLING, Nathan L.; SEGRAVE, Rebecca; CARTER, Adrian; YÜCEL, Murat. Exposure therapy in a virtual environment: Validation in obsessive compulsive disorder. *Journal of Anxiety Disorders*. 2021, vol. 80, p. 102404. ISSN 0887-6185. Available from DOI: https://doi.org/10.1016/j.janxdis.2021.102404.
11. DE FREITAS, Sara; OLIVER, Martin. How can exploratory learning with games and simulations within the curriculum be most effectively evaluated? *Computers & education*. 2006, vol. 46, no. 3, pp. 249–264.
12. EMPYREAN. *House Flipper* [video game]. 2018.

13. FAJNEROVÁ, Iveta; FRANCOVÁ, Anna; TARANZOVÁ, Kateřina; DARMOVÁ, Barbora; KOSOVÁ, Eliška; STOPKOVÁ, Pavla. Virtual reality environment for exposure therapy in obsessive–compulsive disorder: a validation study. *Virtual Real.* 2023, vol. 27, no. 3, pp. 2691–2701. ISSN 1359-4338. Available from DOI: 10.1007/s10055-023-00837-5.

14. FITZGERALD, Martin; RATCLIFFE, Gemma. Serious games, gamification, and serious mental illness: a scoping review. *Psychiatric Services.* 2020, vol. 71, no. 2, pp. 170–183.

15. FONTENELLE, Leonardo F; MENDLOWICZ, Mauro V; VERSIANI, Marcio. The descriptive epidemiology of obsessive–compulsive disorder. *Progress in Neuro-Psychopharmacology and Biological Psychiatry.* 2006, vol. 30, no. 3, pp. 327–337.

16. FREESTON, Mark H; LADOUCEUR, Robert. Appraisal of cognitive intrusions and response style: Replication and extension. *Behaviour Research and Therapy.* 1993, vol. 31, no. 2, pp. 185–191.

17. FUTURLAB. *PowerWash Simulator* [video game]. 2022.

18. Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet Psychiatry.* 2022, vol. 9, no. 2, pp. 137–150. ISSN 2215-0366. Available from DOI: https://doi.org/10.1016/S2215-0366(21)00395-3.

19. HITBOX TEAM. *Dustforce DX* [video game]. 2012.

20. HOLMES, Emily A; JAMES, Ella L; KILFORD, Emma J; DEEPROSE, Catherine. Key steps in developing a cognitive vaccine against traumatic flashbacks: Visuospatial Tetris versus verbal Pub Quiz. *PloS one.* 2010, vol. 5, no. 11.

21. INFINITAP GAMES. *Neverending Nightmares* [video game]. 2014.

22. INOZU, Mujgan; CELIKCAN, Ufuk; AKIN, Burcin; MUSTAFAOĞLU CICEK, Nuray. The use of virtual reality (VR) exposure for reducing contamination fear and disgust: Can VR be an effective alternative exposure technique to in vivo? *Journal of Obsessive-Compulsive and Related Disorders.* 2020, vol. 25, p. 100518. ISSN 2211-3649. Available from DOI: https://doi.org/10.1016/j.jocrd.2020.100518.

23. KESSLER, Ronald C; BERGLUND, Patricia; DEMLER, Olga; JIN, Robert; MERIKANGAS, Kathleen R; WALTERS, Ellen E. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of general psychiatry.* 2005, vol. 62, no. 6, pp. 593–602.

24. KIM, Kwanguk; KIM, Sun I.; CHA, Kyung Ryeol; PARK, Junyoung; ROSENTHAL, M. Zachary; KIM, Jae-Jin; HAN, Kiwan; KIM, In Young; KIM, Chan-Hyung. Development of a computer-based behavioral assessment of checking behavior in obsessive-compulsive disorder. *Comprehensive Psychiatry.* 2010, vol. 51, no. 1, pp. 86–93. ISSN 0010-440X. Available from DOI: https://doi.org/10.1016/j.comppsych.2008.12.001.

25. LAU, Ho Ming; SMIT, Johannes H; FLEMING, Theresa M; RIPER, Heleen. Serious games for mental health: are they accessible, feasible, and effective? A systematic review and meta-analysis. *Frontiers in psychiatry*. 2017, vol. 7, p. 209.

26. LI, Jinhui; THENG, Yin-Leng; FOO, Schubert. Game-based digital interventions for depression therapy: a systematic review and meta-analysis. *Cyberpsychology, Behavior, and Social Networking*. 2014, vol. 17, no. 8, pp. 519–527.

27. LI, T. M.; CHAU, M.; WONG, P. W.; LAI, E. S.; YIP, P. S. Evaluation of a Web-Based Social Network Electronic Game in Enhancing Mental Health Literacy for Young People. *Journal of Medical Internet Research*. 2013, vol. 15. Available also from: `https://api.semanticscholar.org/CorpusID:3618415`.

28. LIASKOU, Maria; RIZOPOULOS, Charalampos. Using Virtual Reality to Raise Public Awareness of Obsessive-Compulsive Disorder: A Preliminary Study. In: *Proceedings of the 2nd International Conference of the ACM Greek SIGCHI Chapter*. Athens, Greece: Association for Computing Machinery, 2023. CHIGREECE '23. Available from DOI: `10.1145/3609987.3610001`.

29. MA, Minhua; OIKONOMOU, Andreas; JAIN, Lakhmi C. *Serious games and edutainment applications*. Vol. 504. Springer, 2011.

30. MADDY MAKES GAMES. *Celeste* [video game]. 2018.

31. MAX INFERNO. *A Little to the Left* [video game]. 2022. Available also from: `https://store.steampowered.com/app/1629520/A_Little_to_the_Left/`.

32. MENON, Vikas. Juvenile obsessive-compulsive disorder: A case report. *Industrial psychiatry journal*. 2013, vol. 22, no. 2, pp. 155–156.

33. MICHAEL, David R; CHEN, Sandra L. *Serious games: Games that educate, train, and inform*. Muska & Lipman/Premier-Trade, 2005.

34. NEALEN, Andy; SALTSMAN, Adam; BOXERMAN, Eddy. Towards minimalist game design. In: *Proceedings of the 6th International Conference on Foundations of Digital Games*. Bordeaux, France: Association for Computing Machinery, 2011, pp. 38–45. FDG '11. ISBN 9781450308045. Available from DOI: `10.1145/2159365.2159371`.

35. NEWELL, Allen; SHAW, John Calman; SIMON, Herbert A. Chess-playing programs and the problem of complexity. *IBM Journal of Research and Development*. 1958, vol. 2, no. 4, pp. 320–335.

36. NINJA THEORY. *Hellblade: Senua's Sacrifice* [video game]. 2017.

37. ÖST, Lars-Göran; HAVNEN, Audun; HANSEN, Bjarne; KVALE, Gerd. Cognitive behavioral treatments of obsessive–compulsive disorder. A systematic review and meta-analysis of studies published 1993–2014. *Clinical Psychology Review*. 2015, vol. 40, pp. 156–169. ISSN 0272-7358. Available from DOI: `https://doi.org/10.1016/j.cpr.2015.06.003`.

38. PITMAN, Roger K. A cybernetic model of obsessive-compulsive psychopathology. *Comprehensive psychiatry*. 1987, vol. 28, no. 4, pp. 334–343.

39. PRAŠKO, Ján; GRAMBAL, Aleš; ŠLEPECKÝ, Miloš.; VYSKOČILOVÁ, Jana. *Obsedantně-Kompulzivní Porucha*. Grada Publishing, 2019.

40. PSYCHOLOGY TODAY. *Mental Health Stigma* [online]. Sussex Publishers, [n.d.]. Available also from: `https://www.psychologytoday.com/us/basics/mental-health-stigma`. Accessed: 2024-05-28.

41. RACHMAN, S. A cognitive theory of obsessions. *Behaviour Research and Therapy*. 1997, vol. 35, no. 9, pp. 793–802. ISSN 0005-7967. Available from DOI: `https://doi.org/10.1016/S0005-7967(97)00040-5`.

42. RACHMAN, Stanley; DE SILVA, Padmal. Abnormal and normal obsessions. *Behaviour research and therapy*. 1978, vol. 16, no. 4, pp. 233–248.

43. RUSCIO, Ayelet M; STEIN, Dan J; CHIU, Wai Tat; KESSLER, Ronald C. The epidemiology of obsessive-compulsive disorder in the National Comorbidity Survey Replication. *Molecular psychiatry*. 2010, vol. 15, no. 1, pp. 53–63.

44. SALKOVSKIS, Paul M; HARRISON, Jimm. Abnormal and normal obsessions—a replication. *Behaviour research and therapy*. 1984, vol. 22, no. 5, pp. 549–552.

45. SASSANO-HIGGINS, Sean A.; SAPP, Felicity; VAN NOPPEN, Barbara. Cognitive-Behavioral Therapy for Obsessive-Compulsive Disorder. *Focus*. 2015, vol. 13, no. 2, pp. 148–161. Available from DOI: `10.1176/appi.focus.130207`.

46. SILVA, Padmal de; MARKS, Melanie. The role of traumatic experiences in the genesis of obsessive–compulsive disorder. *Behaviour Research and Therapy*. 1999, vol. 37, no. 10, pp. 941–951.

47. Simulation, Frustration, Anxiety. In: *Cambridge Dictionary* [online]. [N.d.]. Available also from: `https://dictionary.cambridge.org/dictionary/english`. Accessed: 2024-05-30.

48. SKOOG, Gunnar; SKOOG, Ingmar. A 40-year follow-up of patients with obsessive-compulsive disorder. *Archives of general psychiatry*. 1999, vol. 56, no. 2, pp. 121–127.

49. STEIN, Dan J; COSTA, Daniel LC; LOCHNER, Christine; MIGUEL, Euripedes C; REDDY, YC Janardhan; SHAVITT, Roseli G; HEUVEL, Odile A van den; SIMPSON, H Blair. Obsessive–compulsive disorder. *Nature reviews Disease primers*. 2019, vol. 5, no. 1, p. 52.

50. STENGLER-WENZKE, Katarina; TROSBACH, Johanna; DIETRICH, Sandra; ANGERMEYER, Matthias C. Coping strategies used by the relatives of people with obsessive–compulsive disorder. *Journal of Advanced Nursing*. 2004, vol. 48, no. 1, pp. 35–42. Available from DOI: `https://doi.org/10.1111/j.1365-2648.2004.03166.x`.

51. THORNICROFT, Graham; MEHTA, Nisha; CLEMENT, Sarah; EVANS-LACKO, Sara; DOHERTY, Mary; ROSE, Diana; KOSCHORKE, Mirja; SHIDHAYE, Rahul; O'REILLY, Claire; HENDERSON, Claire. Evidence for effective interventions to reduce mental-health-related stigma and discrimination. *The Lancet*. 2016, vol. 387, no. 10023, pp. 1123–1132.

52. TORRÃO, André; NATÁRIO, João; CARVALHO, Paula; SILVA, Cláudia; SILVA, Frutuoso. A VR Game for Obsessive-Compulsive Disorders Therapy. In: *2021 International Conference on Graphics and Interaction (ICGI)*. 2021, pp. 1–8. Available from DOI: 10.1109/ICGI54032.2021.9655282.

53. *Transcranial Magnetic Stimulation (TMS) for OCD* [online]. 2024. Available also from: https://iocdf.org/about-ocd/treatment/tms/. Accessed: 2024-05-17.

54. TRUONG, Thanh Phuong Anh; APPLEWHITE, Briana; HEIDERSCHEIT, Annie; HIMMERICH, Hubertus. A Systematic Review of Scientific Studies and Case Reports on Music and Obsessive-Compulsive Disorder. *International Journal of Environmental Research and Public Health*. 2021, vol. 18, no. 22. ISSN 1660-4601. Available from DOI: 10.3390/ijerph182211799.

55. TYRER, Ben. *How Ninja Theory's Hellblade: Senua's Sacrifice is creating a realistic portrayal of psychosis* [online]. GamesRadar+, 2017. Available also from: https://www.gamesradar.com/ninja-theory-hellblade-senuas-sacrifice-psychosis-interview/. Accessed: 2024-06-25.

56. UNITY TECHNOLOGIES. *Unity*. 2022. 2022.3.13f1. Available also from: https://unity.com/.

57. USTA, Elif; INOZU, Mujgan. The use of serious games in psychological interventions for anxiety disorders and related psychopathologies: a systematic review. *Current Psychology*. 2024, vol. 43, no. 14, pp. 12610–12633.

58. VANORD, Kevin. *Neverending Nightmares: How OCD Inspired a Psychological Horror Breakthrough* [online]. 2013. Available also from: https://www.gamespot.com/articles/neverending-nightmares-how-ocd-inspired-a-psychological-horror-breakthrough/1100-6414083/. Accessed: 2024-06-20.

59. WITCH BEAM. *Unpacking* [video game]. 2021.

60. WORLD HEALTH ORGANIZATION. *The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines*. World Health Organization, 1992.

61. WORLD HEALTH ORGANIZATION. *Clinical descriptions and diagnostic requirements for ICD-11 mental, behavioural and neurodevelopmental disorders*. World Health Organization, 2022.

62. WORLD HEALTH ORGANIZATION. *Mental disorders* [online]. World Health Organization, 2022. Available also from: https://www.who.int/news-room/fact-sheets/detail/mental-disorders. Accessed: 2024-05-28.

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List of Abbreviations

OCD Obsessive-Compulsive Disorder

WHO World Health Organization

ICD International Classification of Diseases

DSM-5 Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition

SSRI Selective Serotonin Reuptake Inhibitors

CBT Cognitive Behavioural Therapy

ERP Exposure and Response Prevention

TMS Transcranial Magnetic Stimulation

URP Universal Render Pipeline

STAI-6 Spielberger State-Trait Anxiety Inventory, Six-Item Short Form

NIMH National Institute of Mental Health

SUS System Usability Scale

SD Standard Deviation

VR Virtual Reality

A Attachments

A.1 Game Project

The Unity game project is included as an electronic attachment. The project can be opened via Unity Hub. More information is included in the project's README.

A.2 Builds of the Game

The English and Czech (used for testing) versions of the game are available at: `https://betacaroten.itch.io/game-everyday`.

A.3 Informed Consent Form

Informovaný souhlas s účastí ve výzkumu a se zpracováním osobních údajů

Informace o výzkumu:

Tento výzkum slouží jako součást diplomové práce Alžběty Mrkvové z MFF UK, ve spolupráci s Národním ústavem duševního zdraví (NÚDZ) a FIT ČVUT v Praze.

Cílem výzkumu je zjištění, zda vyvíjená hra dokáže pomoci hráčům z běžné populace v nahlédnutí do problematiky obsedantně-kompulzivní poruchy (OCD) a zda v hráčích dokáže navodit úzkost nebo frustraci, emoce, které pacienti s OCD běžně prožívají.

Účastníci testování budou požádáni, aby si stáhli hru *GameEveryday* na svůj počítač s operačním systémem Windows 10 nebo 11. Dostanou k vyplnění tři dotazníky, které vždy vyplní svůj nickname z platformy Discord, aby data z nich bylo možné zpětně provázat. Jeden dotazník bude vyplněn před spuštěním hry. Druhý dotazník bude účastník vyplňovat po dohrání každé ze tří miniher. Po dočtení závěrečného naučného textu vyplní poslední dotazník. Po dohrání také odešle log ze hry (ve formě textového dokumentu) pořadatelce. Získaná data z logu mohou být použita v rámci doplňkových analýz. Na závěr proběhne krátký rozhovor online o zážitcích ze hry mezi samotným účastníkem a pořadatelkou. Obsahem rozhovoru bude právě dohraná hra a zážitky z ní. Tento rozhovor bude nahráván a po obhájení diplomové práce bude nahrávka smazána.

Celé testování – hraní hry, vyplňování dotazníků a následný rozhovor – zabere přibližně hodinu. Minihry se snaží simulovat příznaky OCD včetně úzkosti. Zážitek může být pro účastníka nepříjemný (např. jako když neuděláte zkoušku). Pokud pocítí při hraní nevolnost, může samozřejmě přestat hrát a z experimentu odstoupit.

Osobní údaje z testování budou anonymizovány a bude z nich nemožné zjistit přesnou totožnost účastníka.

V rámci tohoto výzkumu budou sbírány tyto informace o účastníkovi:
věk, pohlaví, nejvyšší dosažené vzdělání, nahrávka z rozhovoru

Prosím vyplňte:
jméno a příjmení (pouze v informovaném souhlasu):
nickname na Discordu:

Prohlášení:
Já níže podepsaný/-á potvrzuji, že

a) jsem se seznámil/-a s informacemi o cílech a průběhu výše popsaného výzkumu (dále též jen „výzkum“);

b) dobrovolně souhlasím s účastí své osoby v tomto výzkumu;

c) rozumím tomu, že se mohu kdykoli rozhodnout ve své účasti na výzkumu nepokračovat;

d) jsem srozuměn s tím, že jakékoliv užití a zveřejnění dat a výstupů vzešlých z výzkumu nezakládá můj nárok na jakoukoliv odměnu či náhradu, tzn. že veškerá oprávnění k užití a zveřejnění dat a výstupů vzešlých z výzkumu poskytuji bezúplatně.

Zároveň prohlašuji, že

a) souhlasím se zveřejněním anonymizovaných dat a výstupů vzešlých z výzkumu a s jejich dalším využitím;

b) souhlasím se zpracováním a uchováním osobních a citlivých údajů v rozsahu v tomto informovaném souhlasu uvedených ze strany Univerzity Karlovy, Matematicko-fyzikální fakulty, IČ: 00216208, se sídlem: Ke Karlovu 3, 121 16 Praha 2, a to pro účely zpracování dat vzešlých z výzkumu, pro účely případného kontaktování z důvodu zpracování dat vzešlých z výzkumu či z důvodu nabídky účasti na obdobných akcích a pro účely evidence a archivace; a s tím, že tyto osobní údaje mohou být poskytnuty subjektům oprávněným k výkonu kontroly projektu, v jehož rámci výzkum realizován;

c) jsem seznámen/-a se svými právy týkajícími se přístupu k informacím a jejich ochraně podle § 28 a § 49 zákona č. 110/2019 Sb., o ochraně osobních údajů a o změně některých zákonů, ve znění pozdějších předpisů, tedy že mohu požádat Univerzitu Karlovu v Praze o informaci o zpracování mých osobních a citlivých údajů a jsem oprávněn/-a ji dostat a že mohu požádat Univerzitu Karlovu v Praze o opravu nepřesných osobních údajů, doplnění osobních údajů, jejich blokaci a likvidaci.

Výše uvedená svolení a souhlasy poskytuji dobrovolně na dobu neurčitou až do odvolání a zavazuji se je neodvolat bez závažného důvodu spočívajícího v podstatné změně okolností.
Vše výše uvedené se řídí zákony České republiky, s výjimkou tzv. kolizních norem, a bude v souladu s nimi vykládáno, přičemž případné spory budou řešeny příslušnými soudy v České republice.

Potvrzuji, že jsem převzal/a podepsaný stejnopis tohoto informovaného souhlasu.

Dne: **Podpis:**

A.4 Questionnaires – Czech Version

GameEveryday - před hraním

Vyplňte prosím tento dotazník **těsně před hraním**.
Nevyhledávejte si prosím odpovědi na otázky.
Po odeslání tohoto dotazníku **spusťte** hru **GameEveryday.exe** a pak z menu vyberte možnost **Hrát**.

* Required

1. nickname na Discordu *

2. nejvyšší dosažené vzdělání *

- ◯ základní škola
- ◯ střední škola
- ◯ vysoká škola
- ◯ Other

3. ještě studuji *

- ◯ ano
- ◯ ne

4. Jak často hrajete hry? *

- ◯ skoro vůbec nebo nikdy
- ◯ kolem dvou hodin týdně
- ◯ podstatně více než dvě hodiny týdně

5. Máte nějaké povědomí o obsedantně-kompulzivní (OCD) poruše? *

	vůbec ne	spíše ne	poněkud	docela dost	absolutně
povědomí o OCD	◯	◯	◯	◯	◯

6. Víte něco o OCD? Můžete napsat, co vás napadá?

7. věk (uveďte celé číslo) *

The value must be a number

8. pohlaví *

- ◯ muž
- ◯ žena
- ◯ nepřeji si uvádět
- ◯ Other

9. Jak se teď cítíte? *

	vůbec ne	jen trochu	docela dost	velmi
Cítím se klidný/á	◯	◯	◯	◯
Jsem napjatý/á	◯	◯	◯	◯
Jsem rozrušený/á	◯	◯	◯	◯
Jsem uvolněný/á	◯	◯	◯	◯
Jsem spokojený/á	◯	◯	◯	◯
Mám starosti	◯	◯	◯	◯

GameEveryday - mezi hrami

Vyplňujte během hraní své pocity. Nezavírejte tento dotazník před odesláním. **Po každé mini-hře** se ukáže obrazovka nabádající k vyplnění tohoto dotazníku. V tu chvíli budete mít možnost zhodnotit sem do dotazníku, jak na vás daná mini-hra působila.

* Required

1. nickname na Discordu *

První minihra - schody

Frustrace - nepříjemný pocit, když se něco nedaří.
Úzkost - nervozita či obavy z dané situace. Může být doprovázena pocitem nevolnosti.

2. Jak jste se cítili **při hraní** první hry? *

	žádná	mírná	střední	zvýšená	nejvyšší možná
frustrace	◯	◯	◯	◯	◯
úzkost	◯	◯	◯	◯	◯

3. Jak se cítíte **těsně po** jejím dohrání? *

	žádná	mírná	střední	zvýšená	nejvyšší možná
frustrace	◯	◯	◯	◯	◯
úzkost	◯	◯	◯	◯	◯

Druhá minihra - ulice

4. Jak jste se cítili **při hraní** druhé hry? *

	žádná	mírná	střední	zvýšená	nejvyšší možná
frustrace	◯	◯	◯	◯	◯
úzkost	◯	◯	◯	◯	◯

5. Jak se cítíte **těsně po** jejím dohrání? *

	žádná	mírná	střední	zvýšená	nejvyšší možná
frustrace	◯	◯	◯	◯	◯
úzkost	◯	◯	◯	◯	◯

Třetí minihra - dlažba

6. Jak jste se cítili **při hraní** třetí hry? *

	žádná	mírná	střední	zvýšená	nejvyšší možná
frustrace	◯	◯	◯	◯	◯
úzkost	◯	◯	◯	◯	◯

7. Jak se cítíte **těsně po** jejím dohrání? *

	žádná	mírná	střední	zvýšená	nejvyšší možná
frustrace	◯	◯	◯	◯	◯
úzkost	◯	◯	◯	◯	◯

GameEveryday - po hraní

Vyplňte tento dotazník bezprostředně **po dočtení závěrečného textu**, který se objeví po dohrání třetí minihry. Nevyhledávejte si prosím odpovědi na otázky.

* Required

1. nickname na Discordu *

2. Jak se teď cítíte? *

	vůbec ne	jen trochu	docela dost	velmi
Cítím se klidný/á	◯	◯	◯	◯
Jsem napjatý/á	◯	◯	◯	◯
Jsem rozrušený/á	◯	◯	◯	◯
Jsem uvolněný/á	◯	◯	◯	◯
Jsem spokojený/á	◯	◯	◯	◯
Mám starosti	◯	◯	◯	◯

3.

	vůbec ne	spíše ne	poněkud	docela ano	ano
Pocítil/a jste úzkost z her?	◯	◯	◯	◯	◯
Přišly vám texty ve hře zajímavé?	◯	◯	◯	◯	◯
Přišly vám minihry zábavné?	◯	◯	◯	◯	◯

4. Dozvěděl/a jste se něco nového o OCD z této hry? Napište co. *

5. Co jsou to obsese? *

- ◯ mylné představy, které jsou považovány za pravdivé
- ◯ vtíravé a nechtěné myšlenky
- ◯ obavy, že o něco přijdeme

6. K čemu slouží kompulze? *

- ◯ k odehnání nudy
- ◯ je to rituál ke spravení nálady
- ◯ k odehnání vtíravých myšlenek

7. Které příznaky OCD mohou existovat? *

- ☐ nedotknout se něčeho špinavého
- ☐ písnička hrající v hlavě týden
- ☐ vyhýbání se číslu 13
- ☐ opakované kontrolování vlastních emailů, jestli tam nejsou chyby
- ☐ vtíravé násilné myšlenky
- ☐ chůze do rytmu
- ☐ nekontrolovatelné tiky hlavou
- ☐ třes rukou
- ☐ rituály proti duchům
- ☐ strach z otevřených prostor
- ☐ kousání nehtů
- ☐ patologické lhaní

8. Řekl/a byste, že vám minihry pomohly k nahlédnutí do problematiky OCD? *

	vůbec ne	spíše ne	poněkud	docela ano	naprosto
	◯	◯	◯	◯	◯

9. Použitelnost systému (hra GameEveryday) *

	1 - rozhodně nesouhlasím	2	3	4	5 - rozhodně souhlasím
Rád/a bych systém používal/a opakovaně	◯	◯	◯	◯	◯
Systém je zbytečně složitý	◯	◯	◯	◯	◯
Systém se snadno používá	◯	◯	◯	◯	◯
Potřeboval/a bych pomoc člověka z technické podpory, abych mohl/a systém používat	◯	◯	◯	◯	◯
Různé funkce jsou do systému dobře začleněny	◯	◯	◯	◯	◯
Systém je příliš nekonzistentní	◯	◯	◯	◯	◯
Řekl/a bych, že většina lidí se se systémem naučí pracovat rychle	◯	◯	◯	◯	◯
Systém je příliš neohrabaný	◯	◯	◯	◯	◯
Při práci se systémem se cítím jistě	◯	◯	◯	◯	◯
Musel/a jsem se hodně naučit, než jsem se systémem dokázal/a pracovat	◯	◯	◯	◯	◯

A.5 Questionnaires – English Translation

GameEveryday - Before playing

Complete this questionnaire **just before playing**.
Please do not look up the answers to the questions.
After submitting this questionnaire, **launch GameEveryday.exe** and select **Play** from the menu.

* Required

1. Discord nickname *

2. highest level of education attained *

- ◯ primary school
- ◯ secondary school
- ◯ university
- ◯ Other

3. I am still studying *

- ◯ yes
- ◯ no

4. How often do you play games? *

- ◯ rarely or never
- ◯ around two hours a week
- ◯ considerably more than two hours a week

5. Do you have any knowledge of obsessive-compulsive disorder (OCD)? *

	not at all	rather not	somewhat	quite a lot	absolutely
knowledge of OCD	◯	◯	◯	◯	◯

6. Do you know something about OCD? Can you write what comes to your mind?

7. age (enter an integer) *

The value must be a number

8. gender *

- ◯ male
- ◯ female
- ◯ I do not wish to state
- ◯ Other

9. How are you feeling now? *

	not at all	just a bit	quite a lot	very much
I feel calm	◯	◯	◯	◯
I feel tense	◯	◯	◯	◯
I feel upset	◯	◯	◯	◯
I am relaxed	◯	◯	◯	◯
I feel content	◯	◯	◯	◯
I am worried	◯	◯	◯	◯

GameEveryday - Between games

Fill in your feelings as you play. Please do not close this questionnaire before submitting it. **After each mini-game**, a screen will appear, prompting you to complete this questionnaire. At that point, you can rate how the mini-game affected you.

* Required

1. Discord nickname *

First mini-game - stairs

Frustration - an unpleasant feeling when something does not go well
Anxiety - nervousness or worries about a situation, may be accompanied by a feeling of nausea

2. How were you feeling **during playing** the **first** mini-game? *

	none	mild	moderate	elevated	highest possible
frustration	◯	◯	◯	◯	◯
anxiety	◯	◯	◯	◯	◯

3. How did you feel **right after** you have completed it? *

	none	mild	moderate	elevated	highest possible
frustration	◯	◯	◯	◯	◯
anxiety	◯	◯	◯	◯	◯

Second mini-game - street

4. How were you feeling **during playing** the **second** mini-game? *

	none	mild	moderate	elevated	highest possible
frustration	◯	◯	◯	◯	◯
anxiety	◯	◯	◯	◯	◯

5. How did you feel **right after** you have completed it? *

	none	mild	moderate	elevated	highest possible
frustration	◯	◯	◯	◯	◯
anxiety	◯	◯	◯	◯	◯

Third mini-game - tiles

6. How were you feeling **during playing** the **third** mini-game? *

	none	mild	moderate	elevated	highest possible
frustration	◯	◯	◯	◯	◯
anxiety	◯	◯	◯	◯	◯

7. How did you feel **right after** you have completed it? *

	none	mild	moderate	elevated	highest possible
frustration	◯	◯	◯	◯	◯
anxiety	◯	◯	◯	◯	◯

GameEveryday - After playing

Fill in this questionnaire immediately **after reading the final text** after the third mini-game.
Please do not look up the answers to the questions.

* Required

1. Discord nickname *

2. How are you feeling now? *

	not at all	just a bit	quite a lot	very much
I feel calm	◯	◯	◯	◯
I feel tense	◯	◯	◯	◯
I feel upset	◯	◯	◯	◯
I am relaxed	◯	◯	◯	◯
I feel content	◯	◯	◯	◯
I am worried	◯	◯	◯	◯

3.

	not at all	rather not	somewhat	quite a lot	yes
Have you felt anxiety from the games?	◯	◯	◯	◯	◯
Did you find the texts in the game interesting?	◯	◯	◯	◯	◯
Did you find the mini-games entertaining?	◯	◯	◯	◯	◯

4. Did you learn anything new about OCD from this game? Write what. *

5. What are obsessions? *

- ◯ misconceptions that are believed to be true
- ◯ intrusive and unwanted thoughts
- ◯ fear of losing something

6. What is the purpose of compulsion? *

- ◯ to ward off boredom
- ◯ it is a ritual to improve one's mood
- ◯ to drive away intrusive thoughts

7. What can be symptoms of OCD? *

- ☐ not touchinga song playing in one's head
- ☐ for a week avoiding of the number 13
- ☐ anything dirty
- ☐ repeatedly checking own emails for errors
- ☐ intrusive, aggressive thoughts
- ☐ walking to a rhythm
- ☐ uncontrollable head tics
- ☐ trembling hands
- ☐ rituals against ghosts
- ☐ fear of open spaces
- ☐ biting nails
- ☐ pathological lying

8. Would you say that the mini-games have helped you to gain insight into OCD? *

	not at all	rather not	somewhat	quite a lot	absolutely
	◯	◯	◯	◯	◯

9. System usability scale (system = GameEveryday) *

	1 - strongly disagree	2	3	4	5 - strongly agree
I think that I would like to use this system frequently	◯	◯	◯	◯	◯
I found the system unnecessarily complex	◯	◯	◯	◯	◯
I thought the system was easy to use	◯	◯	◯	◯	◯
I think that I would need the support of a technical person to be able to use this system	◯	◯	◯	◯	◯
I found the various functions in this system were well integrated	◯	◯	◯	◯	◯
I thought there was too much inconsistency in this system	◯	◯	◯	◯	◯
I would imagine that most people would learn to use this system very quickly	◯	◯	◯	◯	◯
I found the system very cumbersome to use	◯	◯	◯	◯	◯
I felt very confident using the system	◯	◯	◯	◯	◯
I needed to learn a lot of things before I could get going with this system	◯	◯	◯	◯	◯