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A gamified computer experience:
Towards developing a tool to assess the positive and negative effects of using a substance

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Abstract

Online treatment tools are becoming an important part of therapy for people with Intellectual Disabilities (ID) and Substance Use Disorder (SUD). However, people with ID and SUD struggle to use technological tools due to their cognitive limitations. In this project we aimed to see how gamification aspects can improve online treatment tools for people with both ID and SUD by making them more user-friendly and easy to use.

Literature for people with both ID and SUD while using technology treatment tools or games is lacking. However, we have identified aspects while examining the two groups individually, and combined them to create our system. From these aspects, we have designed an online treatment tool, in the form of a game, that adopts tasks from the client's workbook. The client's workbook is used in therapy sessions for this target group. Our tool was tested with four participants (male = 4), who interacted with it and were then interviewed about it. Due to the lack of clarity in our findings, we also conducted a clarification interview with an expert of the field.

Our results suggest that a simple and convenient UI is very beneficial for this group. Well spaced out sentences accompanied with icons that represent them make the task easier for the users. In addition, the gamification aspect we used and was criticized positively is an NPC. The auditory explanation of the NPC that has been combined with subtitles made the tool easy and the tasks understandable. However, our study consisted of a very small sample size and this is a significant limitation. In the future the tool can be fully completed and include all the levels of the workbook to check its effectiveness, as well as undergo a larger scale study to uncover further limitations and concrete results.

Acknowledgments

This thesis marks the end of my MSC in Interaction Technology at the University of Twente. Although they were two very unusual years, due to the COVID-19 outburst in the whole world, they were also extremely fruitful and innovative. Through these years I gained fundamental and important skills that not only have to do with technology but also with humans and their behaviours. I was able to see how we can design for humanity and not for the sake of technology. I was able to see the importance of designing for everyone taking into consideration minorities. This thesis took a big part in this. I'm really thankful that my thesis gave me the opportunity to work with Tactus and Minddistrict, two important companies for people with Intellectual Disabilities and Substance Use Disorder.

This thesis could not have been completed without the help and attention of my supervisor Dr. Joanne Van Der Nagel who helped me understand our target group fully while encouraging me to design something beneficial and also helping me translate the tools for English to Dutch and vice versa. I hope I will soon learn Dutch too and I can finally speak to people in their native language. In addition, I want to thank Dr. Mariet Theune for her constructive and helpful feedback, which really encouraged me to continue working on the tool and writing this thesis. I also want to thank all the participants of our study, for taking some time from their day to experience my tool and answer my question in a second language. Finally, I could not be more grateful to my family and friends who encouraged me through these years and made quarantine and studying from home bearable.

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Acronyms

ID: Intellectual Disability

SUD: Substance Use Disorder

CBT: Cognitive Behavioural Therapy

CBT+: Cognitive Behavioural Therapy Plus

SG: Serious Gaming

DSM-5: Diagnostic and Statistical Manual

UI: User Interface

NPC: Non-Playable Character

Chapter 1: Introduction

1.1 Background

This project focuses on the group of people that have Intellectual Disability (ID) and Substance Use Disorder (SUD). People who have both ID and SUD face different hardships that have to do with both Intellectual limitations and substance addiction.

To better understand the target group and their treatment needs, we will first start by defining what ID is. Starting from a very young age, people with ID have limitations in intellectual functioning and adaptive behaviour (American Psychiatric Association, 2013). The limitations in intellectual functioning are usually related to reasoning and problem solving (Tassé et al., 2016). The adaptive behaviour limitations are separated into three categories: *i)* Conceptual: learning, reading, and writing *ii)* Social: social behaviour and communication *iii)* Practical: managing responsibilities and taking care of themselves (Bhandari, 2020). In this research, we will focus on people with Mild and Moderate ID (American Psychiatric Association, 2013). People with Mild ID can have slow conceptual and social skills and they might need a little support in practical skills. People with Moderate ID have the same limitations as people with Mild ID, but they require more controlled support.

In addition, the DSM-5 (Diagnostic and Statistical Manual) criteria define that people with Substance Use Disorder (SUD) tend to use large amounts of the substance for long periods, and find it difficult to quit or minimize their use. Using a substance tends to affect the users' life negatively in this group. Different cases show that while users try to quit using the substance they face different withdrawal symptoms and want to start using more (American Psychiatric Association, 2013).

The therapy that can be provided to people with both ID and SUD is called Cognitive Behavioural Therapy-Plus(CBT+). CPT+ is based on the CBT protocols but modified so that it benefits people with ID and SUD (Kiewik et al., n.d). During CBT different problematic behaviours and thoughts are uncovered and patients are called to gradually work on them in multiple sessions (Gatchel & Rollings, 2008). Similarly, CBT+ includes a lot more sessions with adjusted materials to fit the situation of the target group. At the CBT+ sessions, the patients are asked to fill in the *client's workbook*, to give information about their experience with a substance (Kiewik et al., n.d). The workbook contains a sequence of modules and exercises that are important and relevant for both the patients and the flow of the therapy. The information gathered from the booklet is important for the patient and the therapist, so that the therapy sessions are personalized and

useful for the patient. Finally, another difference from CBT is that CBT+ involves a confidant, who can also learn in the sessions and assist the patient (Kiewik et al., n.d).

While technology is improving online tools are used more frequently, to collect information about the patients since patients can fill in forms in their own time and space. Kiewik et al., (2017) explain that people with ID and SUD can benefit from online tools too. However, online treatment tools can be inaccessible and hard to use for people with ID and SUD, due to their intellectual limitations. Technology demands higher problem-solving and literacy skills (Levy, 2010), which makes it hard for people with ID and SUD to use. However, this technological boundary does not imply that people with ID and SUD cannot use *online treatment*, but rather highlights the fact that researchers and designers need to give more attention to it. For such technological tools to be accessible, the user interface needs to be more interactive, immersive, and user-friendly (Derome, 2019).

One way to make online treatment more user-friendly is by adding gamification to it. Gamification in therapy has been researched through Serious Gaming (SG), which is a widely researched area where games with the aim to educate, treat and entertain are designed, researched, and developed (Susi et al., 2007). CBT is also combined with serious gaming in literature. For example, Starks (2014) describes a framework called *cognitive-behavioural game design* as a unified way of designing and creating a game for learning and changing the patients' behaviour. In this work, it is described how common elements like music, game environment, and graphics can be used to make the game more accessible, while also using CBT methods for treatment. One important example is that having a Non-Playable Character (NPC), which functions as a narrator who explains the underlying game story, can help the user maintain their focus on the game.

1.2 Research Problem

In this project, we aim to improve online treatment for addiction, by researching and developing a tool for people with ID and SUD. The project is a collaboration with Tactus and Minddistrict. Tactus hosts health programmes for people with addictions and aims to help the patients and their relatives face their addiction in a healthy and helpful way. Minddistrict is an e-health platform that hosts different modules, diaries, and questionnaires that aim to assist the clients in their therapy.

To tackle this issue we decided to make an online treatment game so that the end result would be fun, exciting, and enjoyable for the users. The game will be created based on the *client's*

workbook (VanDerNagel et al., 2016). The *client's workbook* is given to the patients by the therapist in their first session and it consists of different modules. Each module has a different aim, for example, Module 3 & 4 asks the patients to set and explain their goals, while Module 5 asks to write and explain their risky situations. Throughout the therapy, the therapists ask the patients to fill in the modules they discussed in their sessions as homework and then they discuss their responses in the next session.

Since the *client's workbook* is structured in a specific manner and the sequence of the exercises is important, we decided to use only the first module (Positive and Negative Effects of using a substance), due to the time constraints of the project. In this first module, the patients are asked to define their personal positive and negative effects of using a substance. The *client's workbook* provides a set of options for positive or negative effects. In the physical book, the participants can mark the effects that represent their situation, and then these results can be discussed with the therapists in their treatment sessions. The book contains 41 positive and 42 negative options, while also having several white spaces available for the participants to write their own options.

1.3 Requirements Identified from Literature

In order to set the requirements of this project, we took into consideration the characteristics of our target group, along with the information explained in Section 2 and discussions with my supervisor Joanne E.L Van Der Nagel. The list with the specific requirements is the following:

1. The game will be in Dutch
2. The game should contain gamification and user interface aspects to make reading text easy for people with ID and SUD
3. The forms used in the game should be interactive
4. The list of positive/negative effects of using a substance should be taken from the *client's workbook*
5. The developed game should not take a long time to complete
6. The game's rules should not be complex
7. The game's motivation should not appear more important than the treatment's motivation (patient's motivation)
8. The game's levels need to follow the same order that can be found in the *client's workbook*

1.4 Research Questions

RQ1: What is the state of the art for online treatment tools?

a) What are the suitable gamification aspects for people with Intellectual Disabilities?

b) What are the suitable gamification aspects for people with addictions?

c) What is the appropriate complexity of a game for people with Intellectual Disabilities?

d) What has already been done in terms of gamification for cognitive-behavioural treatment for people with addictions, on people with low literacy?

Research question 1 will help us understand what has already been researched or developed in regards to online tools for people with ID and people with SUD. These research questions were mainly answered by the related work in Section 2.

RQ2: How to design an online treatment tool for people with both ID and SUD?

a) How to improve on the current Tactus' systems?

b) How can CBT help on improving such systems?

Research question 2 targets to identify design choices that can be used to improve online treatment tools for people with ID and SUD.

RQ3: Was the developed tool user friendly enough for our target group?

a) How easy was it for the participants to fill in the positive and negative effects forms?

b) How different gamification aspects affected the user experience?

Finally, Research question 3 targets to evaluate the user experience of the prototype we developed and the effect of the gamification and user interface aspects we used.

1.5 Overview

This report presents the related research that occurred before designing the project which defines and explains our target group while also presenting the state of art in online tools for people with ID and SUD. Following this, we explain our ideation process where we formed our game idea. Then, in the following chapter we explain in detail the designing process of the game. The next chapter focuses on the evaluation of the tool. After that, the results of the evaluation will be presented and discussed. Finally, we will discuss the limitations and future work of our project.

Chapter 2: Related Work

This chapter is based on Chrysanthou,2021 and it contains Chapters 2 (Background) and 4.2 (Results).

2.1 Literature Research

2.1.1 Intellectual Disability

We individually understand and act in the world differently, however, there are specific behavioural patterns that group some parts of the population as groups with Intellectual Disability (ID). Based on AAIDD (American Association on Intellectual and Developmental Disabilities) when a person has Intellectual Disability it is characterised that they have significant limitations in intellectual functioning and in adaptive behaviour (Tassé et al., 2016). Intellectual functioning is correlated with intelligence and it includes reasoning, problem-solving, learning quickly, and from different experiences (Tassé et al., 2016). That does not mean that they are not capable of learning but rather that they just need extra time and attention (Bhandari, 2020). People with ID might have an IQ below 70 (Vissers et al., 2016) and limitations in adaptive functioning. Adaptive functioning is separated into three areas: i) Conceptual; ii) Social and iii) Practical (Bhandari, 2020) (Tassé et al., 2016). Conceptual functioning has to do with learning, reading, and writing, the way people speak and learn a language, the way they understand and find reason in their surroundings, and how accurate is their memory. Furthermore, Social functioning is the way people communicate with each other, how they can socially act and empathize with the world and their friends but also how they can follow rules. Finally, Practical functioning, which is similarly important, is the way people can take care of themselves, how they are managing their responsibilities, meaning not only their jobs but also their personal responsibilities at home (Bhandari, 2020). Intellectual disability can be diagnosed during the developmental stage, even before the age of 18. (Bittles et all., 2002) (Tassé et al., 2016). (American Psychiatric Association, 2013) ID can be classified as mild, moderate, severe, and profound. In Mild ID people can be slow in conceptual and social skills. However, they need very little support as they can learn different practical skills. The same thing applies to Moderate ID, with the difference that they need more moderate support. In addition, people with Severe ID have a very slow and delayed development phase and they have limited communication skills. That is why they need support in social settings and family care in everyday life. Finally, Profound ID implies that people cannot live independently and they require continuous support as they have very limited communications skills. They sometimes also have limited physical skills.

2.1.2 Technological Challenges

Technological growth demands more communication, problem-solving skills, and different fundamental skills like literacy (Levy, 2010). This might be hopeful and blissful for humanity as technology is assisting the convenience of our lives, however, it makes participation harder for people with ID (Woittiez et al., 2018). Activities like transportation are now, mainly, by using a car, metro, or a plane which is relatively more complex to use (Woittiez et al., 2018). People with ID need more care and attention for making sure that they can understand and feel comfortable enough to use those transportation methods independently. Another example is job opportunities. The fact that technology is evolving so rapidly, it has, as a result, rendered a lot of those jobs that demand manpower to go extinct, with the consequent result that a lot of people with and without ID end up without a job (Woittiez et al., 2018). In addition, Information and Communication Technologies (ICT) are creating a technological divide between people with and without ID, and to enhance that connection different cognitive and technological requirements, technological principles, and different sensor and motor functions need to be used (Lussier-Desrochers et al., 2017). Having that in mind, there is yet another factor that I would like to address and is the motivation of my current research. People with ID are vulnerable in domains like mental health, behavioural problems, (Harris, 2006), autism, and substance use addictions (Woittiez et al., 2018). This makes their disability even more important. Therapy and therapy tools are important to take into consideration those groups of people and assist them in overcoming their additional disorders, without limiting them and making them feel helpless. That is why they need to be adaptive, accessible, and inclusive for people with ID.

2.1.3 Substance Use Disorder

People with ID face different additional issues and some of them were mentioned in the previous section. One of the additional issues that were mentioned may be substance use. Substance Use Disorder (SUD) is a pattern of behaviour that results from continuously using a substance, even when it affects the user negatively (American Psychiatric Association, 2013). DSM-5 includes ten substances in SUD, which are alcohol, caffeine, cannabis, hallucinogens, inhalants, opioids, sedatives, hypnotics, stimulants, and tobacco (American Psychiatric Association, 2013). SUD does not have defined causes. There is a chance that people turn to excessive substance use because of different emotional distress like anxiety, depression, loneliness, boredom but also because of the desire to fit in certain 'friend' groups (Laudet et al., 2004). Also, attention deficit disorder (ADD) and depression might drive people to substance addiction, as it appears that they have neurobiological similarities (Bizzarri et al., 2007). There is also the possibility for the reason for someone to have SUD to be unknown or depending on their genes (American Psychiatric Association, 2013). The DSM-5 criteria define that people with SUD might use a substance for a longer time or bigger amounts, while they are trying to

stop but are not able to. Their need to continuously use a substance still exists or increases even when they know that they have a physical or psychological problem, or while it affects their life (work, relationships, school) negatively. In addition, people might have urges to use the substance, and make a lot of effort to stop, but they will be unsatisfied with the amount they use and they will need more, which can then cause withdrawal symptoms. Finally, people with SUD will end up giving up important events and social interactions because of their addiction.

SUD is a disorder that directly affects the behaviour of the users and the quality of their life. The fact that there are so many reasons that make people addicted makes the need for the right education to prevent the misuse of substances. It was observed that people with ID are more likely to develop SUD than people without (Van Duijvenbode & VanDerNagel, 2019). Having that in mind, not only does education need to be more detailed but it also has to support people with ID too, as they are a vulnerable and affected group.

2.1.4 Cognitive Treatment Therapy

When we are talking about different disorders we should also mention the therapy that can assist people to overcome them and adapt to society so they can have a better life. Cognitive-Behavioural Treatment (CBT) is a psychological treatment that can assist SUD that was mentioned above and even more. For example, CBT can also help people with depression (Tolin, 2010), anxiety disorders (Zhipei et al., 2014), eating disorders, and severe mental disorders. CBT contains multiple sessions every week or every other week (Rothbaum et al., 2000). CBT aims to identify troubling and irrational thoughts, emotions, and conditions in the life of the patients, and in that way, the patients can gradually work on them (Gatchel & Rollings, 2008). CBT has six phases (Gatchel & Rollings, 2008):

i. Assessment: to identify the patient's thinking patterns, by recognizing and understanding the motivation of the distortion.
ii. Reconceptualization: to challenge their rational behaviour and thoughts by helping patients face their fears, using different methods to identify different problematic interactions, and helping them learn how to relax.
iii. Skill acquisition: to learn how to deal with different difficulties and negative pattern thoughts, patients be their own therapists so they can be independent, self-aware, and confident.
iv. Skills consolidation and application: to practise their new skills.
v. Generalization and maintenance: to discuss the patient's future.
vi. Post-treatment assessment: for the therapist to monitor the patients' state.

CBT is widely used for addictions as it can help people recognise their situation, help them avoid the use of the substance, and teach them how to cope with the need and thought of that substance (Hampton, 2020). CBT is achieved by using different techniques. For example, Behavioural Experiments help patients discover what kind of feedback triggers them towards a positive approach. In addition, by keeping records of their thoughts, patients will be able to trace them easier and replace the harsh thoughts with more balanced and helpful critical thinking. Finally and equally importantly, it helps people to improve their communication skills, especially while they are exposed to different negative stimuli that will lure them to start using the substance again. Similarly, CBT can be beneficial to people with ID too as it can be adapted to fit their learning style.

In a similar way as a lot of physical activities have been moved in a digital form, so has CBT. Interapy (Internet Therapy) is a therapy in which every interaction is web-based, conversations with the therapist might look more like an email or the therapy sessions are conducted through a secure website (Ruwaard et al., 2011). Interapy can help CBT when the treatment requires repetition or when there is no way for face-to-face therapy to be conducted (Ruwaard et al., 2011). For instance, due to COVID-19, any kind of face-to-face meetings was prohibited which resulted in people not being able to attend their therapy or to move their therapy in a digital, online environment. Another benefit of online therapy tools is the fact that people can use them in their own time and space, which will help them get the assistance that they want exactly when they want it. However, one disadvantage of this online therapy is the fact that technology has a lot of limitations due to the vast amount of skills and accessibility it requires. As we mentioned in Section 2.1.2 (Technological Challenges), ICT has different requirements that create a digital bridge and ends up excluding people with ID (Lussier-Desrochers et al., 2017). As people with ID have different mental illnesses, depression, SUD, and autism (Woittiez et al., 2018), therapy and assistance are useful and important for them too.

To conclude, online therapy can be a very effective way of helping people with ID and people with SUD (Kiewik et al., 2017), even though, as aforementioned, online therapy does not include them as much if it is designed and developed in a way that it does not disturb the aim of the treatment. This report will continue by defining and noting how technology can adapt CBT to make it more user-friendly and inclusive for people with ID.

2.2 Literature Findings

What are the suitable gamification aspects for people with Intellectual Disabilities?

To answer this question, which will result in useful and practical examples, we will note down

gamification aspects and user interface aspects. In the Appendix A.1 and A.2, you can find the tables with the title of the aspects and their references.

Most of the papers we have found were explaining user testing and the user interface of SG with adults with ID. Having that in mind we will start with the User Interface aspects. One of the most important 9 principles developers should take into consideration when they are designing an interface for people with low literacy is practicality (Sitbon & Farhin, 2017). The interface should support the aim of the game without getting in the way and making it harder than it ought to be. Having that in mind a simple user interface is extremely important (Tsikinas & Xinogalos, 2020). A simple graphical interface will consist of cartoonish simple graphics, with no excessive and distractive animations or pop-ups (Derome, 2019). Interfaces like the latter will easily draw the users' attention away from the goal of the game, or even away from the small task of reading a text (Derome, 2019). If movement needs to be used in the interface it has to be used strategically (Derome, 2019), to fulfil a purpose or to draw the attention where it is meant to be drawn. A good way to make the interface more entertaining and to make different concepts more understood is to use symbols, or images (Terras et al., 2018).

As people with low literacy have trouble reading and staying concentrated while reading (Derome, 2019), much attention must also be paid to the visualization of text. First of all, it was observed that having audio and text at the same time was very helpful and exciting for people with ID (Sitbon & Farhin, 2017) (Tsikinas & Xinogalos, 2020), as they could take their time and read the text if they want to, but also hear an in-game character speak the text too. In addition to that, if the game includes audio in a foreign language, subtitles are extremely important to exist in every language (Ellis & Kao, 2019). Therefore, a user can add subtitles or remove them if they think they are not useful for them. Moreover, to make the text more user-friendly, you have to make sure that you are using simple and short sentences in a simple conversational language (Derome, 2019). The sentences can therefore be separated with clean lines so they are more visible and it can also be colour-coded, with flattering and not bright colours (Ellis & Kao, 2019).

Furthermore, something that is also connected with user experience, gaming, and treatment, is personalization. Here we do not only mean personalization of the interface, meaning the user can customize the interface to their preference, but also the game should be adaptive to the users' disability. People with ID do not always have common behavioural factors, the target group has a heterogeneous nature that should be taken into consideration when designing a user-centered interface (Terras et al., 2018). However, personalization adds up to the gamification experience as not only it can adjust the difficulty of the game, but also change

different gaming elements, for example, the gaming environment (Tsikinas & Xinogalos, 2020).

Personalization is not the only important thing to affect the gamification of games for people with ID, but there are also many more important factors, starting from motivation. Motivation in games is strictly connected with the complexity of the tasks (Larsson-Berge, 2019) and the rewards (Tsikinas & Xinogalos, 2020). A reward can be used as a motivator. For example, a reward can be an in-game prize that the player needs to collect to complete the game or to get to a better level of the game. A motivator can also be more personalized, for example listening to their favourite song (Tsikinas & Xinogalos, 2020). In addition, something that can also highlight the motivation is a progress bar, which can show how the player is progressing into the game. A progress bar can enhance the challenges and encourage the user to continue playing the game. To conclude, motivators and rewards increase the players' engagement which is exactly what we want in an education serious game (Tsikinas & Xinogalos, 2020).

Furthermore, an immersive experience is also something strictly connected with gamification. To make the game more immersive and engaging for people with ID you should make sure that the game contains a simple and enjoyable interface (Tsikinas & Xinogalos, 2020). A simple interface has all the user interface aspects we discussed above, with the additional information that single-player games are more simple and easier for people with ID to comprehend (Larsson-Berge, 2019; Sitbon & Farhin, 2017). Players can take as much time as they want to engage with the game without any assistance or interference (Larsson-Berge, 2019). Moreover, feedback is also a gamification aspect that can affect the immersion of the player. In this case, feedback can be progressive, but it can also be a hint that can assist in the completion of the task (Larsson-Berge, 2019). Feedback can also be visual and audio 10 feedback that makes textual feedback more interesting or that makes the gaming environment more attractive and personalized (Tsikinas & Xinogalos, 2020).

During our research, we also found some specific gamification aspects. The first is that Computer Serious Games are more effective than Serious Games on other platforms, like mobile phones or tablets (Tsikinas & Xinogalos, 2019). Finally, it was observed that games with a first-person shooter (FPS) perspective (when you can see only the hands of your in-game character) are not preferred for people with attention and impulsive disorders. (Terras et al., 2018)

What are the suitable gamification aspects for people with addictions?

To answer this question, we will also split the information we have found into gamification

aspects and user interface aspects. In the Appendix A.3 and A.4 you can see the title of the aspects we will describe in this section.

The amount of information we have found to answer this question is not equally separated in the two sections. It was observed that most of the papers that discuss serious games for people with SUD emphasise more on the effects of the games and the gamification aspects and not so much on the user interface. Starting from some more specific gamification aspects, it was discussed in the literature that SGs for people with SUD are single-player games, on a computer using a mouse or a keyboard to interact with the game (Hong et al., 2020).

In addition, it was emphasised that enjoyment is extremely important in SG, not only for the users to continue playing for a longer time, but also it affects the players' intentions to use a substance (Hong et al., 2020). In games for addiction treatment, enjoyment was correlated with role-playing (Hong et al., 2020). A user can use different characters that will experience a variety of scenarios. Role-playing and storytelling can create an immersive and interesting experience for the users to make sure to keep their interest. Meaningful scenarios can present different sides of substance use which can shape metaphors and examples, with the aim to evoke emotion and decrease the chance of people wanting to use a substance (Vilardaga et al., 2018). Combining storytelling and role-playing with interactive input gives the users the ability to make several in-game decisions (Hong et al. 2020) that will not only enhance their enjoyment but also their engagement in the game.

Having that in mind, engagement is another important gamification aspect. One way to highlight engagement is to give the players the ability to make different in-game decisions that will affect the course of the game (Hong et al., 2020). Moreover, engagement also increases with the use of visual storytelling, which will assist in the emotional connection with the story (Vilardaga et al., 2018). Different in-game rewards can also keep the user excited and engaged (Vilardaga et al., 2018; Boendermaker et al., 2018). Rewards can be in-game coins or check marks and badges after a module or a set of accomplishments in the game.

To keep the users' interest, you should also consider different motivators. Because adults with addictions might lack the motivation to quit, the game must not confront them with the substance explicitly, but rather use intrinsic motivational methods (Boendermaker et al., 2018). Intrinsic motivation is when the drivers of an action or behaviour are internal and natural, maybe due to emotions or enjoyment (Cherry, 2019). This kind of motivational method can be embraced through SG for health as it can expose the patients to training and treatment in a less

forceful way (Boendermaker et al., 2018). One way to do that is to emphasise the focus on selective objects, for example only on substance biases, which can be implemented using target images. In that way you can indirectly draw the users' attention away from the image with the substance, using a distinct symbol like an arrow (Boendermaker et al., 2018).
In correlation with motivation, another important gamification aspect is Interactive Quizzes (Vilardaga et al., 2018). The reason this is strictly connected with motivation is the fact that in *Interactive Quizzes* the use of motivational feedback is very important. The quizzes can help the users test their knowledge and repeat their treatment in a fun way (Vilardaga et al., 2018). After each quiz module, the game should give feedback and reward to the user to encourage their enthusiasm and engagement. That feedback could be auditory or animations and they can be used in combination with progress bars, to show the participant's improvement while using the game (Boendermaker et al., 2018).

To continue, the user interface also has a big impact on this group. We might have mentioned different UI aspects while discussing gamification, as they are strictly correlated but it is worth mentioning again that feedback is very important to be interactive, filled with interesting audio and animations (Boendermaker et al., 2018; Vilardaga et al., 2018). It was also observed that consistency in the interface is equally important, as the colours can have a specific aim in the background or the game elements and they should not be too bright and distractive, which will draw away wanted attention (Vilardaga et al., 2018).

Finally, an extremely important aspect is personalization. Personalization can come in different forms during a serious game. The game elements and context should adapt depending on the situation of the user (Vilardaga et al., 2018). For example, there should be different modes in the game, and one could be a substance withdrawal mode. Another way personalization could be used is to give more useful and meaningful feedback to the user especially after the end of a module in the interactive quiz (Vilardaga et al., 2018).

Summing up, we have researched the gamification aspects that can be employed for making a game for people with addictions. These gamification aspects include using role-playing and storytelling to evoke emotion and give examples, intrinsic motivation especially using motivational elements and reward, and different decision-making options using interactive quizzes.

What is the appropriate complexity of a game for people with Intellectual Disabilities? To answer this question we gathered information from papers that we found concerning both of

our target groups and some with both target groups combined. In the Appendix A.5, you can find a table with the titles for the complexity characteristics of serious games we have gathered.

Complexity in SG is not something that has to be added, as educational games do not necessarily need it to be difficult. What is important in SG is a controlled complexity to assist education (Westera et al., 2008). Although it was observed that in-game emergent complexity really works (random noises), in the case of an educational game an emergent complex situation is not the best approach (Westera et al., 2008). In games that aim to teach, design and authenticity are not as important as credibility (Westera et al., 2008). The scenarios and objectives of the game need to follow a believable and effective structure and topic. The structure and topics depend on different circumstances, which is why, especially complexity in games for people with disabilities, has a contextual influence (Terras et al.,2018). In cases of people with disabilities, you should also take into consideration the psychological context of the user to find the appropriate difficulty of the game. For example, some people with ID may have caretakers with them but others not, a fact that highlights the variety of their psychological and contextual situation, and therefore having to lower or increase the difficulty of the game accordingly.

Having the above in mind, the interface of a game should be accessible for people with ID (Terras et al., 2018), meaning it should be more simple to make sure that it does not affect the complexity of the learning process more (Tsikinas & Xinogalos, 2020). However, accessibility does not only mean an accessible interface, but also a psychologically accessible game (Terras et al., 2018). The tasks should be solvable. They can be challenging but in the end, the users should be able to solve them. The difficulty of a task can affect the perceived experience of the users (Larsson-Berge, 2019), as if a task is extremely hard to be solved, then it is not expected from the user to continue playing and this ruins the purpose of the SG. To make sure that the tasks are easier to solve you can have feedback or different hints (Tsikinas & Xinogalos, 2020; Westera et al., 2008).

Moreover, something that directly affects the complexity of the game is the number of users. Multiagent-based games tend to be more complex, as there is also the factor of interaction between them (Westera et al., 2008).

Difficulty and complexity, although they have to be controlled, it is important that they exist in an SG, even when the game is directed for people with ID (Ellis & Kao, 2019). As we already explained, the tasks should not be too complex and unsolvable but they should be complex enough to keep the players engaged and motivated (Larsson-Berge, 2019). To make sure that

there is a good balance of complexity in the game, without making it extremely hard, the difficulty level gradually must be increasing (Tsikinas & Xinogalos, 2020). Gradually increasing complexity will give to the users a sense of progress and will also keep them motivated. Finally, dynamic changes and triggers on different modules make the game more complex and unexpected (Westera et al., 2008).

What has already been done in terms of gamification for cognitive-behavioural treatment for people with addictions, on people with low literacy?

Little to no scientific literature discusses SG and gamification aspects of people with ID and SUD. We found a paper that discusses an effective game for people with addiction, which is also commenting on how to make the game so that it doesn't require high cognitive demand. In light of that, we used the information we gathered from the paper to answer a part of our questions, and then we named the common gamification and UX aspects we have found from the two groups. You can find the common aspects in Figure 2.1.

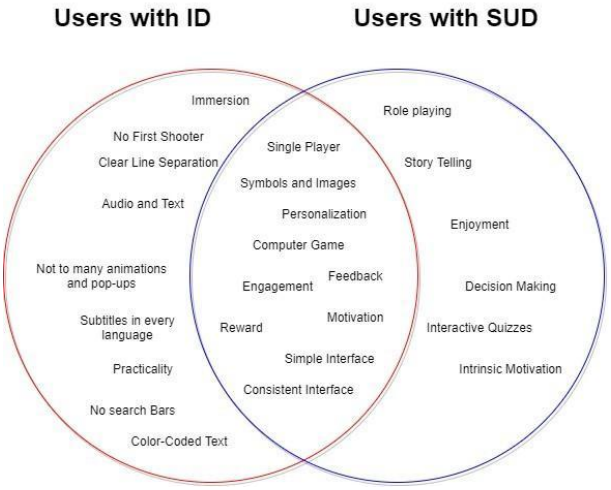

Figure 2. 1 Common Aspect of user with ID and SUD

In the paper (Vilardaga et al., 2018), they mentioned some UX aspects that will make the addiction treatment game more accessible for people with low cognitive skills. First and foremost they mentioned that the interface has to be simple and consistent. The panels have to have a similar interface to each other, with identical sizes. The important buttons have to be big and simple, especially the menu button so it would be very easily visible. They also mentioned that they did not include any videos as they assumed that a slideshow with illustrations is more beneficial. Different images that are in the form of a slideshow can give control to the user, to watch and rewatch them with the aim to gain knowledge and skills on how to quit the substance.

From the research we have completed to answer the other research questions, we have

identified some common aspects in SG. To have an effective game for both the target groups you should design a single-player game (Larrson-Berge, 2019; Sitbon & Farhin, 2017; Hong et al, 2020) that is developed for the computer so the user can use both keyboard and mouse (Tsikinas & Xinogalos, 2019; Hong et al., 2020). The designers should also keep in mind to make sure that the engagement (Sitbon & Farhin, 2017; Vilardaga et al, 2018) and motivation (Tsikinas & Xinogalos, 2020; Boendermaker et al., 2015) of the user are increased while playing the game and the ways to do that is by adding different intriguing, in-game rewards (Tsikinas & Xinogalos, 2019; Vilardaga et al., 2018; Boendermaker et al., 2015) and audio/visual feedback (Tsikinas & Xinogalos, 2020; Sitbon & Farhin, 2017; Vilardaga et al., 2018; Boendermaker et al., 2015) that can assist and encourage the user. Finally, one of the most important aspects is personalization (Terras et al., 2018; Tsikinas & Xinogalos, 2020; Vilardaga et al., 2018). Both of the target groups need special attention as they have heterogeneous behavioural patterns, with different aims, motivations, and experiences.

The common factors are important and quite numerous, however, we identify a lot of important UI and SG aspects separately that should also be taken into consideration. For example, role-playing and storytelling were some of the most effective ways to evoke emotion and give an example of misuse. In addition, different UI aspects that were mentioned in the group of ID, such as, the way text should be presented and accompanied with audio, are not mentioned in the findings that concern people with SUD. To conclude, part of this research question may have been answered but important factors and situations should be taken into consideration, which makes the answer quite incomplete.

Chapter 3: Ideation

3.1 Expert Interview

To perform the initial ideation and brainstorming of our tool and verify the information we collected from Section 2.2, we decided to conduct interviews with experts in the domain. More information about the participants can be found in Section 3.1.1. We also wanted to see how the gamification aspects were used in an organization that is responsible for creating online treatment tools. The interview took place online, due to the government regulation put on due to COVID-19. The full procedure took approximately one hour and the interview was fully recorded after the consent of the participants.

3.1.1 Participants

The participants were two experts from Tactus and Minddistrict, two companies that work with people with SUD and ID.

The expert from Tactus can give us insights and knowledge of our target group to help us find a more appropriate way to use gamification, without limiting the users. In addition, the expert from Minddistrict can explain in more detail some of the more practical aspects that we should take into consideration.

3.1.2 Measurements

With the interview, we want to get a better understanding of the state-of-the-art of online treatment tools for our target group, as well as discuss possible aspects that can help the user experience be more user-friendly. Finally, the interview will give us insights into CBT practises used in therapy with this target group.

The interview was semi-structured, starting with 13 open-ended questions (Appendix B.1) with follow-up questions depending on the interviewees' replies. The questions section was then separated into three subparts:

1. Treatment: questions related to CBT
2. User Interface: questions related to the current Minddistrict tool
3. Low Literacy: questions about different changes and important aspects that should be taken into consideration when making an online tool more accessible for people with ID.

3.1.3 Procedure

The interview took approximately one hour and it consisted of three sections: *i)* Introduction; *ii)* Questions, and *iii)* Ending. In the Introduction, we started by introducing ourselves and thanking

the participants for attending. We made sure to ask them for consent to record the interview and we explained in detail what this interview is going to be about and why it is important for us. In the Ending section, we asked the participants if they had any questions and after thanking them for participating we also asked them if they wanted to stay updated on our research.

To analyse our data we reviewed and transcribed the interview recording. While transcribing we used pseudonymity to hide the participants' names. Furthermore, to analyse the data we used a bottom-up approach in which we read the transcript various times and identified different codes. The selection of codes was performed by taking into consideration a set of factors that may help us answer the topics we discussed in Section 3.1.2.

Coding factors:

1. A sentence is stated by the participants as important
2. A sentence is repeated by the participant
3. A sentence is related to the researched literature
4. A sentence was unexpected to the researcher

After the collection of all the codes, we reviewed them individually and gave them a title that represents what they talk about. We observed that some codes had matching titles, therefore we grouped them.

User Interface	Gamification	Repetition	Target Group	Treatment Methods	Videos
Consistency helps with practicing and learning	Gamification helps with rewarding and motivation	Repetition helps to learn and practise	The group is heterogeneous	CBT for people with SUD and ID is a protocolized treatment with multiple sessions	Videos help with explaining and examples
Standardization to keep the modules consistent	Instant rewarding is important		People with cognitive disabilities need a different tool	Individual sessions help on explaining and teaching	Videos should be accessible and playable
Image slideshow with Audio is more preferred over Video	Games that generalize real life situations		Text does not work for people with ID	In the group session positivity is important, using the applaud factor	With video you only have to follow that flow and not go back
Image slideshow with Audio is more interactive and fun	The use of avatar as a tutor			Practical games are useful for teaching and practicing	Videos can give multiple information.
Text should be less	Communication with the avatar			Do not show a substance to patients	Some people prefer audio instead of video
It is preferred to use more videos and audio files than text				Teach patients about craving by giving them a different item as a craving	
Simple, accessible with guidance especially in the beginning					

Table 3.1. Themes and Codes

3.1.4 Results

The themes that can be seen in Table 3.1, appear to have different correlations between them. *User Interface* and *Gamification* are strictly connected as the interface will shape the gaming environment. However, *Gamification* is also connected with *Treatment methods,* because it was discussed that in some CBT sessions they use games and practical exercises to encourage learning. Also, it was mentioned that in CBT group sessions they use positive reinforcement, which is named *'the applaud factor'.* In addition, the theme *User interface* appears to be connected with the theme *Repetition* as it was noted that consistency and standardization are important to make sure that the interface is accessible for people. Similarly, *Repetition* is connected to *Gamification* as users have to practise the same principles and knowledge multiple times.

Furthermore, while we were analysing the interview we noted some aspects that were surprising or repeated a lot of times. Topics related to videos were one of them, that is why we made a separate *Videos* theme. Videos were mentioned as one way to make online treatment more user-friendly and entertaining for people with ID and SUD. Videos combine audio with visuals and for that reason, it was explained as useful in the interview. It appeared that both of the interviewees were interested in the use of videos, however, when they were asked to state their preference between videos and images with added audio (slideshow images with arrows to continue), they selected the latter. They explained their choice by saying that the images will give the users the freedom to go back and forth as many times as they want and stay in one image as long as they want. Also, one of the interviewees added that the arrows will be more interactive, which is something wanted. Furthermore, the fact that the target group requires less text was repeated numerous times by the interviewees. This is strictly connected with the *User Interface* theme. A surprising aspect that we coded was the fact that the use of a substance in images or video is not recommended as it might trigger users.

While discussing gamification aspects the interviewees mentioned that an in-game avatar can be a good way of adding communication. Finally, it was highlighted that the target group is very heterogeneous and games that generalize real-life situations are useful.

3.1.5 Discussion

Some aspects that we found in Section 2.2 were also mentioned by the interviewees. Those

were: *i)* consistency, *ii)* reward, *iii)* personalization, and *iv)* storytelling. In Section 2.2, we have mentioned that consistency between each page is very important so that the users would find it easier to navigate through them, and it will also make the interface more simple (Tsikina & Xinogalos, 2020; Terras et al., 2018). In addition, reward and motivation are two of the most important gamification aspects as they can be combined with feedback. This will not only help the user keep a positive mindset but also boost their engagement and challenge them more to continue using the online tool. In the interview, *reward* was named as the positive factor, which is used to encourage the patients in the CBT. In the interview, it was explained that our target group is very heterogeneous which highlights the need for personalization. Finally, as one of the interviewees mentioned, storytelling is important for immersion and understanding the situation and can be used to present real-life situations.

The interview helped us understand the real situation and the need for an accessible treatment tool for people with ID and SUD. The experts gave us real insights from their experiences and this helped us set realistic expectations and requirements for our prototype.

3.2 Gamification Characteristics

From the Interview and Section 2.2 we have collected a lot of user interface and useful gamification aspects. However, not all the aspects of the online tool we will implement for multiple reasons. First, our target group has cognitive limitations that might affect their focus, especially when a task takes a lot of time. Having that in mind we want to make sure that the game will not take more than thirty minutes to be completed. In addition, another issue that forces us to make a smaller version of the game is the time constraints of this thesis project.

Although we believe that all the aspects have a level of importance, we will use the MoSCoW Prioritization System to assess our priorities. The MoSCoW is a prioritization method designers and developers use after they set the requirement of the tool they will create. This way it helps them make the right prioritization of the functionalities depending on the real clients' requirements and time constraints. As our project is quite limited in time, this method will help us evaluate what we can incorporate in our tool and what not to.

3.2.1 Must Have

In the *Must-Have* list, we will place gamification aspects that are necessary for our project to work. It doesn't necessarily mean that without these elements the project will not work. However, it means that without them we will not be able to answer our research questions, or we will not affect the users' experience in the way we want.

1. **Feedback & Reward**

The gamification *Feedback & Reward* was found as important in Section 2.2 and was mentioned in the Interview. Thus, having feedback and giving rewards to the users is a must-have feature in our tool. This aspect is important as it can keep the users motivated and focused so they can continue playing the game.

Feedback can be used: *i)* To explain to the users why knowing their positive and negative effects of using is important, *ii)* To give instructions, and *iii)* To show the users' improvement.

Reward can be used: *i)* As a personal reward, which shows to the user that their reward is focusing on their treatment and helping themselves. These can be words of affirmation and encouragement, and *ii)* As a game reward, in which the users will gain different in-game items for their good work.

2. **Interactive Actions**

Interactive actions were identified as a *must-have* gamification in our project as they can keep the users engaged and occupied. As we observed in Section 2.2 interactivity is encouraged to be used to make storytelling more enjoyable and engaging (Hong et al., 2020), but it was also used to make the users more motivated (Vilardaga et al., 2018). In addition, in the interview, while discussing the differences between slideshow images (images with background audio) and videos, it was mentioned that slideshow images are more preferred as they add more actions to the game, which makes it more engaging and interactive.

Interactive Actions can be used: *i)* To select the positive and negative effects of using *ii)* To have an arrow to continue. This will help us make sure that they have enough time to read and process the text/audio, and *iii)* To interact with the NPC, using buttons.

3. **Consistent & Simple User Interface**

Having a *consistent and simple interface* might sound like a self-evident aspect, but it is extremely important for our target group and it is something we need to ensure that exists in our online treatment tool.

Consistent & Simple User Interface can be used: *i)* To ensure that the tool's environment is controlled. Icons, buttons, and extra gamified interface elements should look graphically the same, *ii)* To ensure that there are no unnecessary and extra elements that will draw the users attention away from the main tasks, and *iii)* To have very similar looking pages so that it will not be confusing for the users every time the page changes.

4. **Audio with text & images**

   One of the most mentioned aspects, from the interview and Section 2.2, is the use of audio and text together. People with ID and SUD face different struggles while reading or trying to concentrate on the text.

   Audio with text & images can be used: *i)* To have a combination of the positive/ negative effects in text, an icon that characterises it, and the audio of what the text reads. Each positive/ negative effect will have these 3 combinations to ensure consistency and assistance, and *ii)* To have the image of the NPC on the screen, audio of what the NPC is saying, and a dialogue bar so the user can see the text.

3.2.2 Should Have

In the *Should-Have* list we will place gamification elements that are important but are not necessary for the prototype to work, and therefore do not affect the aim of the study.

1. **Symbols, Images & Animations**

   Symbols & Images are gamification that was mentioned a lot in the literature (Section 2.2). However, it has to be used in a very careful way as a lot of images or moving icons can be destructive. They are very important for our prototype, however, they are not a necessary feature. The use of animation needs to be as minimal as possible, to ensure that it will not be a distraction while the participants are trying to fill in their positive and negative effects.

   Symbols & Images can be used to: *i)* To represent the text. Using an icon that shows what the positive/ negative effects mean, and *ii)* To make the environment more interesting and immersive. We will create an NPC and ensure that all the designs are in a similar style.

2. **Colour-Coded Text**

   Clear text for people with ID and SUD is very important, due to their conceptual functioning limitations (Ellis & Kao, 2019). Although the colour-coded text does not affect the programme from operating, it is very important to make the text more readable for users.

   Colour-Coded Text can be used: *i)* To highlight titles, *ii)* To separate the text into sections, and *iii)* to highlight important words in the text. For example in the NPC's dialogue.

3.2.3 Could Have

In the *Could-Have* list, we will place elements that could benefit our prototype and research, however, we will implement only if we have time.

1. **Role-Playing & StoryTelling**

   Role-Playing & Storytelling are very important gamification aspects to ensure that the game is immersive. Although it makes the game more engaging and fun, it will be too time-consuming to use in a way that would evoke emotions and make sense with the flow of the game.

   Role-Playing & StoryTelling can be used: *i)* To make the game more interesting, by having an in-game aim, *ii)* To make the game more immersive, by having in-game characters that the user can talk to, and *iii)* To have a sense of an avatar, by having user characteristics and in-game items.

2. **Decision Making**

   Decision Making is different actions that the user can make that change the course of the game, and therefore, make it more engaging. This gamification is very important however it should be used with caution as it can make the game very complex.

   Decision Making can be used: *i)* To make the game more engaging by asking the user to make a choice that will give a different result. For example, it can give them an extra task, or change the environment.

3.2.4 Will Not Have

In the *Will-not-Have* list, we will place elements that we think will make interacting with the game a bit hard and are a bit unnecessary for this prototype.

1. **Personalization**

   Our target group is very heterogeneous as it was seen in Section 2.2 and during the interview. Because of that, personalization is something that we should include. However, we do not place it in the *Should Have* list for different reasons.

   We will not use personalization because *i)* A personalization system to work conveniently and smoothly needs a lot of detail and attention that the time frame of this project does not allow us, and *ii)* A detailed personalization will require personal information from the users. Due to ethical concerns, we will not have access to this information for this thesis.

2. **Challenge**

   Complexity and challenges are very important in a game as they motivate the user to continue playing. However, our target group is very heterogeneous, and in fear of making the game too complex for some people, we will not add any more complexity.

   We will not use challenges because *i)* we do not want some users to find the game hard, *ii)* we understand that for some people reading the text and finding the positive/negative effects is hard enough, and *iii)* we want to make sure that the complexity does not cover the aim of the patient, to fill the positive and negative effects.

3.3 Game Idea

In Section 3.2, we specified different aspects that helped us define what is needed for the game. For each aspect, we looked through existing games and saw how they were used to motivate and excite the users. As Feedback & Reward was an important aspect we were inspired by games that eager the users to collect items while doing some game actions. An example of games like that is 'Hades'[1] in which, while the protagonist is trying to escape he also collects gems, money, and gifts, to trade with other in-game characters and to give him additional powers to ease the player's progress. In addition, the combination of audio & text and interactive actions gave us the idea that we need to have a non-playable character. While looking through games we saw that different non-playable characters exist to highlight the storyline of the game and to guide the users. For example, in 'Roller Coaster Tycoon'[2] a higher ranking NPC helps you build your first roller coaster and teaches you the basics of operating a park.

The idea of our game is very simple. The participants will gain items while they are completing their tasks and they trade their items to create a form of interaction. The game will be in a fantasy world so that it is not at any point realistic or confused with reality. Finally, the game will not be related to or present any substances, to ensure that we will not trigger the participants.

3.3.1 Overview

The game is set in a fantasy world where travelers and collectors are very eager to collect as many valuable items as they can. The users are new in the trading industry and they first have to improve their in-game character so that they will be able to collect as many valuable items as possible. The users will meet a character who will be their trainer/tutor and will teach them the tricks of the trading industry, but also help them navigate around the platform. They can be their guiding voice, by reading the text and explaining the tasks.

[1] https://www.supergiantgames.com/games/hades/
[2] https://www.rollercoastertycoon.com/

With this idea, the trainer will give the users tasks to do, which will help them gain more benefits in the game. These tasks will be drawn from the *client's workbook* (VanDerNagel et al., 2016). Each module in the *client's workbook* represents one level inside the game. In this way, gamification is used to make the *client's workbook* more user-friendly and exciting for the patients. In Appendix A.7, you can see the list of the Modules' titles drawn from the *client's workbook*. Patients can continue playing the game as homework and proceed through the levels.

On each level, the participants will gain a reward. The reward can be an update in the character's score or an item. The character's score can be viewed by the other in-game characters which can decide if you are a reliable, or interesting character to trade with. The higher the scores the higher the chance of having an interaction with the characters. This adds a level of complexity to the game. The item reward can be used to trade with other characters. The aim of the reward is to act as feedback and encouragement for the patients to continue filling the workbook. For each level, the tasks are not the only thing that is changing. Each time the participants will gain different items of different values, as well as character's scores.

For each level, all the gathered responses will be sent to the therapist of the patient. In this way, the patients and therapists can discuss the responses in their sessions as they do with the physical clients' workbook. In addition, the therapists can decide whether the patients can continue to the next level or whether they should repeat the same level. In the final level of the game, the users will have a collection of high-valued objects, as well as completed their homework for their sessions.

In this project, we will only develop the first module of the *client's workbook*, 'Positive and Negative Effects'. Having that in mind the users will fill in their positive and negative effects of using, and gain two small rewards, one personal score, and an item. In addition, they will have to trade one of their items just to have simple interaction with a character and the level will end. Although they will gain a higher personal score, these scores are not going to be used in this project as they might be too complex to be explained and understood in just one level. As in this thesis project we only want to see how the participants interact and experience the game, we will not collect and send their responses to their therapists, for ethical reasons.

3.3.2 Motivations

The story of the game is very much different from the reason the users will use the game. Users will play the game to fill in their information for their therapy. This is almost unrelated to the

aim of the game, which is to trade items. In our tool, we will have two different motivations for playing the game which will be implemented in such a way that they do not overlap with one another.

Users' motivation as a player:

The game will aim to train the user, so it will require the users to gain more understanding of the game and of how they can trade items. It will give rewards to the users when they are working. Those rewards can be used later in the trading phase. The more items and user characteristics the user gains, the better the player they will be in the trading phase and in the game in general.

Users' motivation as a patient:

On the other hand, the game aims to motivate the user to continue filling the positive and negative effects of using a substance. The patient aims to give their information so that their therapist can have a better understanding of them, and also the patients for themselves. The game will give rewards to the users because they filled their positive/negative effects, making them think that as long as they continue filling in the information they will be better at the game. At the same time as long as the users continue playing they are helping themselves as they are working for their health, by giving information to the therapist and acknowledging their personal effects of using a substance.

Chapter 4: Design

4.1 Game Flow

To give our game a clear structure we decided to separate it into four sections: *i)* Introduction; *ii)* Phase 1; *iii)* Phase 2; and *iv)* Outro. For each section of the game, you can read a more detailed explanation of the interface and design in Section 4.3.

Introduction

- **Introduction to the NPC:** In this Scene, the user is introduced to the NPC for the first time.
- **Explanation of the aim of the game:** The NPC explains her role and what is the purpose of the game. She shows the user the book they will use in the game to complete said purpose.
- **Introduction to the tasks of the game:** The NPC gives to the users a tutorial on the different tasks of the game. It explains how they can check an option they want, how they can listen to the written options, and how they can continue to the next task. In addition, she shows the users the items they currently own and the scores of their in-game inventory.

Phase 1

- **Positive and negative effects of using a substance:** In this phase, the user has to check the positive and negative effects of using a substance. Phase 1 includes 2 forms for positive effects and 2 forms for negative effects.
- **Reward:** After the users fill the forms they gain a reward. They gain scores for their in-game character for filling the two positive effects and for filling the two forms for negative effects they gain an item.

Phase 2

- **Summary:** The book shows to the users a small summary of some of the positive and some of the negative effects they selected in Phase 1.
- **Positive and negative effects of using a substance:** The users have to fill one form for positive effects and one form for negative effects. The forms in this phase are similar to the forms in Phase 1 - Positive and negative effects of using a substance. The difference between the two phases is the content of the forms.
- **Trading with a character:** A new NPC character appears in the game which asks the

users if they want to trade an item or not. If the users decide to continue with the trading phase they have to choose one item from their inventory and trade it with the new NPC.

Outro

- **Level up:** Regardless of the decision the users made in the Trading Phase they level up.
- **Goodbye from NPC:** Because this is a short experience of something that could be a full game, the NPC explains that there are no more levels.

4.2 Gamification Characteristics

The game consists of two significant elements, namely the NPCs and the Book. Both elements work together to ensure that the interaction is as user-friendly as possible by using the gamification characteristics we prioritized in Section 3.2 while also benefiting the storyline of the game.

In the story of the game, there are two NPCs. The main NPC is the tutor of the users, and the one that trains the users to get better at trading. The second NPC is the one that trades with the users. In addition, the Book is the "textbook" that the main NPC uses to teach the users.

4.2.1 Non-Playable Character

The NPC is the most important element of the game, as it is not only the tutor of the player but also helps the user interact with the text. The NPC gives a more interactive feeling to the game as it talks to the user. To make sure that the *interaction* is not only just listening to the NPC talk, we also provide a subtitles section where the users can read what the NPC is saying. After each sentence/paragraph that the NPC says, the players need to click on an arrow in order to continue with the following piece of dialogue. This gives more interaction capabilities to the users. Furthermore, this communication creates a sense of *storytelling* for the user, as the NPC is also responsible for narrating the story of the game. For example, when the trading phase occurs the NPC explains to the users the situation and encourages them to decide if they want to continue with the trading or not.

In addition, the NPC gives *feedback* and *instructions* to the users. For example in the beginning the NPC gives a tutorial to the users on how to use the application. Through the interaction, the NPC gives feedback to the users on how to continue playing, on what is presented on the screen, or even an explanation on why filling the positive and negative effects will help them.

Moreover, the NPC is a *combination of audio, text, and image* which is the actual character. The *appearance* of the NPC was very important in this case. We wanted to make sure that the

character is approachable and trustworthy. We found that characters with childish-looking faces are perceived as warm and trustworthy, but less reliable (Lee & Heeter, 2015). In Lee & Heeter (2015), it was explained that when making a character, the role of the character should be represented in its appearance. So for the NPCs we designed we took into consideration some stereotypical characteristics of their job in the game. Finally, we found that realism is not always a good idea as it will not make our NPCs a relatable person and also it might be a bit uncanny to the user. That is why although our NPC is anthropomorphic it also has cartoonish features without adding too much realism to the facial characteristics.

Finally, we decided that the NPCs would not have motion while speaking because having movements may distract the users' attention and still images make the game more convincing since we cannot replicate realistic mouth movement for the prototype.

For this experience, we needed two NPCs: *i)* the tutor of the player; and *ii)* the NPC that the player trades with.

4.2.1.1 The tutor: Tess

After brainstorming and looking into related examples of characters we settled on an anthropomorphic, female character. Her name is Tess which is a Dutch name. In Appendix C.1.1 you can see some of the inspiration we took when designing Tess. We used colour schemes that are present in everyday life and selected images that represent the job of the NPC, libraries, books, and librarians. We also wanted to have some childish influence so some of our inspiration was drawn from children-like characters.

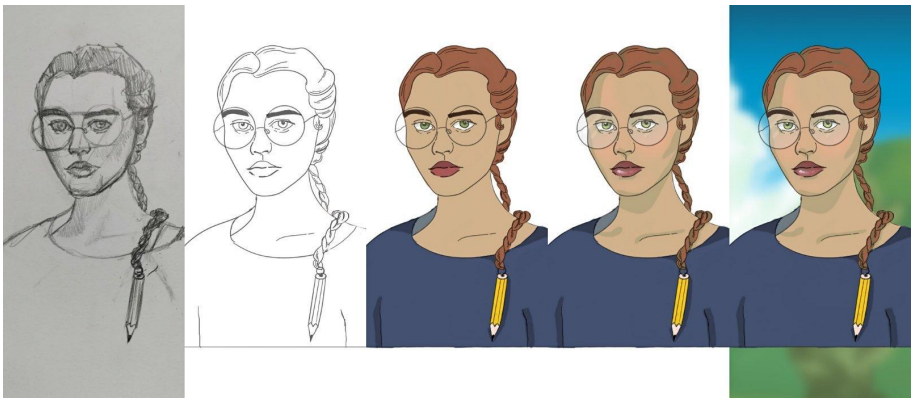

Figure 4.1 Tess' design progress

Incorporating everything together, in Figure 4.1 you can see the different design stages we created until we finalized Tess's appearance. Tess looks like a serious and sophisticated person

as we wanted her to be perceived as a tutor. She is wearing big glasses, which is a slightly stereotypical characteristic for people who read a lot. Still with the glasses on you can see her blushed and rounded cheeks, so she can appear a bit child-like. And, although she is not smiling, the way her cheeks were drawn, she appears like a friendly and happy person. In addition, her hair is tightened up to look more chic and sophisticated. Finally, wanting to make her still look like she lives in a fantasy world without being too extraordinary, we decided to connect the pencil to her hair instead of having her holding it.

4.2.1.2 The trader: Luther

The responsibilities of this character are not as many as Tess's. This NPC's job is only to trade with the users. In addition, this character is created based on the same gamified characteristics as Tess. The difference is in the motivation and background story between them. This NPC is supposed to be a traveler and also a collector that wants to trade an item with the users. We decided to go with an anthropomorphic male NPC, called Luther. So Luther is holding a big brown bag to store and carry all of his belongings. We also chose to make him look like he is sunburned, due to all his travels and wearing a straw hat for the same reason. In Appendix C.1.2 you can see images we used to get inspired to design Luther. We found character designs with extra huge bags and beards to show that the characters are on the move constantly. The colours that were used were inspired by different marketplaces found in fantasy games and movies.

Figure 4.2 Luther's design progress

Figure 4.2 shows the creative process of design Luther. Although from our inspiration travelers and merchants are dressed with colourful clothes and extreme accessories, we decided to design him as simple as possible. In this way, the NPC will look like a traveler in a fantasy world but will not be distracting for the user due to excessive design choices.

4.2.2 Book

The Book is used as a way to enhance the tasks and make them more user-friendly and accessible. The book is the main way of interacting with the game. The main task of the game is to fill the positive and negative effects of using, which the users can do by using the book. Each option is presented with its representing icons. The users can click on the speaker icon to listen to the text and select each option by checking the respective checkbox. In addition, the user can *interact* with the items in their inventory and view their score within the book. This creates a sense of role-playing and also it is used as a way of *reward and feedback*. Every time the users answer a set of positive/negative effects, the book rewards them with an extra item or a higher score.

Necessary attention needs to be paid to the interface of the book. Firstly, it needs to have a *simple and consistent* interface. There should not be a lot of information, which makes it distractive and overwhelming for the user. That is why, in the book we use a *combination of icons and text* with caution, making sure to not change the placement or sizing and not overflowing the pages with information. In addition, to make a clear separation of the text when needed we have *different colours for the titles* to draw the attention of the users. As the book does not contain a lot of text, adding more colour-coded text was not very important.

The appearance of the book is very simple. In Appendix C.1.3 you can see some of our inspiration, and in Section 4.3 you can see how the design ended up looking in different cases. We wanted the book to look simple but still drawn from a fantasy world, that is why it is leather bound with gold corners and beige old pages. In Section 4.3. you can read in detail how and why the information was placed like that on the pages of the book.

Figure 4.3 Book Appearance

4.3 Game Interface

The interface of the game is very important for our target group since it can affect their ability to interact and use the game. With the interface, in this case, we don't only mean the appearance of the game but also the script of the game. For the game interactions to be seamless for the users, we need to ensure that almost every time there something is expressed verbally in the game, it is also written on the user interface.

To make the interface consistent throughout all the phases of the game we hand-drew every element that was used and created two main interface structures: *i)* the NPC Scene; and *ii)* the

Book scene. In Appendix C.2 you can see the throw-away prototypes we did to view the placement of different elements. Different versions of the designs were discussed with a CBT expert. The first interface, *NPC scene* (Figure 4.4), is when a conversation with the NPC occurs and in this case, the interface includes a background, a dialogue box, and the NPC. The second interface, *Book scene* (Figure 4.5), is the most used one and it includes the book opened and the same background as the other scene.

Figure 4.4 NPC scene

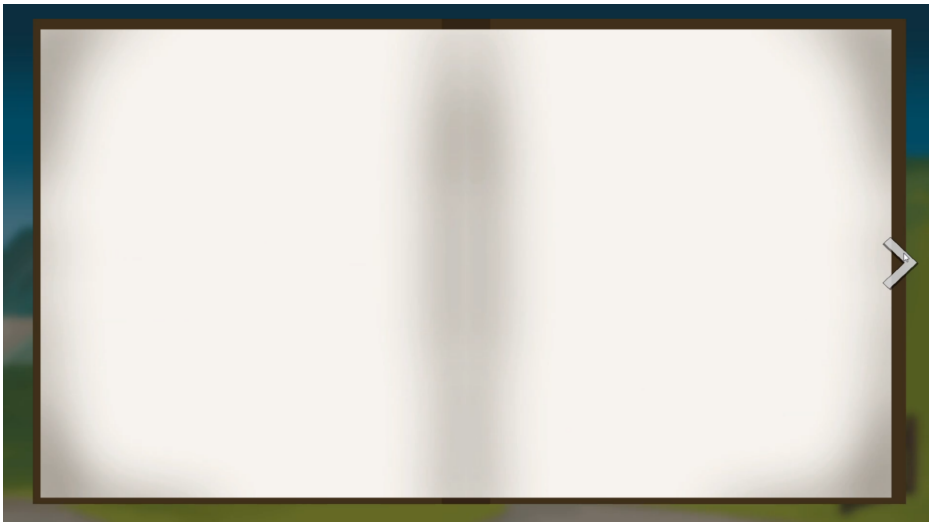

Figure 4.5 Book scene

In Appendix C.3.1, you can see the background that is visible throughout the game. We wanted the background to have bright colours so that it is attractive to the eyes, and simple shapes so that it is not relatable to the real world.

4.3.1 Introduction

The Introduction is the first scene of the game and the interface that is used is the “NPC scene”. The first thing that occurs is the meeting with the NPC (Tess) and she is placed in the middle of the page to ensure that the attention is on her.

Wanting to make sure that Tess is a likable and easy-to-understand character, her introduction script is very important. Whatever Tess says can also be read in the dialogue box below. We separated the script into smaller chunks to ensure that there is enough spacing between the lines and so that it is not overwhelming to read. For each piece of dialogue text, an arrow is present on the right side, so that users can continue to the next piece of text-only when they are ready (Figure 4.4).

Part	English	Dutch
1	Hi there! I’m Tess. Are you ready to play a game?	Hallo daar! Ik ben Tess. Ben je klaar om een spelletje te spelen?
2	I am a collector of treasures. Can you help me get more valuable items?	Ik ben een verzamelaar van schatten. Kun je me helpen aan meer waardevolle voorwerpen te komen?
3	I will explain how to do this.	Ik zal uitleggen hoe dit moet.
4	We ‘ll do some exercises. These exercises will help me learn more about you. Meanwhile, I will help you learn how to become successful in trading.	We zullen wat oefeningen doen. Deze oefeningen zullen mij helpen meer over jou te leren. Ondertussen zal ik je helpen te leren hoe je succesvol wordt in de handel.
5	So let’s get started!	Dus laten we beginnen!
6	This workbook has everything we need. In which you can get more items with the exercises And also see your improvement in trading.	Dit werkboek heeft alles wat we nodig hebben. Er kunnen meer voorwerpen krijgen met de oefeningen En ook jouw verbetering zien in de handel.

Table 4.1 Introduction Script

Tess starts the conversation by introducing herself and explaining what she wants from the users. Although Tess’s goal is to gather more valuable items, she explains to the users that she will teach them how to get better in trading and how to get more items as well. In that way, the users are called to help Tess while she is used as the helper in this situation too. In part 6 of the script, when Tess explains the use of the workbook, an image of the workbook appears.

Tess, then, gives a tutorial to the users on how they can use the book. In this case, the interface changes to the “Book scene”. Having that in mind, Tess will no longer be visible to the user. In the throw-away prototypes (see Appendix C.2) both of the pages were filled with the content of the book, but this idea changed as we wouldn’t have space to add a dialogue box. To solve this, the left page of the book only has a dialogue box with the text and the other the content of the book.

Part	English	Dutch
1	This is what you now own. Looks Good! You can earn more items by doing exercises.	Dit is wat je nu bezit. Ziet er goed uit! Je kunt meer voorwerpen verdienen met het doen van oefeningen.
2	These are your scores. These are your honesty points. Your sympathy. And persuasion. We will improve these as we do the exercises.	Dit zijn jouw scores. Dit zijn jouw eerlijkheid punten. Jouw sympathie. En overtuiging. Wij zullen deze verbeteren terwijl we de oefeningen doen.
3	Before we start with the exercise, I will show you how it	Voordat we met de oefeningen beginnen laat ik je zien hoe het

	works.	werkt.
4	The first task is to check your positive and negative effects of using alcohol or drugs. The book gives you six options at a time.	De eerste taak is om jouw positieve en negatieve effecten van het gebruik van alcohol of drugs te controleren. Het boek geeft je telkens zes opties.
5	You can select the one that apply to you by clicking on the box.	Je kunt degene selecteren die op je van toepassing zijn door op het vakje te klikken.
6	You can listen to the text by clicking the audio icon.	Je kunt naar de tekst luisteren door op het audiopictogram te klikken.
7	And when you are done, you can click this arrow to continue.	En als je klaar bent, kun je op deze pijl klikken om door te gaan.

Table 4.2 Tutorial Script

The tutorial on how to use the workbook starts by showing to the user the items that are stored and then the initial scores. In the case of the stored items, the right page of the book shows the inventory of the users. The inventory contains many slots, some of which contain the items that the user already owns. When Tess is explaining the character's scores the right page has three progress bars with corresponding icons: *i)* one for *honesty*; *ii)* one for *sympathy*; and *iii)* one for *persuasion*.

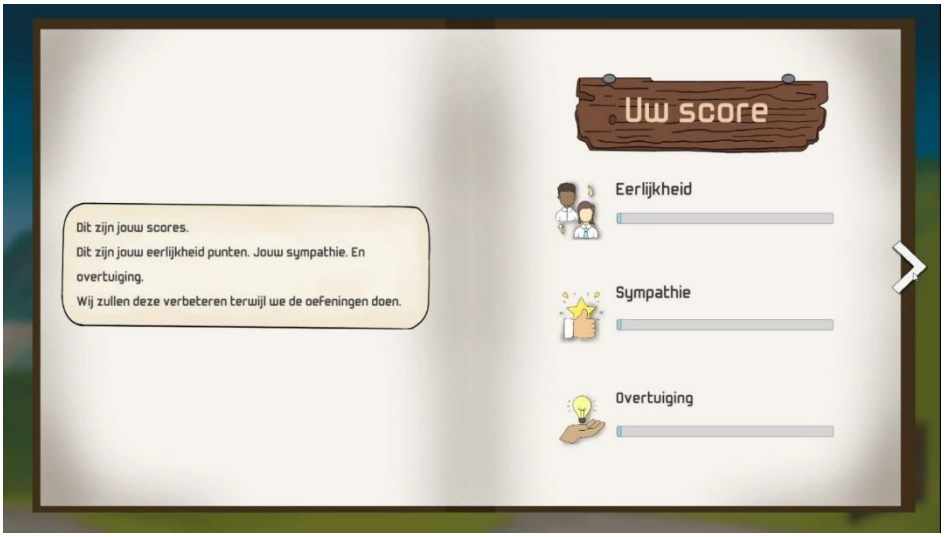

Figure 4.6 Character's score, in Introduction Phase

Finally, Tess explains to the users how they can interact with the positive and negative effects form. In this case, the users can only see three options on the right page, and then a circle pop-up showing the mentioned elements (checkbox, audio icon, and arrow).

Figure 4.7 Training for filling the form, in Introduction Phase

4.3.2 Phase 1

Phase 1 is the main interaction phase of the game, as the users will have to do the tasks for the first time. This phase contains: *i)* the positive effects form; *ii)* the explanation; *iii)* the positive effects form; *iv)* the reward; *vi)* the negative effects form; *ix)* the explanation; *xv)* the negative effects form; and *viii)* the reward.

Figure 4.8 Positive effects form, in Phase 1

In this phase, there are two positive and two negative forms as we wanted to present as many options from the Clients' Workbook as we could. The interface for the positive/negative effects forms is the same but the options change each time. There are three options per page, so six for each form. For each given option, there is a checkbox, which the users can click to choose that effect, an icon that represents each effect, the text of each effect, and an audio button that reads the text of the effect out loud. Having six options for each form left enough space around the content so that it would be more readable. The icons used for each option were hand-drawn to

ensure consistency and we tried to represent the text as much as we could (see Appendix C.4). While the users are filling the positive/negative effects, Tess and the dialogue box are not visible. By not including these two components the interface remains simple and as clear as possible. However, we acknowledge that having no visible transcript for what Tess is saying might be a limitation of our prototype. The script in these cases was almost the same for every positive or negative form.

Effects	English	Dutch
Positive 1	Let's get started! First, you need to check the positive effects of using alcohol or drugs. Positive effects are pleasant experiences with using alcohol or drug. Take the time to find out which ones apply to you. Click the arrow when you're done.	Laten we aan de slag gaan! Eerst moet je de positieve effecten van het gebruik van alcohol of drugs controleren. Positieve effecten, zijn de fijne ervaringen bij alcohol of drugs gebruik. Neem de tijd om erachter te komen welke op jou van toepassing zijn. Klik op de pijl als je klaar bent.
Positive 2	Let's look at even more benefits of its use. Same thing, just check the ones that apply to you.	Laten we eens kijken naar nog meer voordelen van het gebruik. Hetzelfde, vink alleen degene aan die op jou van toepassing zijn.
Negative 1	We can go on! We also want to know what negative effects alcohol or drug use has on you Negative effects are the ones you don't like. You can listen to the text by clicking on the icon.	We gaan verder! We willen ook weten welke negatieve effecten alcohol of drugs gebruik op jou hebben Negatieve effecten zijn de gevolgen die je niet prettig vindt . Je kan naar de tekst luisteren door op het pictogram te klikken.
Negative 2	Let's take a look at even more negative effects of use.	Laten we eens kijken naar nog meer negatieve effecten van gebruik.

Table 4.3 Positive & Negative Forms Script

After the first positive effects form and the first negative effects form there is an explanation page. In all the explanation pages that follow, Tess explains why it is important to fill in and know the positive and/or negative effects of using. The interface of the book changes in this case. On the left page of the book, you can see the dialogue box so you can read what Tess is saying. On the right page, you can see Tess and the wooden sign with her name. This page is very simple to ensure that the users remain focused on Tess and what she is saying.

Effects	English	Dutch
Positive Explanation	Well done! The positive effects are your reason for wanting to use. Knowing your reasons will also make it easier to change your usage.	Goed zo! De positieve effecten zijn jouw reden dat je wilt gaan gebruiken. Als je weet wat jouw redenen zijn, is het ook gemakkelijker om je gebruik te veranderen.
Negative Explanation	Negative effects are your reason not to use. Knowing them can help you avoid using alcohol or drugs during difficult times.	Negatieve effecten zijn jouw reden om niet te gebruiken. Als je ze kent, kun je voorkomen dat je in moeilijke tijden alcohol of drugs gebruikt.

Table 4.4 Positive & Negative Explanation Script

Figure 4. 9 User Score Reward, in Phase 1

Moreover, using rewards might motivate the users to continue playing the game, that is why we have two different rewards after the two positive and negative forms. After the positive effects form the user will gain more points on their characteristics. The scores of the three characteristics (honesty, sympathy, and persuasion) are doubled. In the brainstorming sessions, we were thinking of a way to have a metric system and an explanation on why the three scores are increasing, but we chose to make it as simple as possible for multiple reasons. Firstly because we decided to not include any complexity and challenges in the game. Secondly, we didn't want the users to think that the answers they give, or the number of effects they check affect their scores since it is important to fill in their personal effects without having to think of the consequences or the reward system. The interface for the characteristics reward is similar to the interface in the Intro Phase (Section 4.3.1). On the left side, they can see how the scores are affected, e.g. "2x honesty". On the right page, they can see the progress bars for each characteristic with the values of the now increased bars.

Figure 4.10 Item reward, in Phase 1

The second reward is after the negative effects form and this reward is an item. In Figure 3.8 you can see the interface. The new item is shown on the left page and also placed in one of the previously empty rectangles on the right page of the book. Finally, Tess's script in these cases has to be encouraging and rewarding, and she also explains how this reward can help the users in the game.

Reward	English	Dutch
Scores	Well done! The book now knows more about you. Your scores go up. This will help us trade more items.	Goed gedaan! Het boek weet nu meer over jou. Je scores gaan omhoog. Dit zal ons helpen meer items te verhandelen.
Item	Well done. The book rewards you. It gives you a new item because you answered the questions.	Goed gedaan. Het boek beloont je. Het geeft je een nieuw voorwerp, omdat je de vragen hebt beantwoord.

Table 4.5 Rewards Script

4.3.3 Phase 2

Phase two is the most interactive phase in the game. The actions that occur in this phase are: *i)* summary of results, *ii)* positive effects form, *iii)* negative effects form; and *iv)* trading phase.

In the summary, the users can see a *maximum* of four positive effects on the left page and a maximum of four negative effects on the right page. The displayed effects are what the users selected in Phase 1. If the users choose more than four then the tool will randomly select 4 and present them. When they choose less than four then whatever was selected is presented on those pages. Each page will have a sign for the title. Finally, this scene will not have a dialogue box.

NPC	English	Dutch
Tess	These are the answers you've given so far.	Dit zijn de antwoorden die je tot nu toe hebt gegeven.

Table 4.6 Before Trade Script

The users will be asked to fill in the positive and negative effects of using again. We wanted to include as many positive/negative effects from the workbook as possible, that is why we have another set of forms in Phase 2. While brainstorming, we rejected the idea of having all the effects in Phase 1, with the aim to make sure that the game was not repetitive and boring for the users. However, in Phase 1 we have more forms than in Phase 2. The interface in these sections is the same as in Phase 1 (as explained in Section 4.3.2).

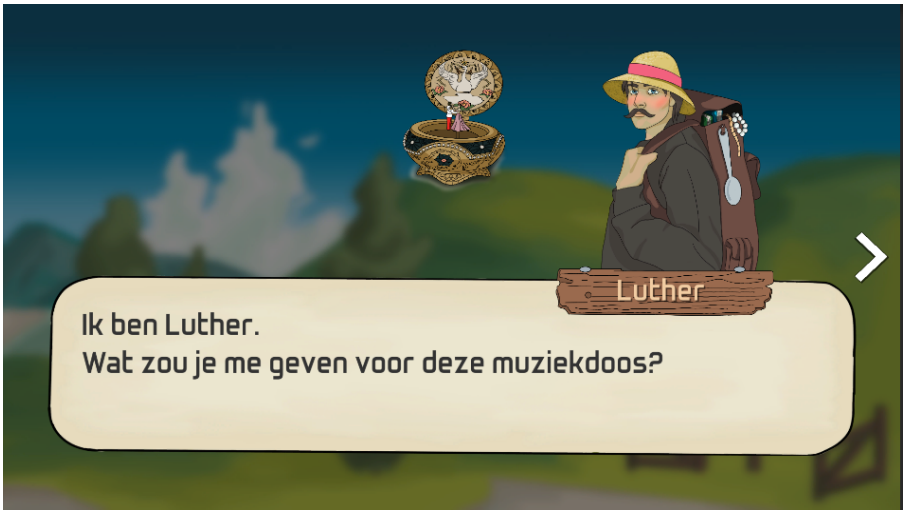

Figure 4.11 Luther's introduction, In Phase 2

The trading phase happens right after the negative effects form. The book closes and the users can only see the background as Tess introduces the new character of the game. As Luther appears in the game the interface has the structure of the "NPC scene", as explained in Section 4.3. Luther is placed on the right, above the dialogue box, and on his left, the users can see the item that he wants to trade (Figure 4.11).

NPC	English	Dutch
Tess	There is someone who wants to trade with you.	Er is iemand die met je wil handelen.
Luther	I am Luther. What would you give me for this music box?	Ik ben Luther. Wat zou je me geven voor deze muziekdoos?
Tess	Do you want to decline his offer? Or go to the storage to see what you can give him?	Wil je zijn aanbod afslaan? Of naar de voorraad gaan om te kijken wat je hem kunt geven?

Table 4.7 Trading Script

After Luther introduces himself he immediately makes a trading offer to the user. Tess then asks the user to make a decision and decline, or continue by going to the storage.

Figure 4.12 Decision making, in Phase 2

If the user clicks the icon on the left (with the X marker) then the user declines the offer and the game continues to the Outro. If the users click the icon on the right (with the stacked boxes) that represents the inventory of the user then it means the user wants to continue with the trade. The book opens up again, and on the right page, the user can see all the items that they own in the game.

Figure 4. 13 Select an Item to trade

Whatever the users select, the next action is Luther's response, so the book will close and we will go to the “NPC scene”, where we can see Luther and his response. In the full game, his response is different depending on the item the users choose. In Figure 4.14, you can see a diagram showing how the users' decisions affect the course of the game.

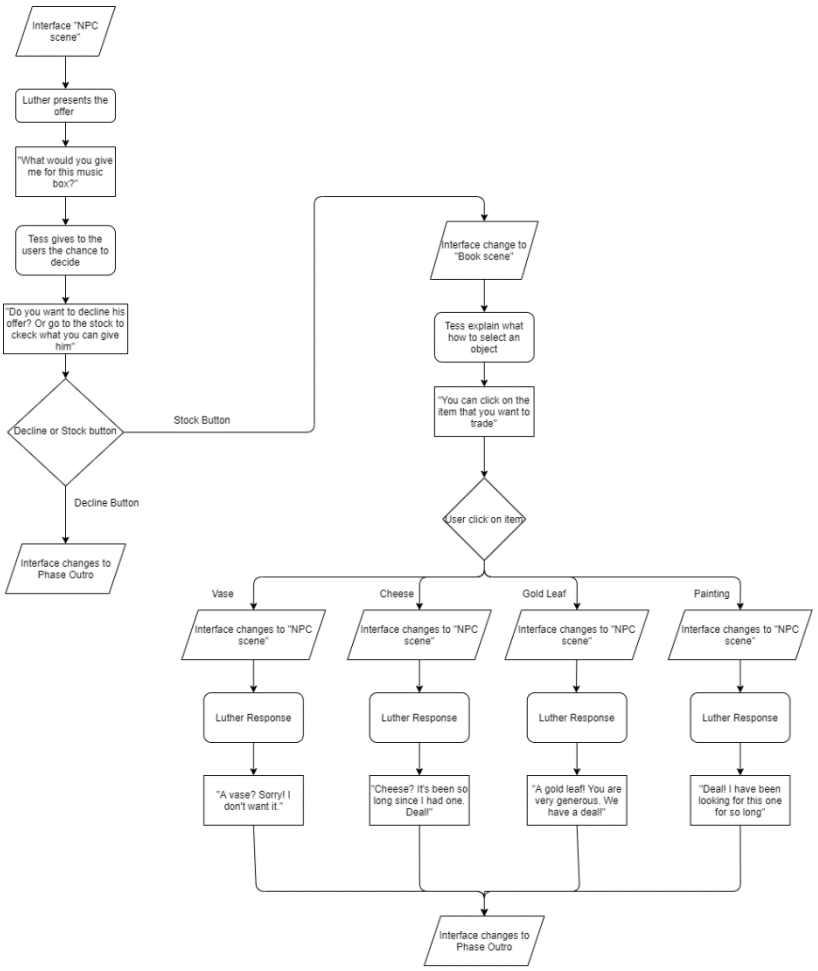

Figure 4.14 Dynamic game course change based on players decisions, in Phase 2

4.3.4 Outro

Part	English	Dutch
Next Level	Congratulations! You have passed this level.	Gefeliciteerd! Je hebt dit level gehaald.
End	Thank you for your participation! There are no more levels for now, but I hope to see you soon! Bye!	Bedankt voor je deelname! Er zijn voorlopig geen levels meer, maar ik hoop dat ik je snel zie! Tot ziens!

Table 4.8 Outro Script

As soon as Phase 2 ends, even if the users decided to trade or not, they complete this level. Because we want this game to consist of a lot of levels, which will be the modules of the workbook, we included a scene where the level ends, and the users can decide if they want to continue with the next one. In Section 3.3, you can read more about how the game can be expanded on. In our prototype, the user can click the button and, since this is the end of the experience, Tess appears on the screen and lets the user know that there are currently no more levels available.

Figure 4.15 Next level interface, in Phase Outro

Chapter 5: Evaluation

To answer the two research questions in Section 1.4 we conducted an evaluation study. Although it is preferred to conduct such studies physically, due to the COVID-19 regulations we made the study online. Having that in mind, we used the user interface aspects we collected in Section 2.2 and made the study accessible for our target group. In addition, we made sure that the whole evaluation process would not take more than one hour, to ensure that the users will remain focused.

5.1 Measurements

In the study, we wanted to investigate how the gamification and user interface aspects had affected the users' experience, by collecting both qualitative and quantitative data.

It is important to see if the participants understood the positive and negative effects. We wanted to investigate whether the gamification and user interface aspects used to present the positive and negative effects of using were clear and easy for the users to translate in their personal life.

We also wanted to investigate three specific functionalities: *i)* The combination of Audio and Text *ii)* The use of a Non-Playable Character (NPC), and *iii)* the use of motivational elements. Each of the above functionalities contains different gamification aspects which can be found in the table below. Audio & text were used in several cases and they were a very important functionality for our target group that their detailed analysis was mandatory. The NPC required a lot of gamification aspects, together they aimed to make the NPC likable and helpful to the user. The NPC had a lot of interaction with the user and that is why it is an important variable in our study. Finally, motivational elements were important to ensure that the focus and interest of the users remained on the tasks, which is something we want.

Audio & Text	NPC	Motivational Elements
Audio	Audio	Reward
Text	Text	Image (of the reward)
Role Playing	Image (of the character)	Feedback
Feedback	Storytelling	Role Playing
	Role Playing	
	Immersion	
	Feedback	

Table 5.1 Gamification Aspects and Characteristics

At the end of the study, we conducted an interview. The interview consisted of two parts. In the first part, we asked ten questions (See Appendix E.2.2). With these questions, users had to express their opinion as well as rate their preferences using a Likert scale. To present this scale we used face emoticons (Figure 5.1), with 1 being the happy face and 5 the sad face.

Figure 5. 1 Interview Scale

The second section of the interview included the UTAUT questions. The UTAUT questionnaire is used so that researchers can gain more insight into the technological applications for mental health (De Witte & Van Daele, 2017). The questionnaire is used to see how users feel about these specific applications, so they can be properly embedded in clinical practise. We used the exact structure of the provided questionnaire but changed the language to be simpler. It comprises Likert scale questions to show agreement with different statements. This was not sufficient in our case, as our target group struggles a lot with interacting with forms. That is why we made it into an interview where I read the English version of the question and the participants could read the Dutch version of the question on the screen or listen to the translated version from their caregivers. In addition, to make it more understandable, we used the same emoticons as in Figure 5.1, instead of just numbers. In UTAUT, 1 represents "totally disagree" and 5 "totally agree". We did not want to change the scaling system and confuse our users so we reversed it, with 1 being "totally agree" and 5 "totally disagree".
Finally, the reason we had two sections in the interview was to give the participants a chance to refuse to continue with the questions if they are overwhelmed.

The quantitative data were collected within the code of the game which is: *i)* a click counter for the audio button, and *ii)* the total time they needed for each positive/negative form.

5.2 Participants

The study included four participants with ID and SUD (male = 4). The participants had to be older than 18, and have a caregiver with them that will assist by translating English to Dutch. All the participants had very good knowledge of English and the study ended up being in English. However, the caregivers were very helpful as they translated phrases or words to Dutch and vice versa.

To find the participants we contacted therapists in the Netherlands that specialize in people with ID and SUD. In the brochure and in the study itself we did not ask the participants to clarify what kind of ID they have. We rather had this conversation with the therapists. Our participants were individuals with mild ID or borderline intellectual functioning.

Due to COVID-19 we could not go to the clinic and search for potential participants. We didn't want participants who only had ID as we did not want them to pretend to have an addiction. Two of the participants no longer had a problem with addiction but they continued having sessions with their therapists. In addition, a participant insisted that they had an addiction to games but their therapists said that this is not the case.

5.3 Procedure

Before conducting the study and starting searching for participants we had to send our study details to the Ethical Committee of our faculty (Electronic Engineering, Mathematics and Computer Science - EEMCS) as well as complete the checklist asking for ethical approval from Tactus. The checklist specifies our practises in the evaluation as well as our way of ensuring the users' privacy. In addition, we created and gave our participants an information brochure in Dutch where we explained the aim of our study and had a brief explanation of the tasks that they would have to complete. We tried not to give away a lot of information while also informing them of what they should expect from the study. You can read the Brochure in Appendix E.1 in Dutch and in English.

The evaluation took place in Microsoft Teams as it is more secure than other meeting platforms. Because we wanted to make sure that it will be easy for the participants to complete the study, we created a presentation that contains all the information. Each slide displays the script of the evaluation, which is what the research will say, in both English and Dutch. For the presentation of the text, we ensured that: *i)* the line space is 1.5; *ii)* there are small sentences; *iii)* it is written in a simple language, and *iv)* there is one sentence per line. In Appendix E.2, you can see the presentation we used for the evaluation.

The structure is divided into four parts: *i)* Introduction; *ii)* Interacting with the game; *iii)* Interview; and *iv)* Outro.

The introduction phase starts with the researcher introducing themselves and explaining the purpose of the study. In this part, we asked permission from the participants to video record the meeting. Moreover, because our target group has a hard time interacting with forms, especially online, the consent form was verbal. We wrote the points of the consent form (in English and

Dutch), and we asked the participants if they agreed to them.

Consent points:

- Have you read and understood the study information, or has it been read to you?
- Do you voluntarily consent to be a participant in this study?
- Do you understand that you can refuse to answer questions?
- Do you understand that you can withdraw from the study at any time, without having to give a reason?
- Do you understand that information you provide will be used for a Master's thesis report?
- Do you understand that the collected personal information that can identify you, will not be shared beyond the study team?
- Do you agree with being video recorded during this study?

In the "Interacting with the game" part, we sent the game to the participants in the chat of the call. We had instructions on the presentation for how to download and open the game. No further explanations were needed here, as we also asked the participants to play independently. We wanted to see how accessible the game is for the users.

As soon as the participants finished interacting with the game, we conducted an interview. The interview contained both open-ended and closed-ended questions. You can see all the questions we used in Appendix E.2.2 and Appendix E.2.3.

Finally, in the outro, we thanked the participants and let them know how they can contact us.

5.4 Analysis

To analyse our interviews, we transcribed the recordings. To transcribe the interviews, we used clean verbatim which only represents the content of the interview. For example, we left out: *i)* filler words; *ii)* repetitive words; *iii)* stutters; and *iv)* in some cases grammar mistakes. In addition, we sorted all the replies of a question in one section leaving out the user ID so that we ensure anonymity. To code and analyse the interviews we had one coder and used the top to bottom coding approach. In this way, we created themes and categories from before and then code the transcript. We created the themes based on the research questions (Section 1.4).

Theme	NPC	Motivational Elements	Audio & Text	Positive & Negative Effects
Categories	Text	Reward	Understanding	Understanding
	Audio	Motivation	Usefulness	Icons
	Explanation	Usefulness		Interface
		Likability		

Table 5.1 Pre-defined Themes and Categories

The four themes contain different categories which represent the different aspects we wanted to analyse. We reviewed the transcript a couple of times and selected the codes and placed them into the categories of the themes

To analyse the UTAUT questionnaire we reviewed its manual. There it explains that one way to analyse the data is by taking into consideration all the collected values and then calculating their average. As we did not have a large participants pool, analysing the average of the results did not give us a reliable answer. However, the data can be used to show a brief representation of users' perceptions and usability of technological tools. In addition, in the manual, the questions are separated into seven sections. In Table 5.2 you can see the seven sections and the questions that are contained in each section. We used these sections to draw conclusions about our users' experience, using the numbering and verbal answers participants gave. Furthermore, in the manual some questions required reversed scores, so we also reversed the numeric answers to discuss the overall representations.

Section	Questions
Outcome Expectation	1, 7, 13, 18
Effort Expectation	2,8,14
Social Influence	3,9,15,19
Facilitating Conditions	4, 10, 16
Fear	5, 11
Trust in data security	17, 20
Knowledge	6, 12

Table 5.2 UTAUT Question in Themes

We observed that most of the users struggled to give a number as an answer even if we insisted. They preferred to give long explanations verbally. Because those cases were numerous we decided to find keywords in their explanations and use them to assign a more fitting number. We did not do that for all the answers but only for the ones that had a clear emphasis on their opinions.

- For "Not at all" and "No of course" we assigned the score 5.
- For "Depends on…" and "I don't know" we assigned the score 3.

- For “Yes of course”, “Definitely” and “Full trust” we assigned the score 1.

Finally, we verified the data by finding any errors in the relation between the verbal explanations and the number the participants gave us. Normally in this case we would erase the replies from the participants with errors. However, because our sample size is very small we could not do that, and we resolved this issue by changing the number accordingly. For example, user 2 struggled to define the numbers they wanted. In one case they said “No” and said number 2. Number 2 is positive on our scale so it doesn’t represent “No”.

- If the verbal answer is “No” or negative and the participants assigned the score 1 or 2, we changed the scores to 5 and 4 respectively.
- If the verbal answer is “Yes” or positive and the participants assigned the score 5 or 4 we change the scores to 1 and 2 respectively.
- Answers with 3 never change

The analysis of the quantitative data collected from the game were not detailed as we did not have enough participants to draw significant and reliable conclusions. Therefore, we will present our findings in a graph and make observations regarding them.

5.5 Results

5.5.1 Interview

In this section, we will discuss the qualitative results of our study that correspond to our research questions.

1. **NPC:**

   The questions related to the NPC were focused on Tess. All the participants expressed that Tess gave clear and easy-to-understand explanations. One participant even commented that the level of Dutch was easy and understandable for even kids. However, one of the participants said that Tess's explanations were long and that in some cases they didn’t wait for her to finish the sentence and started the exercise as soon as they understood what they had to do. In addition, a participant quoted that “the voice was like google translate”, meaning that it was monotonous. When discussing the use of text while Tess was speaking, almost everyone said that it was useful with one participant saying “It is always helpful to have text when something is talking to you”, and they explained that this helps so that you do not miss something. Worth mentioning here is that one participant said that they only read the first two sentences of each piece of text,

and then continued to the next step without waiting for Tess to finish.

2. **Motivational Elements:**

   The motivational elements discussed in the interview were the two rewards that the participants gained when they answered the forms. In terms of the rewards, scores and items, no participant really cared about them. A participant explained that the rewards had no correlation with the questions and it appeared that they had no "weight" in the experience. They also highlighted that it was "nothing useful". In the case of likability, no participant mentioned anything, although one participant said it was fun, which does not specifically explain that they liked it or not. Two participants explained that the elements did not motivate them as they just wanted to continue filling their positive/negative effects. One of them even explained that "It feels good to know what the problem is".

3. **Text & Audio:**

   The combination of text and audio made the information more understandable for the participants. One reason behind this is because the audio was in their native tongue. In terms of the usefulness of the audio button, the participants explained that they did not use the button. However, when they were asked about it, they said that it is useful for people with "lower IQ" or lower skills. Also, one participant said that it would be very useful for people who cannot read.

4. **Positive & Negative Effects:**

   In terms of understanding the effects' form, we coded that all the participants found the pages easy to understand. They mentioned that different aspects of the interface affected their experience. One participant explained in detail that the number of options and the space between them made it easy for them. While another participant also explained that the icons were a reason that made it easier for them. Most of the participants expressed their likability for the icons, as one participant explained that people who cannot read can really benefit from them. However, one of the participants was disinterested in them and said, "I prefer to do it through the text". Finally, one of the participants suggested that although the icons were good, they could be better by adding a green "√" on top of them to show positivity.

5.5.2 UTAUT Questionnaire

Figure 5.2 displays the numeric answers given by the participants. Participants 2 and 4 answered almost all the questions with numbers. The rest did not really pay attention to the numbers however they gave long answers and explanations that can help us similarly. We

reversed the scoring of some of the questions that had a negative meaning, by following the manual's instructions and extracted a new graph. We observe that most of the ratings are either 3 "Neither agree nor disagree" or below 3 which is positive. 50% of all the replies were positive, almost 10% were negative and the rest were neutral.

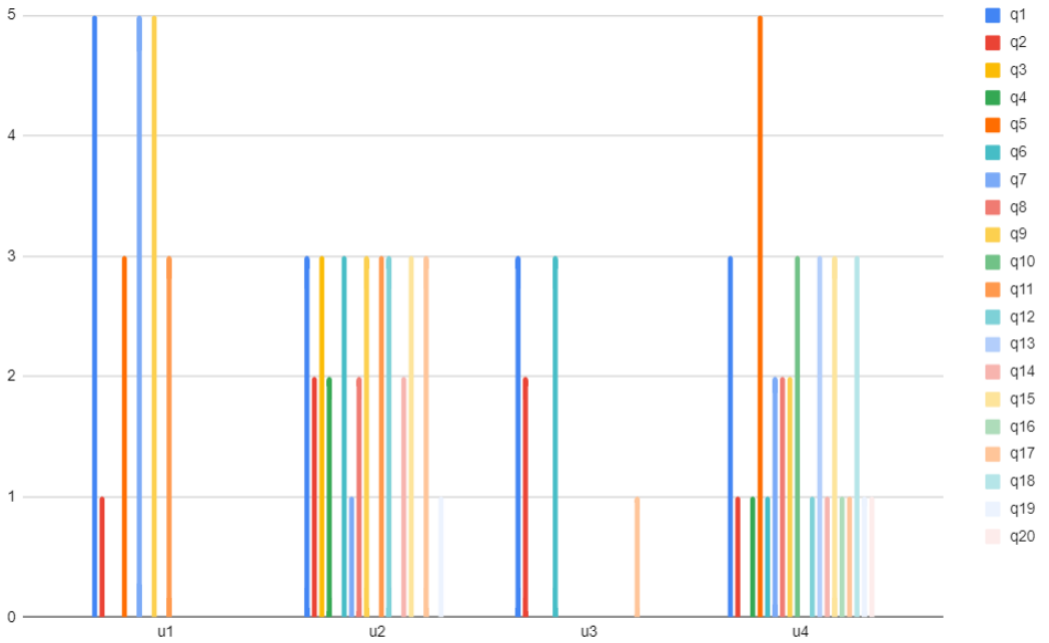

Figure 5. 2 UTAUT Responses

1. **Outcome Expectation:**

   The questions aimed to find out how useful the game can be. While looking at the graph with the numeric answers most of the answers were score 3 which represents a state of "neither agree nor disagree". However, we also had two replies from the first participant with a score of 5 "Totally Disagree", which shows that for them the game is not really helpful. On the other hand, one participant believes that the game can help them improve their well-being by scoring with 1. While looking at the qualitative data one participant that scored with 3 appeared conflicted as they firstly said "No I don't think so." but then elaborated by saying that maybe the game will help because "it would help you to think about the good things and bad things about being addicted". This also made them say "the game would help, yeah". Another participant explained in detail that they do not have a problem, so therefore they do not think that they can benefit from the game. But they still explained why they rated it as 3 by saying "If I had a problem, I think it is a 3, of course, it will help. Not on its own. It has to be used as an extra." Finally, one user expressed that if the game was longer and you could repeat it, it could be useful.

2. **Effort Expectation:**

The participants appeared to believe that they can play the game with ease. All the answers were positive. Question 2 was a negative question saying that it would cost them a lot of time and energy and two of the participants disagreed with the statement (4) and the other two totally disagreed with it (5). In addition, questions 8 and 14 were positive and all the participants that gave a numeric answer were positive too. Some of the participants explained their answers and said that you can play the game in your own time whenever you want.

3. **Social Influence:**

In terms of the social encouragement to use the game, the numerical answers were a bit unclear. We had a high number of 3. It appeared that the participants did not have a definite answer if they thought that the game could be encouraged by people close to them. One participant used 5 to say that their GP would not advise them to use the game and in contrast, one used 2 to say that they might advise them. In question 19, two participants "totally disagreed" with the statement, one participant said that they do not care what other people think and another said, "How would they know." For the other three questions, the participants who did not give a number as a reply said that nobody would really recommend it to them, with one explaining their answer by saying that they do not have a problem.

4. **Facilitating Conditions:**

Most of the numeric replies given by the participants suggested that technical facilities are available for playing the game. For question 4 all the participants gave a positive reply even verbally, with one participant explaining that we need to make the game more accessible for people with operating systems like macOS and Linux. Question 10 was the only one with a score of 3, with two of the participants responding positively, by providing a verbal explanation. One of them explained that their caregiver can help them, while the other said that they always play games alone. Participant 3 suggested we add contact information in the game so, in case of a technical issue, the users can contact us directly. Participants also appeared to have the necessary technical knowledge to use the game, as it was easy for them to understand and play.

5. **Fear:**

Fear related to the internet was a bit unsure between our participants. The Internet is not necessarily a threatening thing for our participants. One explained that it depends on what game they are playing, however, another explained that they "feel at home on the internet".

6. **Trust in data security:**

   In terms of the security concerns, participants seemed to trust us towards the way we developed our technology and also towards their therapist. The same applied to the final question which asked if they are afraid of confidential information being leaked into the wrong hands. All the participants expressed their disagreement. One participant even suggested when we are sending information to their doctor to make sure to encrypt the information.

7. **Knowledge:**

   Participant 4 appeared to have enough knowledge about the game to score it with one. However, the rest of the participants were a little bit more hesitant. One of the participants said that they have a little bit of knowledge and hence they gave a score of 3. While another participant said that they only played one level of the game and they are not sure if they know what to expect exactly.

5.5.3 Quantitative Data

The qualitative data that we collected from the game was the click counter of the audio button and the total time needed for each user to finish filling the effects forms. It was observed that no one used the audio button, as the counter was never triggered.

The time needed for each participant to fill in the forms can be viewed in the table below.

	Positive1 (sec)	Positive2 (sec)	Positive3 (sec)	Negative1 (sec)	Negative2 (sec)	Negative3 (sec)
U1	24.2076	83.1962	29.6962	32.2336	43.7181	34.8041
U2	34.9704	31.467	37.9337	28.3503	17.4002	19.8665
U3	43.0039	30.1338	26.267	24.017	14.8335	16.7002
U4	29.069	19.0493	17.816	62.8811	18.8827	16.616

Table 5.3 Total time for each form

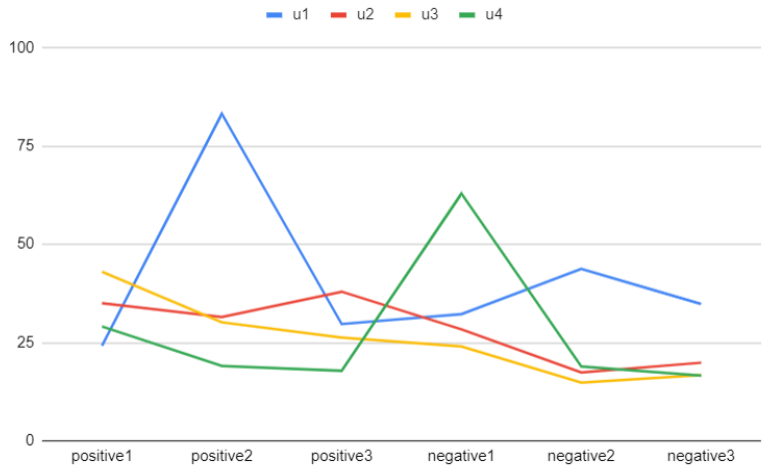

Figure 5. 4 Representation of Total time for each form

As we do not have a large sample size our results are not reliable enough to be analysed and draw concrete conclusions from. However, we can look through them and use them to discuss qualitative information. From the graph we observe that it took less time for the participants to fill in the negative form than the positive form. An exception is participant 4 who needed almost double the time to complete the first negative form than the first positive form.

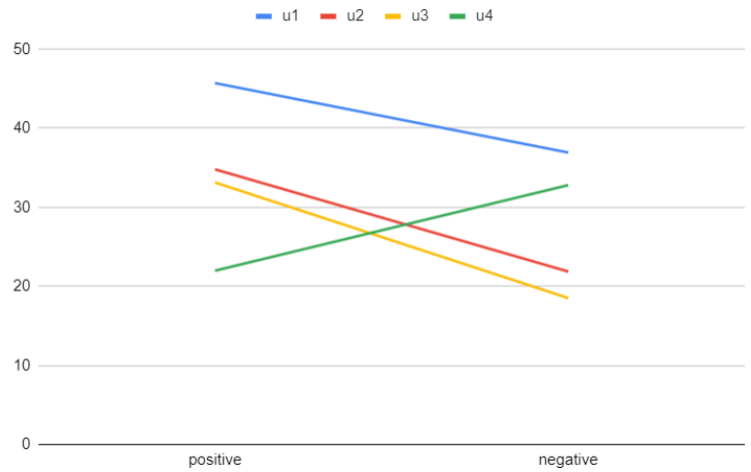

Figure 5. 5 Representation of Average time for Positive and Negative forms

For each user, we generated the average time they needed for all the positive forms and all the negative forms. We observe that 3 of the participants had a linear decrease of the average time they need for the positive forms to the negative. However, participant 4 had a rise on their average.

5.6 Clarification Interview

After analysing our data we came across some uncertainties about the users' preference towards

the audio button and the rewards, that required further clarification. We organised a study in which an expert would impersonate a person with ID and SUD. They were tasked to complete the study with the exact same procedure as described in Section 5.3 and answer some more specific questions about our findings. Unfortunately, the expert we set our meeting with cancelled and, as a replacement, we asked an expert, who is also a therapist and the supervisor of this thesis, Joanne VanDerNagel. Joanne was involved in the processes of this thesis project, however, in the interview, she only commented and answered questions we asked her as an expert.

5.6.1 Procedure

The clarifications we highlighted from our results were mainly related to the motivational elements and the audio button. Our aim with the interview with the expert was to address and determine the origin of our findings. The interview was semi-structured with three open-ended questions with some follow-up conversations.

The questions were:

1. We observed that none of our participants used the audio button. However, when they were asked about it they explained that although they haven't used it they think that it can be useful for people with more limitations than them. What do you think about this?
2. While discussing the reward with participants we observed that one participant was a bit bothered by it saying "it was useless", while the rest did not really care about it and one of them even said it was "fun". However, this makes us wonder if this reward was really useful or not.
3. As an expert, do you have any remarks or feedback about the game?

The interview took place online on Microsoft Teams with a duration of 15 minutes. To transcribe the interview we used smooth verbatim where we included: *i)* filler words; *ii)* stutters; *iii)* original content with no paraphrasing; and *iv)* no grammar corrections. We used a bottom-up approach to code the transcripted. Because we only had three very specific questions, we created three themes: *i)* motivational elements; *ii)* audio buttons; and *iii)* feedback. After we reviewed the interview we identified some codes and placed them in their related themes.

5.6.2 Results

In terms of the lack of use of the audio button, the interviewee said that "this is a typical situation where more research is needed". She explained that there is logic and truth behind our findings and our participants might not really need it. However, she highlighted the bias that

might exist in our small sample size. The target group is very heterogeneous, as she explained, and similarly, people who cannot read and write might as well use and benefit from the audio button. To highlight the need for more research she gave us a similar example that she faced in her work, where participants said that they didn't use the icons, but saw them peeking to see them a few times.

While discussing the way participants perceived the motivational elements she explained that the participants might be feeling like the game is an extension to their treatment programme and the reward is actually finishing up the exercise. She also said that maybe there are two different ways that the participants perceived the game. One way was that they needed a story and an in-game reward to improve their experience and help them. The other was that they felt tricked, that their treatment was disguised as a game and that maybe they didn't need the extra motivation. She also found it interesting when a participant preferred the game to the workbook and said that by adding the story we improved the experience of the treatment module for that participant.

Finally, some general comments she added were that filling the positive and negative effects of using a substance in the format we presented appeared far more useful than using paper and pencil. She added that a very relevant and good topic to research is the difference and comparison between gamification aspects versus a full game.

Chapter 6: Conclusion

Aiming to improve the user experience of people with ID and SUD while they are trying to assess their positive and negative effects of using, we set out to answer three research questions.

6.1 **Research Question 1:** What is the state of the art for online treatment tools?

a) What are the suitable gamification aspects for people with Intellectual Disabilities?

For people with ID, computer single-player games are more suitable. Immersion is a useful gamification aspect, and it can be implemented with icons, symbols, and images, only when it is necessary. It is important to use visualizations with caution so that they are not distractive. In addition, the use of feedback and rewards can increase engagement and interaction with the tool. A simple and consistent interface is necessary so that it is easy to use. A highly important aspect is also the use of audio with text. Text has to be presented in simple language, with short sentences and with a clear separation between them. The combination of audio and text is more helpful as people can choose if they want to read or listen.

b) What are the suitable gamification aspects for people with addictions?

For people with SUD making a tool engaging and motivating is very important. Using story-telling and role-playing can evoke emotion to the users. Combining interactive quizzes with decision making and reward can make educational and treatment tools more gamified and therefore more engaging. In addition, the use of animations with non-bright colours can also benefit the group. Finally, personalization is a very important aspect to make the gamified experience more relatable with the user.

c) What is the appropriate complexity of a game for people with Intellectual Disabilities?

When creating games for people with ID it is important to understand that the context of the game can make it harder. For people in this target group, games can already be hard without additional complexity. Making an accessible and simple UI can minimize the complexity. It is important to ensure that all the given tasks are solvable so that people will not be discouraged. Finally, increasing the difficulty gradually is necessary for a game to be enjoyable and not make it too overwhelming for the users.

d) What has already been done in terms of gamification for online treatment tools for people with addictions, on people with low literacy?

There is not enough research on gamification for people with both ID and SUD. Findings suggest that a consistent and simple interface is an important aspect for the target group. Moreover, the game needs to be engaging and immersive using animations and images. The common aspects we collected while looking through the target groups separately were: *i)* reward, *ii)* personalization; and *iii)* feedback.

6.2 **Research Question 2:** How to design an online treatment tool for people with ID and SUD?

a) How to improve on the current Tactus' systems?

The Tactus systems have a very consistent UI, however, it is not as simple as the target group requires. The amount of text should be decreased and the use of images or videos should be utilized more. Images in the form of a slideshow can help the patients take their time looking through the exercises. Gamification aspects can help make the treatment tool more engaging. For example, the use of an NPC as a tutor can help the patients by guiding them throughout the tool. Another improvement that can add gamification to the systems is an instant reward. However, this reward should be fitting for the tool or treatment so it will not confuse the patients. Finally, a combination of Audio and Text can help the patients read through the text that cannot be excluded from the system.

b) How can CBT help on improving such systems?

CBT already incorporates many gamification aspects in the treatment process. Thus, when CBT principles can be implemented into a system it makes it more engaging and gamified. Firstly, a system that follows CBT principles should have multiple levels or modules since CBT consists of different sessions. With that in mind, the system should also include repetition which helps patients understand and practise the given exercises more. In addition, in CBT exercises the 'applaud factor' is used to encourage patients to continue with their therapy. Similarly, when incorporating this into a system, different rewards can encourage and motivate patients to continue using the system. Finally, CBT exercises look a lot like games that have educational and treatment purposes. Implementing those practises into an online tool can help patients take their time and complete the exercises as many times as they want in their own space and time.

6.3 **Research Question 3:** Was our tool user friendly enough for the participants?

a) How easy was it for the participants to fill in the positive and negative effects forms?

The participants seemed to understand the positive and negative effects of using a substance within our game. The results suggest that the intervention was easy enough for them. Participants noted that the language used in the explanations of the forms was simple and understandable. It appears that Tess's explanations fulfil their purpose, as participants explained in cases they heard the first two sentences and knew exactly what to do. The user interface of the effects forms effectively eased the process of filling them in for the participants. The principles we used, by having spaces between each effect, having icons, and also using big letters, were mentioned positively in the participants' interviews. The results in Section 5.5 suggested that the measures we took were enough to make participants fill in the forms with ease.

b) How different gamification aspects affected the user experience?

This question is split into three sections, which are the three main gamification aspects we used: *i)* NPC; *ii)* Motivational Elements; and *iii)* Audio and Text.

Starting from the NPC section, Tess really affected the users' experience positively. Participants said that her explanations were clear and useful, while also saying that she explained everything they needed. However, Tess's explanations, as one participant noted, were a bit long. Not everything she said was necessary for them to understand what they had to do. Worth mentioning is the fact that one participant recognised that Tess had an artificial voice. This might have affected the users' experience negatively as they called her voice "monotone". Although NPCs affected our participants positively, more attention needs to be paid on the quality of the voice so it sounds realistic enough.

The motivational elements were perceived in a way that we didn't expect. Participants didn't really care about them, with one participant expressing negative feelings about them. Based on the interview with the expert, motivational elements, on one hand, might make the users' experience better when filling in the effects forms, while on the other hand make it feel as if they are used to cover the fact that they are completing a treatment exercise.

Finally, the combination of Text & Audio appeared very beneficial as it gave the participant the freedom to read something in case they struggled with the audio or in case they missed

something. However, no one used the audio buttons, although they all explained that the button is a useful addition. Based on the interview with the expert, the button is indeed a useful functionality as it can benefit the bigger group that cannot read.

In general, the game seemed to offer a user-friendly experience which we aimed for. The participants completed the intervention with no instructions or assistance from their caregivers. The explanations the NPC gave appeared to be enough for them to understand how they can play the game and fill the forms. Although, in some cases the explanations were too long for them. The UI of the positive/negative effects forms was simple and user friendly enough that they filled their effects with ease. The UTAUT results also suggested that it was easy enough for them. However, it is important to take into consideration that the participants were not sure how this game would help them. One participant mentioned that if the game was longer, with repetitive actions, it might have been able to help them but the answer was not definite.

Chapter 7: Discussion

The project aimed to find how gamification can make online treatment tools more accessible and user-friendly for people with ID and SUD. This group faces difficulties when using technology, and while everything is slowly being transferred in a technological environment, they end up being excluded from the benefits of treatment technologies. Our findings can help companies who specialize in people with ID and SUD to improve their treatment systems by using the gamification aspects that we discussed.

We started the research by looking at the two groups individually. Through the literature research we showed that the UI is very important for people with ID and it really affects their experience. Emphasis was given on the appropriate and cautious use of text, only when it is needed. The sentences are important to be spaced out and written using simple language. While it is hard for people with ID to read text, it should not be fully eliminated. Text can be included as subtitles or in explanations. In terms of gamification aspects that are important in this group, the literature did not offer much. One of them is the use of animations such as images, icons and videos but it is important to be used with caution so that they do not distract the users while they are completing tasks. Another important gamification aspect is the use of feedback and reward, which encourages the users to continue using the tool.

On the other hand, the literature presented more gamification aspects than UI aspects that are appealing for people with SUD. The two gamification aspects we mentioned above for people with ID, *animations* and *feedback and reward*, are important for this group too. In addition, for people with SUD, it is also important to use storytelling and role-playing to make the tool more engaging and relatable. Stories that are close to reality can evoke emotions that can teach and help people with SUD, about the negative effects of using a substance.

When looking into the two target groups of the project there were some common aspects that are beneficial for both like simple UI, feedback and reward, animations, and personalization (Figure 2.1). However, there were some factors which are important for ID and SUD individually. For example, attention to text is important for people who have ID but it was not mentioned for people who have SUD. Similarly, storytelling and role playing are very important for people with SUD but they were not mentioned for people with ID. There is a gap in research for people with ID and SUD combined in terms of the right use of technological tools and gamification. Since our target group is people with both ID and SUD we took into consideration all the aspects, even those that were not common for both groups. It is pleasant to see that none of the uncommon

aspects affected the users negatively. Moreover, the attention on the right placement and use of text affected our participants very positively as they expressed that it made the tool easier. In addition, the NPC we used to enhance storytelling and role playing also gathered many positive comments, highlighting its usefulness.

Furthermore, it is important to discuss that the decision we made to not use complexity and challenge has affected the user experience of the tool, as a game, negatively. Participants said it was boring and "a bit childish for their taste". From the literature (Section 2.2), we have found that complexity is important and can be increased gradually to eliminate the possibility of people feeling overwhelmed. Having that in mind in future work complexity should be prioritized.

While evaluating the tool we generally had very positive feedback. Participants found the UI really helpful. One of them even mentioned how the placement of the options and icons was spaced out enough and made the UI clear. This really highlights how important a simple UI is, with minimal text and icons used only when needed. The NPC also gathered positive reactions as it was mentioned as helpful, and the use of text with the NPC's voice was also very beneficial. However, for some of our participants, some explanations that the NPC gave were lengthy for their needs and taste. One participant was only reading what was needed to understand the task and then ignored the NPC completely. This means that our participants did not need a lot of assistance, or that the text we used was indeed very long in some cases. A larger sample size can give a more concrete answer to this question.

One of the conflicting findings we had was how the participants perceived the rewards. Almost none of them cared about the rewards, while one expressed very negative feelings about them, as they did not make sense to them. The reward was used so that it encouraged participants to continue filling their effects. However, from the interviews we conducted with them, nobody appeared to be affected in such a way. One of the reasons that this might have happened was because the game that we presented was small, with only one level. This, however, emphasises that if rewards will be used to make a tool more gamified and engaging, it needs to be made certain that they are something that the participants want and they have a well-defined use in the game.

In Section 3.3.2 we presented two different User's Motivations, with one being the *patient's motivation* and the other the *game's motivation*. It was surprising to see how this might have reflected in the way participants perceived the rewards. Two participants acted more as

patients, as they explained that they felt good because they filled in the positive and negative effects. On the other hand, the other two participants appeared to be commenting on the game, with one justifying that they wanted to continue playing and the other expressing negative feelings towards the rewards by calling them "not useful". It is interesting to observe that there is a difference between a *game* and a *tool with gamification aspects*. It is also interesting to research further on which one is more beneficial for this target group. A larger sample size could give a more defined answer on the User's motivation. In our opinion, if most of the participants appeared to have a *patient's motivation*, where they care more about the treatment tool and completing their therapy exercises, then a *tool with gamification aspects* is more beneficial. However, if most of the participants care more about the tool as a game and want to complete the game to gain more rewards etc. then a *game with* educational and treatment tasks is more useful. The difference between those two cases lies a lot in how the tool will be designed. A *tool with gamification aspects* will not have a lot of rewards or tasks outside the treatment purpose and it will not have an in-game storyline. It will rather use some of the gamification aspects that were found beneficial (such as the use of the NPC). The NPC does not have to have a story, it can just exist to help the users complete the tasks. On the other hand, a *game* will look more like the one we created in this project, but it will have to be longer with more complex tasks and deeper storylines.

Moreover, another unexpected observation was the fact that no participant used the audio button, although they explained that it is a useful feature. Even though it was unexpected, we cannot help but address the bias that might be introduced by our small sample group. In the 'clarification' interview with the expert, it was discussed that our group is quite heterogeneous, and we also have to mention that the study did not include any edge cases of participants. In Section 1.1 we explained that we emphasised on people with mild and moderate ID. The group in the bigger picture contains people with a level of ID who might need this functionality, even though our participants did not. This observation was also named by the expert as a "classic case of more research needed".

Completing the UTAUT was very useful in our case, although we were not able to collect a lot of quantitative data. Participants were able to explain their answers with their own words which gave us a better understanding of how the technology was perceived. It was highly pleasing to see that most of the replies were positive, especially mentioning how easy the tool was to use. However, most of the participants were unsure of how the tool will help them with their therapy. This, in our opinion, is correlated to the question we set earlier, *game* vs. a *tool with gamification aspects*. Maybe, one reason for the participants' uncertainty is because they did not think a *game*

is useful in this case, but rather a *tool that uses some gamification aspects.*

Finally, because of the small sample size of our evaluation, we cannot draw any significant conclusions on how long the participants needed to complete the forms. One remark is that the majority of our participants needed less time to complete the negative effects than the positive effects. However, one participant had an increase in the time they needed to complete the negative effects. We have multiple theories while this occurred. For example, maybe the reason their time decreased was because they got accustomed to the UI of the tool. Moreover, maybe most of them know their negative effects better than the positive, and one participant took more time to make sure of theirs. With such a small sample size we cannot draw any conclusions, and more research with a wider sample group can give a more defined answer.

Chapter 8: Limitations

The most important limitation of our study, in my opinion, is the very small sample size. The quantitative data are not reliable and resourceful as we didn't have enough participants. In the same way, because we didn't have enough participants we ended up having participants that were educated enough that we could have a conversation in their non-native language. This does not cover the realistic and holistic perspective of people with ID and SUD. Having that in mind, a limitation of our study was the fact that the researcher did not speak Dutch, so the participants had to speak English or have a translator with them to help them.

In addition, another limitation in the prototype was the fact that the NPC characters had an artificial text-to-speech voice. Because of our lack of knowledge of Dutch and the COVID-19 regulations we did not have the opportunity to record a native Dutch speaker. The artificial voice might have affected the user experience as one of the participants called the voice "monotone".

Moreover, the fact that the study had to be conducted in a virtual environment and not physically in the participants' working space is a limitation for our target group. Online technologies are not as easy for our participants to use. Having the introduction of the study, the game and the interview in an online environment might have affected the participants negatively.

Finally, some gamification and UI aspects we excluded from our project are considered a limitation as they could have affected the user experience positively. Complexity could have made the game more interesting and make the rewards, the character's scores and items, more relatable in the game.

Chapter 9: Future work

As mentioned earlier, people with ID and SUD are a very heterogeneous and large group, therefore our sample size of 4 participants and 1 expert is not a reliable representation. A study with a larger sample size can give more insights on gamification and UI aspects that benefit the target group. Future studies would also benefit if the participants did not know English. Knowing a second language can be considered as an additional significant skill for people with ID and SUD, as adults with ID do not always have the option of benefitting from a higher and post-secondary education (Piazzoli & Kubiak., 2019). It is important for studies for people with disabilities to be more inclusive and make sure that people from all backgrounds and situations are taken into consideration. The same applies to the sample size of expert participants.

In addition, it would be beneficial if the game is developed until its final stage as we explained in Section 3.3. More levels can be implemented to ensure that all the modules of the workbook are included. Furthermore, the findings and aspects that were excluded in Section 3.2 can be added within those levels. For example, it would be important to analyse how challenge and complexity can affect user experience. Taking into consideration Tsikinas & Xinogalos (2020), the complexity of the game can increase gradually at each level, and in that way, it might not be too overwhelming or too boring for the users. Moreover, another aspect we excluded from our study, that should be included in future work, is personalization. Personalization in this case comes with a lot of attention for security and ethics, as it is very connected with private data like health records, healthy and unhealthy habits, etc. However, personalization can make the experience more meaningful and helpful for the participants.

Furthermore, in the expansion of the game more gamification properties can be included, with lots of different characters with deeper storylines and more time for conversation. This aspect will make storytelling and role-playing more immersive and this might make the game more interesting. In addition, in-depth research of the concept of using gamification aspects in a tool versus having a complete game could be investigated. This suggestion can clarify their differences and the potential use cases for each of them.

Finally, accessibility is very important. Taking into consideration all the feedback we have gathered from our study we believe that it is important to make the game available for different operating systems, such as macOS and Linux.

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Appendix A: Related Work

A.1 Gamification aspects for people with Intellectual Disability

Gamification Title	Reference
Immersion	Tsikinas & Xinogalos, 2020
Not First Shooter	Terras et al., 2018
Single Player	Larsson-Berge, 2019; Sitbon & Farhin, 2017.
Feedback	Tsikinas & Xinogalos, 2020 ; Larsson-Berge, 2019
Computer Games	Tsikinas & Xinogalos, 2019
Reward	Tsikinas & Xinogalos, 2020
Engagement	Sitbon & Farhin, 2017
Motivation	Tsikinas & Xinogalos, 2020

A.2 User Interface Aspects for people with Intellectual Disability

UI Title	References
Audio and Text at the same time	Sitbon & Farhin, 2017; Tsikinas & Xinogalos, 2020
No search bars	Derome, 2019
Short and simple language	Derome, 2019
Use of symbols, images	Terras et al., 2018
Not too many animations and pop-ups	Derome, 2019
Practicality	Sitbon & Farhin, 2017
Personalization	Terras et al., 2018 ; Tsikinas & Xinogalos, 2020
Subtitles in all languages (optional for users)	Ellis & Kao, 2019
Clear line separation	Ellis & Kao, 2019
Colour-coded text	Ellis & Kao, 2019
Simple Interface	Tsikinas & Xinogalos, 2020

A.3 Gamification Aspects for people with Substance Use Disorder

Gamification Title	References
Single Player Games	Hong et al., 2020
Web-based Games	Hong et al., 2020
Roleplaying	Hong et al., 2020
Story Telling	Vilardaga et al., 2018; Hong et al., 2020
Engagement	Vilardaga et al., 2018
Enjoyment	Hong et al., 2020
Motivational elements	Boendermaker et al., 2015
Reward	Vilardaga et al., 2018; Boendermarker et al., 2015
Decision making	Hong et al., 2020
Interactive Quizzes	Vilardaga et al., 2018
Intrinsic motivation	Boendermaker et al., 2015

A.4 User Interface Aspects for people with Substance Use Disorder

UI Title	References
Auditory/Animation Feedback	Vilardaga et al., 2018; Boendermaker et al., 2015
Personalization	Vilardaga et al., 2018
Neutral Colours	Vilardaga et al., 2018

A.5 Complexity Characteristics for games for people with Intellectual Disability

Complexity Characteristics	References
Contextual Influence	Terras et al., 2018; Westera et al., 2008
Gradual Increase of difficulty	Tsikinas & Xinogalos, 2020
Emergent Complexity	Westera et al., 2008
Environment	Westera et al., 2008
Changes in the game	Westera et al., 2008
Solvable tasks	Larrson- Berge, 2019
Difficulty is necessary	Ellis & Kao, 2019; Larrson- Berge, 2019
Accessible UI	Tsikinas & Xinogalos, 2020; Terras et al., 2018
Feedback	Tsikinas & Xinogalos, 2020; Westera et al., 2008
Controlled Complexity	Westera et al., 2008
Agent Number	Westera et al., 2008
Credibility	Westera et al., 2008

A.6 Common aspects in the target group

Common Aspects	References
Single Player	Larrson-Berge, 2019; Sitbon & Farhin, 2017; Hong et al., 2020
Computer game	Tsikinas & Xinogalos, 2019; Hong et al., 2020
Engagement	Sitbon & Farhin, 2017; Vilardaga et al., 2018
Motivation	Tsikinas & Xinogalos, 2020; Boendermaker et al., 2015
Reward	Tsikinas & Xinogalos, 2019; Vilardaga et al., 2018; Boendermaker et al., 2015
Personalization	Terras et al., 2018; Tsikinas & Xinogalos, 2020; Vilardaga et al., 2018
Feedback	Tsikinas & Xinogalos, 2020; Sitbon & Farhin, 2017; Vilardaga et al., 2018; Boendermaker et al., 2015

A.7 Clients Workbook Modules

Number	Dutch	English
1	Voordelen en nadelen	Advantages and disadvantages
2	Top 3 Voordelen en nadelen	Top 3 Advantages and Disadvantages
3	Doelen Stellen Alcohol	Setting Goal Alcohol
3	Tussendoelen	Intermediate goals
3	Doelen Stellen Drugs	Setting Goal Drugs
3	Tussendoelen	Intermediate goals
3	Doelen Stellen Gokken	Setting Goal Gambling
3	Tussendoelen	Intermediate goals
3	Doelen Stellen Roken	Setting Goal Smoking
3	Tussendoelen	Intermediate goals
4	Mijn andere doelen	My other goals
5	Mijn risicosituaties	My risk situations
6	Jezelf belonen	Reward yourself
7	Tips om te stoppen of te minderen	Tips to stop or reduce

8	Gewoontes	Habits
9	Mijn gewoontes met gebruik	My habits with use
10	Gewoontes veranderen	Changing habits
11	Trek	Craving
12	Trek	Craving
13	Trek meten	Measuring pull
14	Nee-zeggen	Say no
15	Verschillende manieren om nee te zeggen	Different ways to say no
16	Thuis nee-zeggen	Say no at home
17	Gebruiksoverzicht van -	Usage overview of -
18	Hoe ver nog?	How far away?
19	Smoesjes	Excuses
20	Andere gedachten	Other thoughts
21	Anders denken en anders doen	Think differently and act differently
22	Anders denken en anders doen	Think differently and act differently
23	Anders denken en anders doen	Think differently and act differently
24	Uitglijders	A short deviation from planned abstinence
25	Geheugenkaartje	Memory card
26	Mijn plan	My plan
27	Gebruiksgrafiek	Usage Chart
28	Wie staat waar?	Who is where?
29	Beste Helpers	Dear Helpers

Appendix B: Interviews

B.1 Interview with Experts from Tactus and Minddistrict Questions

Treatment

- How many **different Cognitive Behavioural Treatment principles** did you use while designing your tool?
- Have you ever considered **making a gamified version of CBT**?
- Have you ever **come across a gamified CBT approach**?
- We know that CBT contains **multiple sessions**. How does the user interface change in different sessions?

User Interface

- Is it possible to do more on the tool, currently?
- Why do the videos need to be converted?
- What elements did you use in the current tool that will **keep users more engaged** and **eager to use the tool again**?
- Which do you think is more effective, when it comes to **teaching people skills that will assist them in quitting a substance**: A series of images (like a slideshow) with audio on every image or A video?
- It was observed that **storytelling and role-playing** in Serious Gaming help people with addiction to understand better an example of substance misuse as it can evoke emotions. How did you implement this in your online treatment tool?

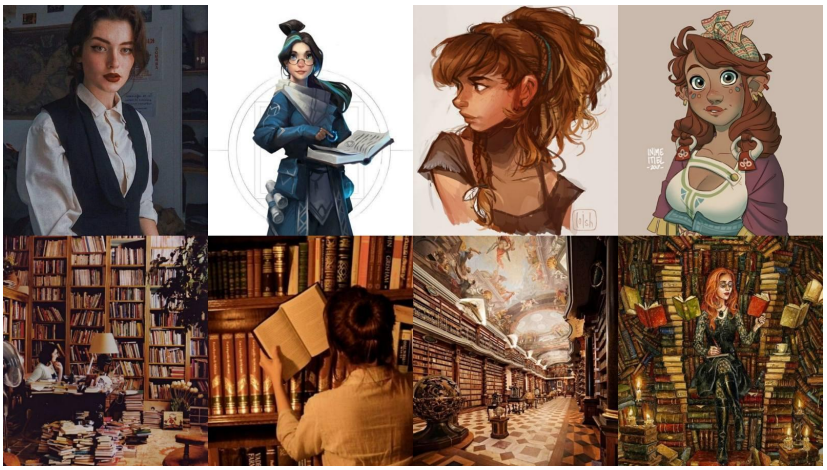
Low Literacy

- Are you open to making changes to the current tool to fit people with low literacy?
- Is there **a list of changes** that you made in the interface to make it accessible for people with low literacy?
- What are the most **important aspects of treatment tools for people with low literacy**, in your opinion?
- Do you think there are **some UI elements or treatment methods** that are **used for people with Substance Use disorder** that are **not effective** with people with **low literacy?**

Appendix C: Design

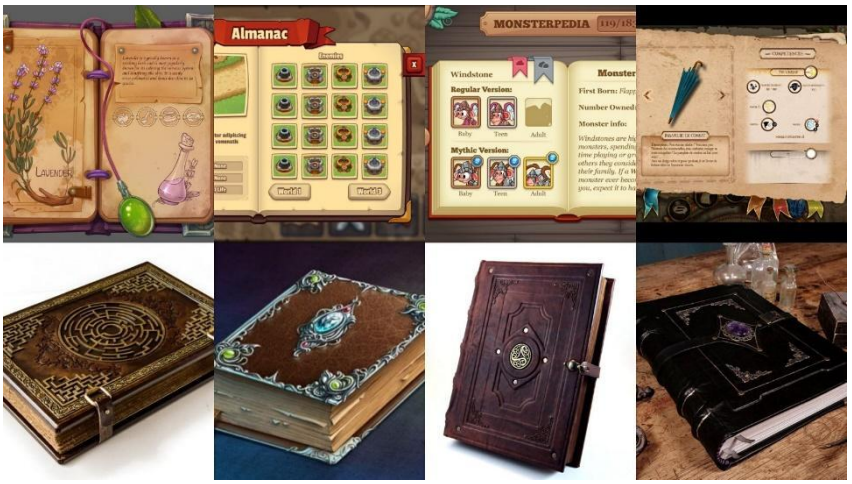
C.1 Character Inspiration

C.1.1 NPC: Tess



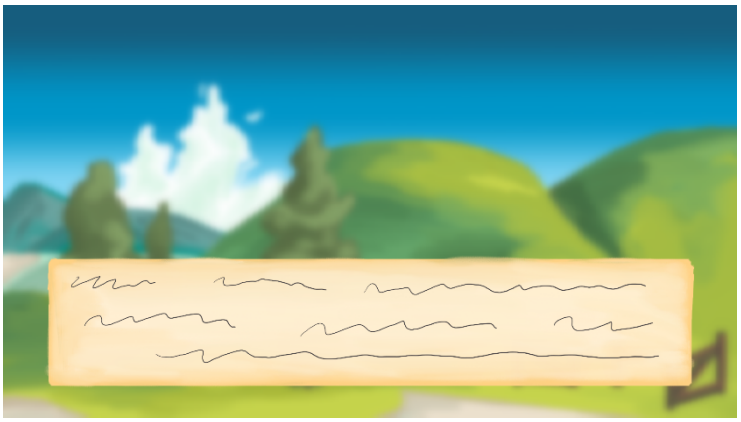
C.1.2 NPC: Luther

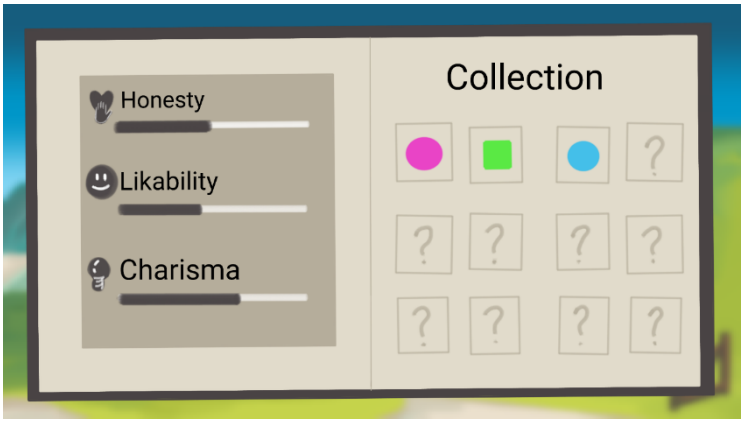
C.1.3 Book

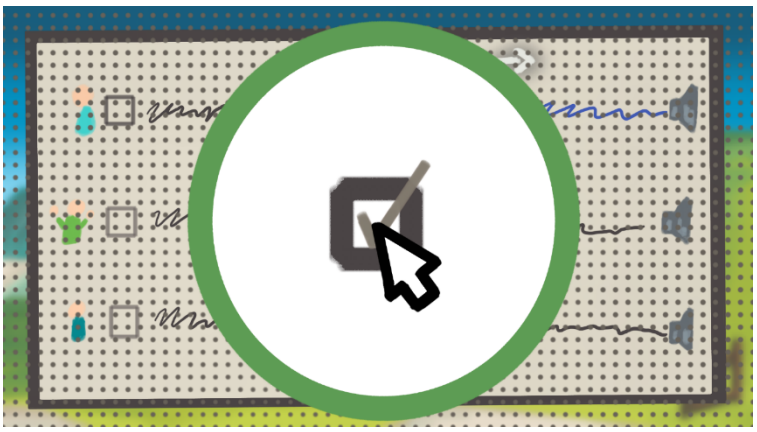


C.2 Throw-Away Prototype

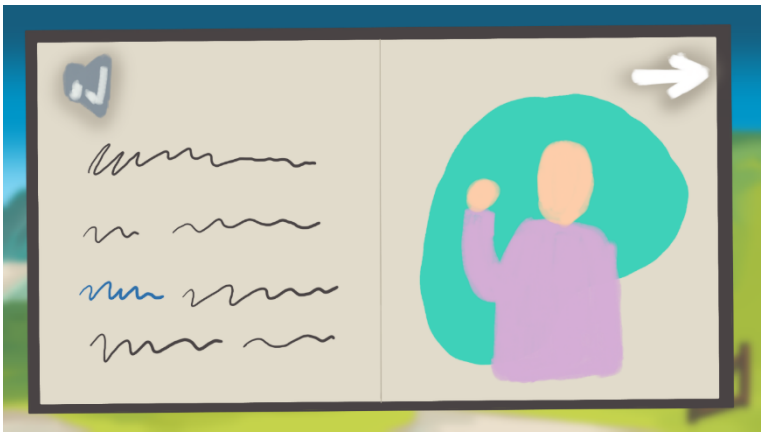
C.2.1 Introduction





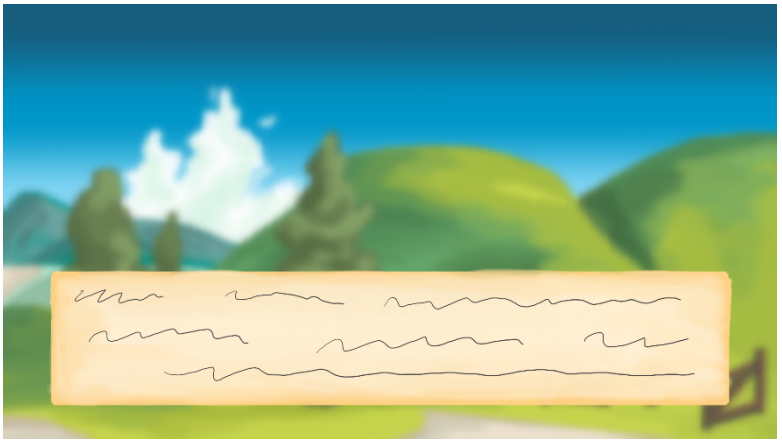


C.2.2 Phase 1



C.2.3 Phase 2

C.2.4 Outro



C.3 Game Interface Design

C.3.1 General Background

C.3.2 Tess Introducing the Book

C.4 Positive/ Negative Effects relevant icons

C.4.1 Icons for Positive Effects

Icon	English	Dutch
	I am less gloomy	Ik ben minder somber
	I am more creative	Ik ben creatiever
	I am trembling less	Ik tril minder
	I belong more	ik hoor er meer bij
	I can drive better	Ik kan beter rijden
	I can make love easier	Ik kan de liefde makkelijker maken
	I can relax better	Ik kan beter ontspannen
	I can sleep better	Ik kan beter slapen

	I can win a lot of money	Ik kan veel geld winnen
	I feel more attractive	Ik voel me aantrekkelijker
	I get more energy	Ik krijg meer energie
	I have less bad memories	Ik heb minder slechte herinneringen
	I have less illness	Ik ben minder ziek
	I have less thoughts of suicide	Ik heb minder gedachten aan zelfmoord
	I like myself better	Ik vind mezelf leuker
	I talk more easily to others	Ik praat gemakkelijker met anderen
	It helps me act tough	Het helpt me om stoer te doen
	It's fun at a party	Op een feestje is het leuk

C.4.2 Icons for Negative Effects

Icon	English	Dutch
	Concentrating takes more effort	Concentreren kost meer moeite
	I eat worse	Ik eet slechter
	I gets me in trouble with the police	Ik krijg problemen met de politie
	I hear voices	Ik hoor stemmen
	I lose friends and family	Ik verlies vrienden en familie
	I see things that are not really there	Ik zie dingen die er niet echt zijn
	I take care of my household worse	Ik zorg slechter voor mijn huishouden
	It puts me in money trouble	Het brengt me in geldproblemen
	Things are not going so well at school	Het gaat niet zo goed op school
	Friends criticise it	Vrienden bekritiseren het
	I'm embarrassed	Ik schaam me
	I do things I shouldn't	Ik doe dingen die ik niet zou moeten doen
	I feel sad more easily	Ik voel me sneller verdrietig
	I fight more often	Ik vecht vaker
	I get angry more quickly if I have used	Ik word sneller boos als ik heb gebruikt
	I get less fit	Ik word minder fit
	I sleep poorly	Ik slaap slecht

	I take care of myself worse	Ik zorg slechter voor mezelf

Appendix D: Development of the Online Tool

D.1 Game Flow

To develop the game we used Unity because it is a well-known free-to-use game engine that has a well-established infrastructure for building 2D games. Unity also gave us the ability to import our own assets and customize the game as we wanted. The designs we made in the Designing phase were exported as ".png" files and we were able to import them in Unity and immediately use them.

D.1.1 Data Collection

For the game, we also created a database. Even though the game is a short experience, it was necessary to collect data and conduct the studies remotely. Therefore the use of a locally hosted database was mandatory. The initial idea for collecting data was to record any information in text files and request from the users to send those files. This was not a viable solution since it would introduce complex tasks for the users and make the study experience even harder for them.

The database is called "online_treatment_tool" and it contains two tables, "user" and "pages". The structure of the tables is the following:

Field name	Data Type	Key	Explanation
id	Int	Primary	An auto increment number for every time we have a new user
Username	Varchar	-	"u" + id
advantages	Varchar	-	The responses in the positive effects in Phase 1
disadvantages	Varchar	-	The responses in the negative effects in Phase 1
clickAudio	Int	-	A click counter for the audio buttons
date	Date	-	The date the played the game

Table D.1 Users Table in Database

Field name	Data Type	Key	Explanation
ID	Int	Primary	An auto increment number
userID	Int	Foreign	A foreign key from the user table
timeAdv1	Int	-	The time the user needed to complete the positive effects in Phase1
timeAdv2	Int	-	The time the user needed to complete the positive effects in Phase1
timeAdv3	Int	-	The time the user needed to complete the positive effects in Phase2
timeDis1	Int	-	The time the user needed to complete the negative effects in Phase1
timeDis2	Int	-	The time the user needed to complete the negative effects in Phase1
timeDis3	Int	-	The time the user needed to complete the negative effects in Phase2

Table D.2 Page Table in Database

The data are stored in the database just when the users finish the first level. As the game progresses the information is being stored in two objects in the game. One for the users and one for the pages. Those objects exist while one session of the game is playing. As soon as the game closes all the information stored in the objects is deleted from memory. That is why we need to store them in the database before the game ends. Another solution would be to execute calls to the server to add information to the database every time we have new information to store. But, this can be a resource- and time-consuming task for the game and the network of the user.

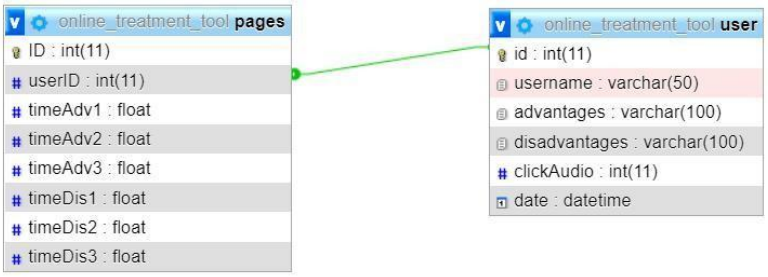


Figure D. 1 Database Table Relation Representation

D.2 Game Characteristics

D.2.1 Non-Playable Character

The NPCs had a very simple interactive design. After creating their appearance which is also a ".png" picture and planning what they were going to say, the only thing that was left was the audio. As we will have no movement from the NPCs their voice should be believable. The game would be in Dutch and as I do not speak Dutch I could not voice the characters. However, I found a free text to speech website that has different voices that can voice Dutch text. The application is called "Voicebooking[3]". This application gave us a lot of freedom that different other applications we used before did not. It has four different settings. You can select the language you want the text and audio to be in. For Dutch, it provides five options, two male and three female. For Tess we chose "5. FEMALE" and for Luther, we chose "2. MALE". To make our selection we tried hearing the introduction script for each character and see which voice fitted them best. For Tess, the decision was a bit hard as the first option (3. FEMALE) and the third option (5. FEMALE) fit the character we designed very well. After trying more sentences we choose "5. FEMALE" as it sounded more enthusiastic. On the other hand for Luther, the selection was quite easy, as the first voice (1. MALE) appeared a bit younger in comparison with the second voice (2. MALE) and in comparison with the image, we designed for Luther. The next

[3] https://www.voicebooking.com/en/free-voice-over-generator

setting that the application provided was “Speed”. For both of the characters, we slowed down the audio. This made the voice have a bit of a gap between each word. It was easier for me, who does not speak Dutch, to understand a bit what the characters are saying but it also made us feel comfortable that our audio will not be too fast and too overwhelming for the users. The final set from the application was “Pitch”, but we didn’t change it and left it in its initial state. When we were done with our text we clicked “Play” to listen to it and ensure that the sentences sound good and normal and then downloaded the audio by clicking the button “Download”.

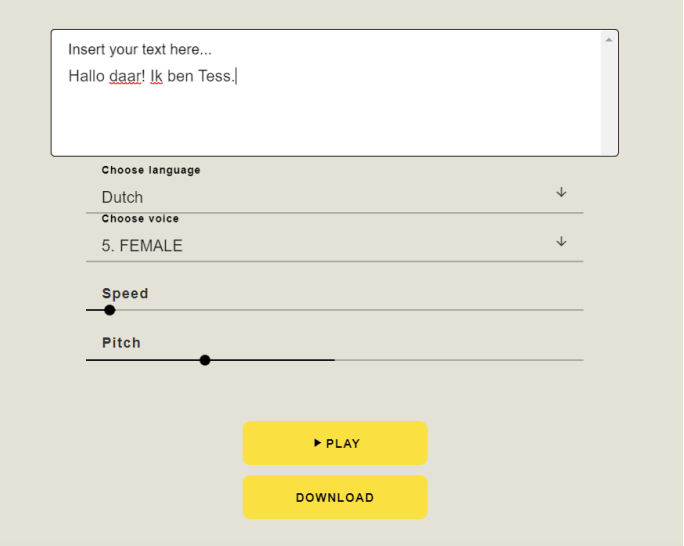


Figure D. 2 VoiceBooking Interface

We created different audios so that the audio will represent what is presented on the dialogue box at each time. When the users click the given arrow after each dialogue segment, the next piece of text would appear and the corresponding audio would play. In addition, we also turned from text to speech all the positive and negative effects using Tess’s voice.

D.2.2 Book

The book has a very simple design, beige pages, and brown cover, however, we wanted to also have the functionality for the pages to turn. We found a free asset called “2D Book Page Curl using native 2D UI tools[4]” in the Unity Asset Store. This asset gave us the ability to have a 2D flat book and also be able to turn its pages from right to left, scale up and down so that we adjust it to our screen, and also auto flip pages.

This book came with a set of pages, but for our book, we made our own beige pages with shading on the corner which we then imported as assets into the book. As the book turns you

[4] https://assetstore.unity.com/packages/tools/animation/book-page-curl-55588

can define the order in which it can turn so we made one left and one right page and then we placed them alternately. The difference between these two pages is the spot where the shadow hits so that it doesn't look as flat. The book was placed as a component in front of the background. From the settings provided by Unity, we made the background a bit darker than before so that it will not be distracting and the users can focus on the book. While the game progresses we created all the components and placed them in front of the book and in that way the book works as a canvas and background for the buttons and text. Finally, the only functionality we used from the open-source asset was the auto flip. Every time the users click on the arrow on the right side, the content of the book disappears and we auto-flip to the right page of the book. To achieve the auto-flip we used a function called "FlipRightPage" that the asset we used provided us. When the page is almost fully turned we present the new content on the book.

D.3 Game Interface

To organise our development in a consistent way we created a scene on Unity for each game phase, except for the introduction. The introduction phase had two scenes on Unity, one with Tess talking to the user and one with the book open. For each scene, we created a corresponding code script that was responsible for the back-end and functionalities of the game. An extra script was created to make the arrows functional and it was connected with almost all the scenes. Finally, as we mentioned in Section D.1.1 we also collected the time the users needed to complete each form. As soon as the users opened the page with the form, a timer started counting and when they clicked the arrow to continue the timer stopped and the value was saved in the object Pages.

D.3.1 Introduction

The introduction phase starts slowly as it is the first interaction of the user with the game. The interface slowly fades in, from black to the content. We placed a timer of 2 seconds from the moment the content of the game appeared so that the audio of Tess will start to achieve a smooth transition. The first scene of the Introduction is called "IntroScene- NPC" as only Tess will appear. The users can click on the arrow as soon as they feel comfortable letting Tess continue with the text. When the arrow is clicked we have a click counter increase and the button disappears. The reason we remove the button from view is to ensure that the user will never double click. The counter is used to determine which is the next step that should appear in the introduction scene. There are several introductory texts that Tess is saying. In the first 4 clicks, the only thing that is changing is the text inside the dialogue box and Tess' audio file. Then, when Tess is presenting the book for the first time, an image of the book appears. To do so, we check when the click counter is equal to 5 and change the book's visibility to true. Similarly, when the content of the book changes, we make the arrow visible again, so that users can click it

and proceed to the next step.

By having a click counter we also know when we can change the scene after Tess shows the book. The interface of the next scene is the "Book Scene", which we mentioned in Section 4.3. In these two pages, the users cannot interact with the content of the book. Users are not able to interact with the progress bars and they can proceed to the next step by clicking the arrow on the right page of the book. When said arrow is clicked, the auto flip functionality is used and the current content of the book disappears. The content of the next pages will be the storage of the game. In this page the users can only see the items and click the arrow to continue. The final task in the Introduction phase is the training for how to use the different buttons that users can interact with. After each explanation, we have a timer of two seconds to ensure that the users understand everything and then 1 second for Tess' audio to start. After this is done then the arrow is made visible again. The final step in this Phase is to change the scene to the Phase1 Scene.

D.3.2 Phase 1

As we explained in Section 4.3.2, Phase One consists of different sections but we have mainly three: *i)* the positive/negative effects form; *ii)* the explanation, and *iii)* the rewards.

Starting from the positive/negative effects forms, when it comes to the development, they work in the same way. As the content of the pages appears, Tess starts to talk. The users can start interacting with the content of the pages immediately. When the users click on the audio icon, a function is immediately triggered to play the audio. Each audio icon is connected to prerecorded audio. We recorded and downloaded the audios for each option in the same way as we did for the audio of Tess in Section D.2.1. In addition, every time the user clicks an audio icon, a counter is increased. We want to use this counter to analyse the usefulness of the audio functionality. To select the options they can click on the checkboxes. When the users click the arrow on the right page of the book, the options that were checked are saved in an object in the code. The responses that the user gives are not saved as a complete text but rather one string with numbers. The reason we did that is to ensure that their responses are encrypted. The numbers represent the corresponding position of the response on the screen. We have two string variables where we store the responses. One variable for the positive responses and one for the negative. Each option is separated with a ";" and then each form is separated with a "|". For example, one value for the positive variable is "1;2;3;|3;4;|" which means that the user selected the first, second, and third options for the first positive form and the third and fourth for the second positive form.

When the arrow is clicked in Phase 1 the content of the current pages disappears, the page auto

flips and the new content appears. There is a timer of 1 second before Tess starts talking again. The explanation pages are not interactable. Tess' audio starts and the users can also see the text in the dialogue box. When they want to continue they can click the arrow for the page to flip.

Finally, the same applies to the reward pages, they are not interactable. The users get to see what kind of reward they gained. They cannot interact with the progress bars or the items in the inventory. When they feel comfortable to continue they can click the arrow and the page changes.

D.3.3 Phase 2

Phase 2 starts with a summary of the responses the user gave in Phase 1. On the left, the user can see some positive effects they chose, and on the right some negative.

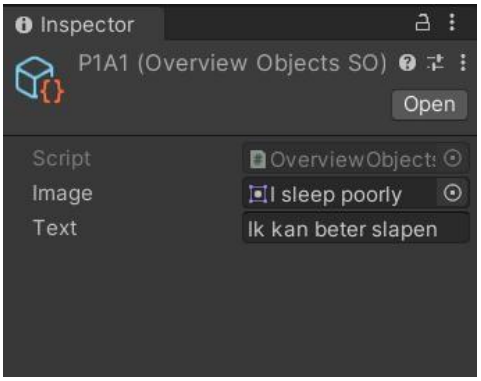


Figure D. 3 Object for the first positive option in Phase 1

In Unity, we created an object for each option. This object contains the text of the option and its representing icon. The title of each object represents the order in which it appears in the form, for example, if the title is "P1A3", it means that the option is the third in the first positive form (Part 1 Advantages 3). Having these objects can help us connect the responses the users gave in Phase 1 with the options. To find the right objects we first split the string only where there is a "|". In this way, we have two new strings, each one representing one form. For each new string, we split it where there is a ";" and we have multiple numbers. Finally, we take those numbers and make our string that represents the Object. We use that string to present the Objects in the right place.

For example:

Positive Responses: "1;2;3;|3;4;|"

First, split:

Positive 1: "1;2;3;"

Positive 2: “3;4;”

Second split:

Positive 1 Responses and their Objects :

‘1’: “P1A1”

‘2’: “P1A2”

‘3’: “P1A3”

Positive 2 Responses and their Objects:

‘3’: “P2A3”

‘4’: “P2A4”

Each book page presents a maximum of four options. However, we expect that there will be cases when we will have more or less than four selected responses for the positive or negative effects. For these cases, we made different algorithms to select what to show on the screen. After we split the two strings the second time, we sum up the length of each string to find out how many responses we have.

- For the case where we will have exactly four selected options then we will find their objects and present them all.
- For the case where we will have less than four selected options on positive or negative, we will present exactly those options. For example, if the users selected only three positive options then on the left page there will be only three selected positive options.
- For the case where the users selected more than four options, we will randomly select four of them.

On this screen, the users can click the arrow on the right to continue when they feel comfortable. The next two sections are a positive form and a negative form. These forms work in the same way as in Phase 1, with the difference that when the users click the arrow we do not collect their responses. In the future when more features and levels will be added the responses will be collected here too. However, for the current prototype it is not necessary as we will not present another summary and we will not use the data in another way.

When the users finish filling their negative form and can click the next arrow, the book disappears. Only the background remains visible and Tess says to the user that someone wants to trade. After two seconds, the interface will change to the “NPC scene” structure and Luther will ask the user if they want to trade something. Luther is developed in the same way as Tess is, and after a one-second timer, the audio with his voice plays. When the users click the arrow, Luther disappears and Tess appears with two new buttons (as described in Section 4.3.3). Tess

is asking the user to make a choice. When the users click a button it is automatically disabled to ensure that the users will not double click it and the interface changes as we explain in Section D.3.1.

The same thing applies when the users are asked to select which item they want. When an item is clicked, all items are made non-interactable to avoid accidental double clicks. Each item has its own function and when the users click one, its corresponding function is called which contains the right reply that Luther will give. In Figure 3.11 you can see how the response differs depending on the selected item.

After this interaction, the scene changes to the Outro.

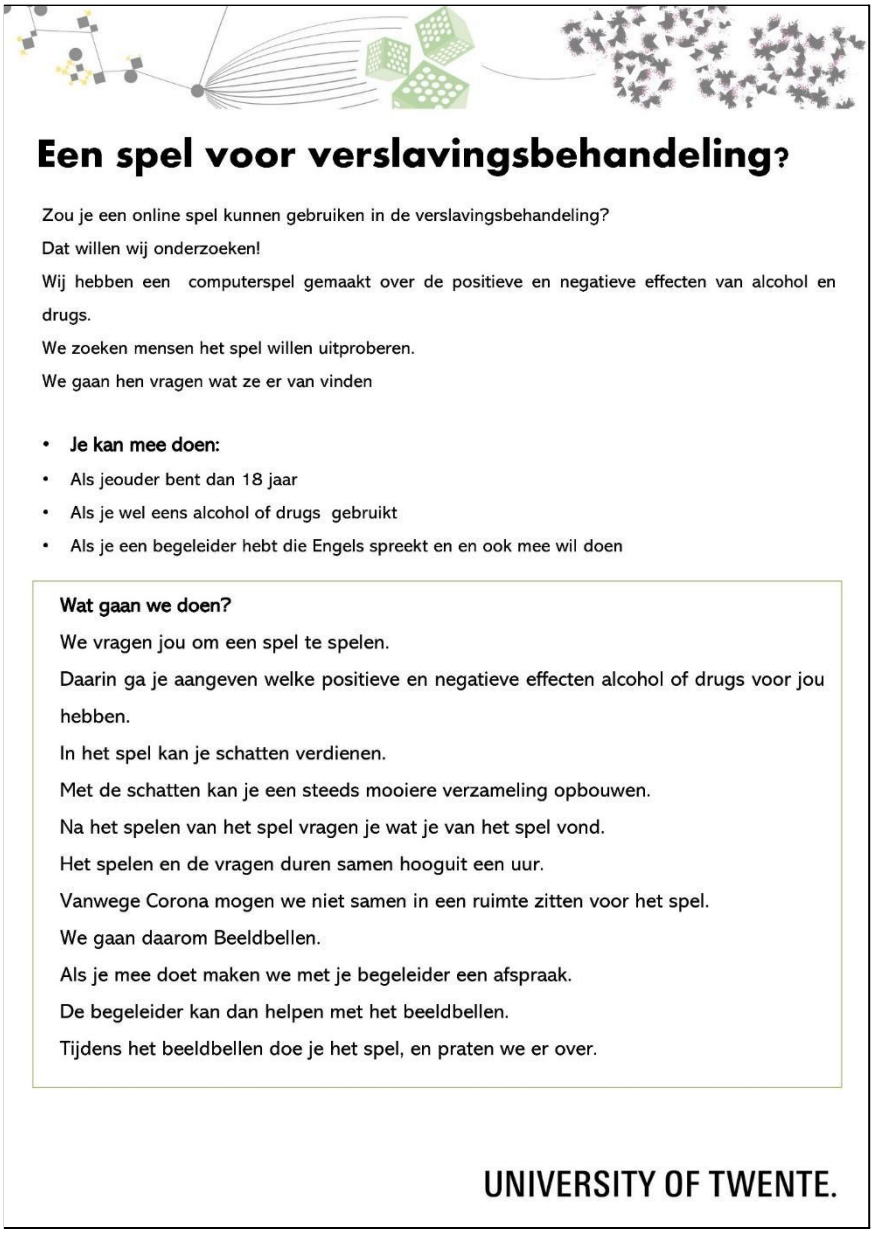
D.3.4 Outro

There is not a lot of interaction in the outro scene. When the scene changes there is a timer for Tess' audio to start. The user can click the button "Volgende"/ "Next" to continue. As soon as they do that the information collected in the object "Users" and "Pages" are stored in a local database. Finally, the interface turns to the "NPC scene" where Tess thanks the users and the background fades to black and the game ends.

Appendix E: Evaluation

E.1 Informational Brochure

E.1.1 Dutch



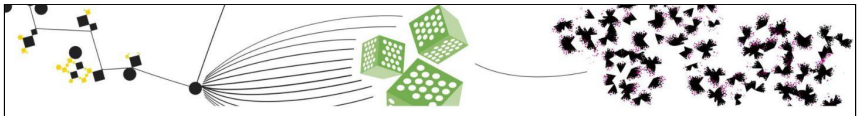
Een spel voor verslavingsbehandeling?

Zou je een online spel kunnen gebruiken in de verslavingsbehandeling?
Dat willen wij onderzoeken!
Wij hebben een computerspel gemaakt over de positieve en negatieve effecten van alcohol en drugs.
We zoeken mensen het spel willen uitproberen.
We gaan hen vragen wat ze er van vinden

- **Je kan mee doen:**
- Als jeouder bent dan 18 jaar
- Als je wel eens alcohol of drugs gebruikt
- Als je een begeleider hebt die Engels spreekt en en ook mee wil doen

Wat gaan we doen?
We vragen jou om een spel te spelen.
Daarin ga je aangeven welke positieve en negatieve effecten alcohol of drugs voor jou hebben.
In het spel kan je schatten verdienen.
Met de schatten kan je een steeds mooiere verzameling opbouwen.
Na het spelen van het spel vragen je wat je van het spel vond.
Het spelen en de vragen duren samen hooguit een uur.
Vanwege Corona mogen we niet samen in een ruimte zitten voor het spel.
We gaan daarom Beeldbellen.
Als je mee doet maken we met je begeleider een afspraak.
De begeleider kan dan helpen met het beeldbellen.
Tijdens het beeldbellen doe je het spel, en praten we er over.

UNIVERSITY OF TWENTE.



We nemen dat op video op Zo kunnen we het later nog eens nakijken, en aantekeningen maken.
De opnames zelf wissen we daar na.
De begeleider is er om jou en ons te helpen in het onderzoek Bijvoorbeeld met het beeldbellen.
En met het vertalen van Nederlands naar Engels, en andersom.
We gaan geen vragen aan de begeleider stellen.

We willen graag weten wat jij van het spel vindt.
We willen ook weten hoe oud je bent.
Andere persoonlijke gegevens worden niet opgeslagen.

Van het onderzoek komt een verslag.
Daar komen géén namen in.
Niemand weet dus wie er mee heeft gedaan, alleen de onderzoeker.

Wil je meedoen?

Meedoen is vrijwillig
Als je niet wil, is dat prima
Als je mee doet kan je altijd stoppen als je dat wil
Als je na het beeldbellen toch niet wil dat we jouw gegevens gebruiken, moet je dat binnen een dag laten weten.

Contacteer de onderzoeker:
Antrea Chrysanthou
a.chrysanthou@student.utwemte.nl

Contacteer de Ethische commissie:
Drs. P. De Willigen
ethicscommitee-cis@utwente.nl
Building: Ziverling 1051.
Drienerlolaan 5, 7522 NB Enschede

(Voor vragen, klachten of opmerkingen over het onderzoek.)

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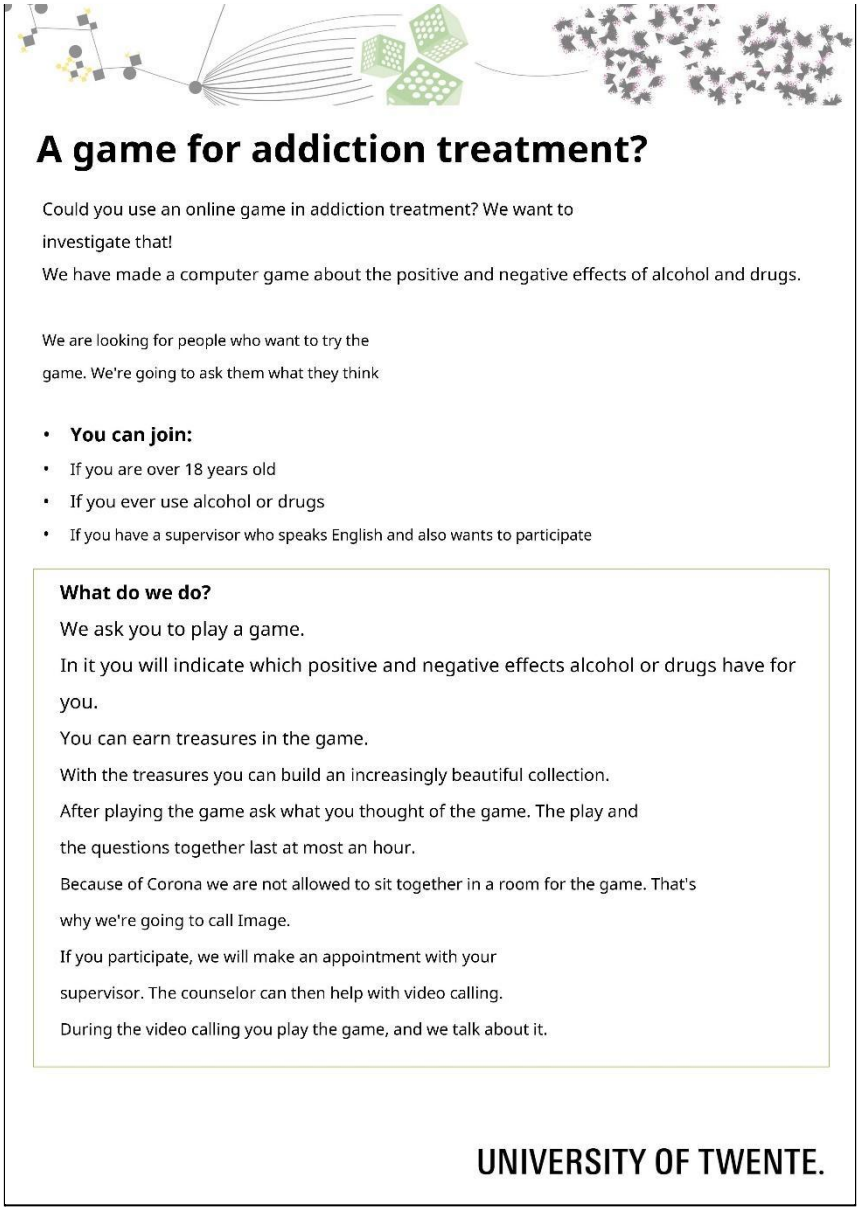
E.1.2 English



A game for addiction treatment?

Could you use an online game in addiction treatment? We want to investigate that!
We have made a computer game about the positive and negative effects of alcohol and drugs.

We are looking for people who want to try the game. We're going to ask them what they think

- **You can join:**
- If you are over 18 years old
- If you ever use alcohol or drugs
- If you have a supervisor who speaks English and also wants to participate

What do we do?

We ask you to play a game.
In it you will indicate which positive and negative effects alcohol or drugs have for you.
You can earn treasures in the game.
With the treasures you can build an increasingly beautiful collection.
After playing the game ask what you thought of the game. The play and the questions together last at most an hour.
Because of Corona we are not allowed to sit together in a room for the game. That's why we're going to call Image.
If you participate, we will make an appointment with your supervisor. The counselor can then help with video calling.
During the video calling you play the game, and we talk about it.

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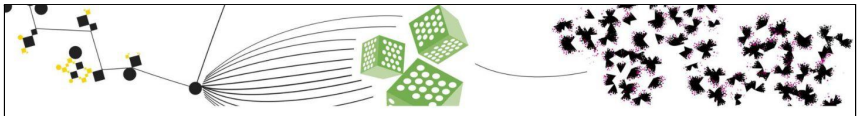


We'll record that on video so we can check it again later, and take notes. We then delete the recordings themselves.
The supervisor is there to help you and us in the investigation. For example with video calling. And with the translation from Dutch to English, and vice versa.
We will not ask questions to the supervisor.

We would like to know what you think of the game.
We also want to know how old you are.
Other personal data is not stored.

A report will be issued of the
investigation. There are no names in it.
So no one knows who did it, only the researcher.

Do you want to join?

Participation is voluntary
If you don't want to, that's fine
You can always stop if you want to
If you do not want us to use your data after the video call, you must do so within a day let you know.

Contact the researcher:
Antrea Chrysanthemum
a.chrysanthou@student.utwemte.nl

Contact the Ethics Committee:
drs. P. De Willigen
ethicscommitee-cis@utwente.nl
Building: Silvering 1051.
Drienerlolaan 5, 7522 NB Enschede

(For questions, complaints or comments about the study.)

UNIVERSITY OF TWENTE.

E.2 Evaluation Presentation

E.2.1 Introduction & Consent

Hello! I'm Antrea. I do not speak Dutch so I will speak in English.	Hallo! Ik ben Antrea. Ik spreek geen Nederlands, dus ik zal in het Engels spreken.
Do you want to introduce yourselves?	Wilt je zich voorstellen?
I would really appreciate it if the caregiver would also translate what I say in Dutch! Or read out loud the text on the right.	Ik zou het echter erg waarderen als de begeleider wat ik zeg ook in het Nederlands vertaalt! Of lees de tekst rechts voor.
I will stop after each paragraph, so you can translate. If necessary.	Ik stop na elke alinea, zodat je kunt vertalen.

I would like to start by thanking you for participating.

With this research, we want to find ways to make online treatment more accessible.

Our research has two parts. In the first part, you will play a game. In the game, you will need to check the Positive and Negative effects of using alcohol or drugs.

In the second part, you will answer a number of questions.

Om te beginnen wil ik je bedanken voor jouw deelname.

Met dit onderzoek willen we manieren vinden om online behandeling toegankelijker te maken.

Ons onderzoek bestaat uit twee delen. In het eerste deel speel je een spel. In het spel moet je de positieve en negatieve effecten van het gebruik van alcohol of drugs controleren.

In het tweede deel beantwoord je een aantal vragen.

We will need to record our meeting call.
We will need the video recording:

- To have your recorded consent of attending
- To analyze our data in the end.

The video will not be shared with a third party.
Your answers remain confidential

The data we will collect and the video will not be shared. Your data may be deleted if you request within 24 hours of the study.

Are you okay with me starting the video recording?

We zullen ons gesprek moeten opnemen.
We hebben de video-opname nodig:

- Om duidelijk te maken dat je mee wil doen
- Om uiteindelijk onze data te analyseren.

De video wordt niet gedeeld met andere mensen: het blijft geheim wat je zegt

De gegevens die we zullen verzamelen en de video worden niet gedeeld. Jouw gegevens kunnen worden verwijderd als je dit binnen 24 uur na de studie aanvraagt.

Vind je het goed dat ik de video-opname start?

This is the consent form:

- Have you read and understood the study information, or has it been read to you?
- Do you voluntary consent to be a participant in this study?
- Do you understand that you can refuse to answer questions?
- Do you understand that you can withdraw from the study at any time, without having to give a reason?

Dit is het toestemmingsformulier:

- Heb je de studie-informatie gelezen en begrepen, of is deze aan je voorgelezen?
- Geeft je toestemming om vrijwillig deel te nemen aan dit onderzoek?
- Begrijpt je dat je kunt weigeren om vragen te beantwoorden?
- Begrijpt je dat je zich op elk moment kunt terugtrekken uit de studie, zonder dat je een reden hoeft op te geven?

- Do you understand that information you provide will be used for a Master's thesis report?
- Do you understand that the collected personal information that can identify you, will not be shared beyond the study team?
- Do you agree with being video recorded during this study?

- Begrijp je dat wat je vertelt zal worden gebruikt voor mijn afstudeer onderzoek?
- Begrijp je dat jouw persoonlijke gegevens alleen bij mij en mijn begeleiders bekend worden?
- Ben je het ermee eens dat er tijdens dit onderzoek video-opnamen worden gemaakt?

To continue, in a moment I will send you the game in this chat.

As soon as the game starts you can start playing. You can speak out loud and explain to me what you are doing if you want to.

Try not to ask help from your caregiver and play alone.

Before we start, do you have any questions?

Om verder te gaan, zal ik je zo dadelijk de game in deze chat sturen.

Zodra het spel begint, kun je beginnen met spelen. Je kant hardop spreken en me uitleggen wat je doet als je dat wilt.

Probeer geen hulp te vragen aan jouw begeleider. Het is de bedoeling dat je het spel zelf speelt.

Heeft je, voordat we beginnen, nog vragen?

We are not testing your abilities or watching your responses.

So enjoy the game, and do not hesitate to answer honestly

We willen weten of het spel goed werkt. Het gaat dus niet om hoe goed jij speelt, maar om wat je van het spel vindt!

Dus veel plezier in het spelen, en zeg vooral eerlijk wat je vindt!

This is how you can access the game:

Once you can see the game in the chat double click it. The screen will change and there you can click "Download".

The game will slowly be downloaded. You can then go to the Downloads in you computer and find the game. It looks like this:

Double click it.

Dit is hoe je toegang krijgt tot het spel:

Zodra je het spel in de chat kunt zien, dubbel klik je erop. Het scherm verandert en daar kun je op "Download" klikken.

Het spel wordt langzaam gedownload. Je kunt dan naar de Downloads op je computer gaan en het spel zoeken. Het ziet er zo uit:

Dubbelklik erop.

A pop up will appear on your screen. From there you can click "More Info".

Then click the button on the bottom right that should say: "Run Anyway".

The game will slowly start on your screen.

Er verschijnt een pop-up op jouw scherm. Van daaruit kunt je op "Meer info" klikken.

Klik vervolgens op de knop rechtsonder die zou moeten zeggen: "Toch uitvoeren"

Het spel start langzaam op je scherm.

E.2.2 Interview

I have some questions to ask you. There are no right or wrong answers. You can express your opinion freely. You can also elaborate if you want to.

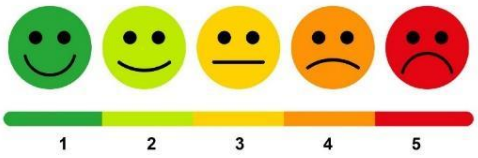
In the questions which you can see these smileys. You can indicate which one suits what you think best.

Ik heb een paar vragen. Er zijn geen goede of foute antwoorden. Je kunt jouw mening vrij geven. Je mag er ook meer bij vertellen als je wil.

Bij de vragen zie je deze smileys. Je mag aangeven welke het beste past bij wat jij vindt

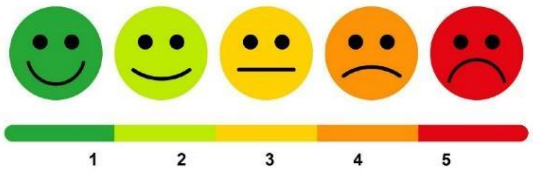
Wat vond je leuk op het scherm met de positieve en negatieve effecten? En waarom?

Hoe nuttig waren de pictogrammen naast de positieve en negatieve effecten naar jouw mening? En waarom?



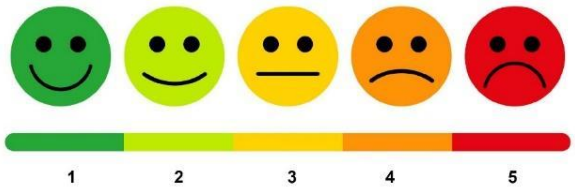
Hoe gemakkelijk was het voor je om de juiste positieve en negatieve effecten te vinden? En waarom?

Hoe handig vond je de audioknop? En waarom?

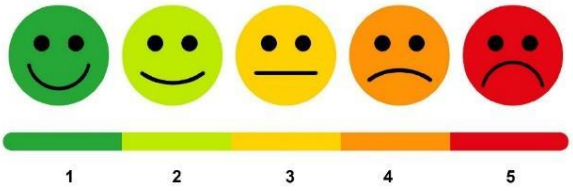


Wat vind je van de uitleg die Tess je gaf?

Hoe gemakkelijk was Tess te begrijpen? En waarom?

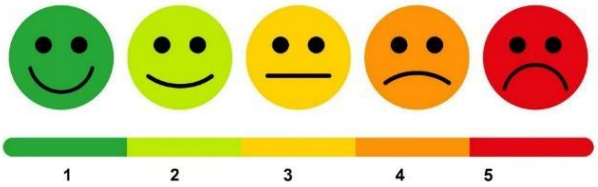


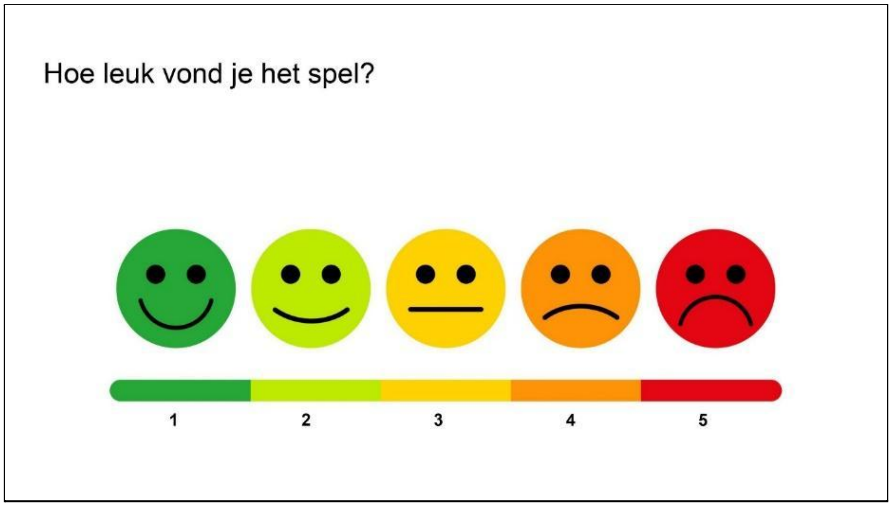
Wat vond je van de tekst toen Tess aan het woord was? En waarom?



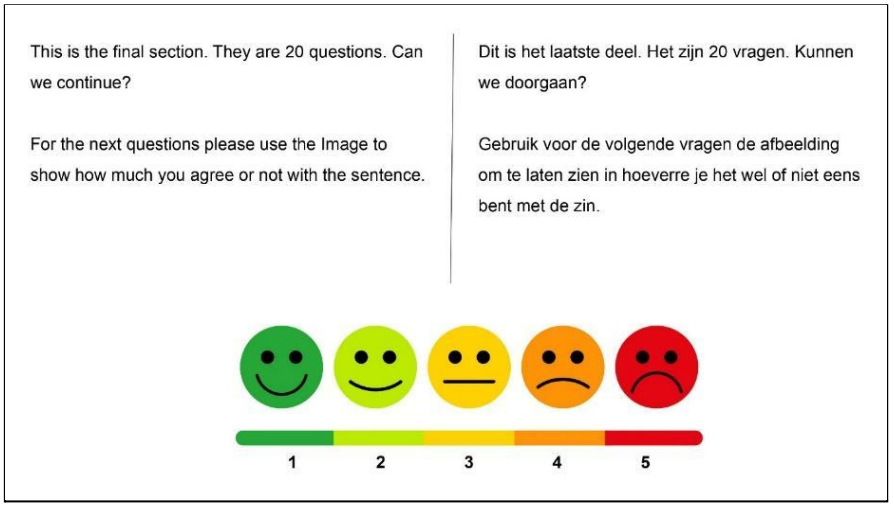
Heeft Tess je geholpen het spel te gebruiken?

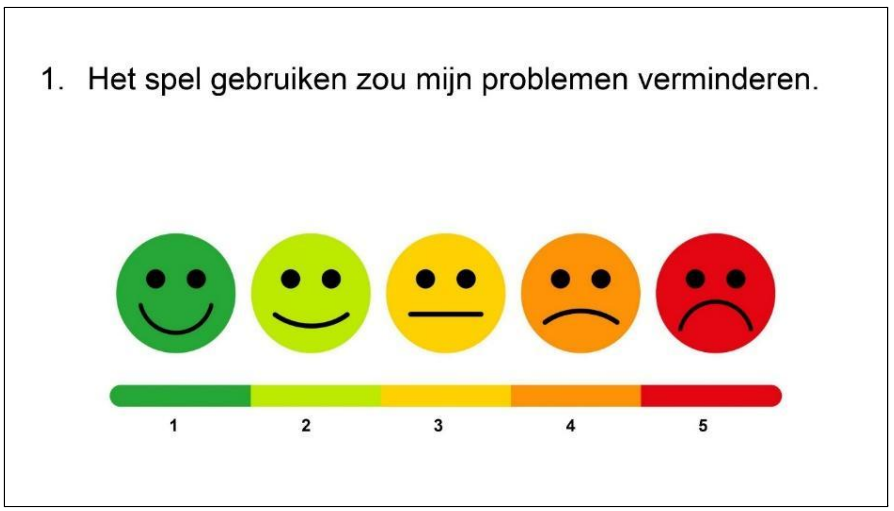
Hoe graag wilde je doorgaan met het invullen van de positieve en negatieve effecten nadat je de beloning had ontvangen? En waarom?



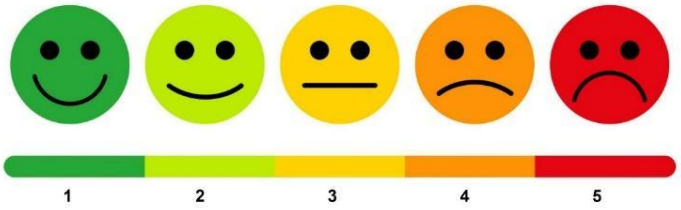


E.2.3 UTAUT Interview

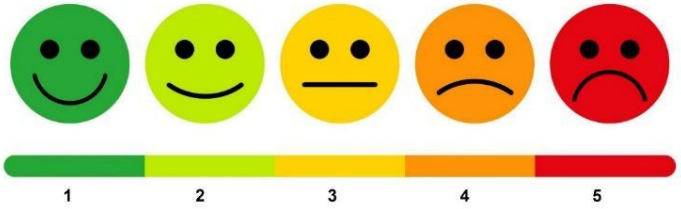




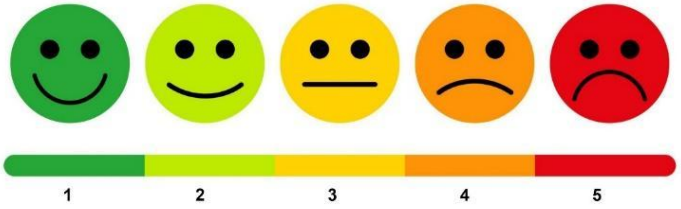
2. Gebruikmaken van het spel zou me veel tijd en energie kosten.



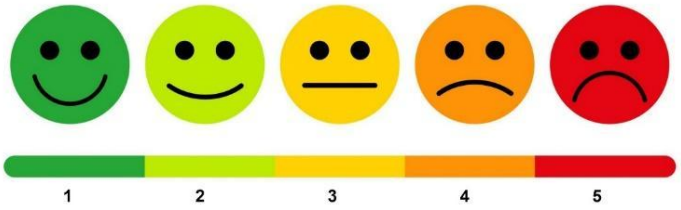
3. Mensen in mijn omgeving zouden me aanraden om het spel te gebruiken.



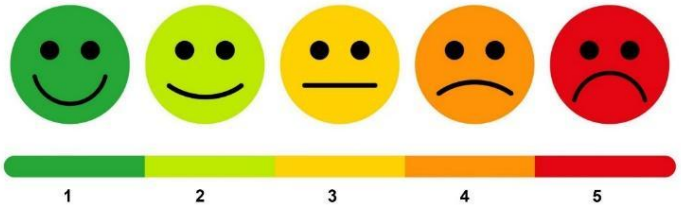
4. Ik beschik over een computer of smartphone met toegang tot het internet en zou zo gebruik kunnen maken van het spel.



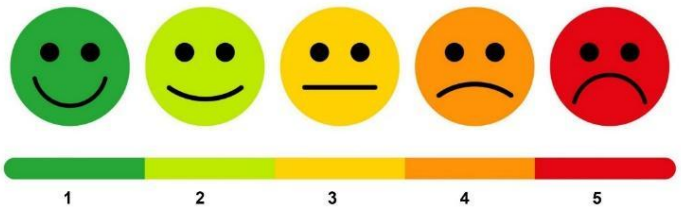
5. Het internet voelt soms als iets bedreigends.



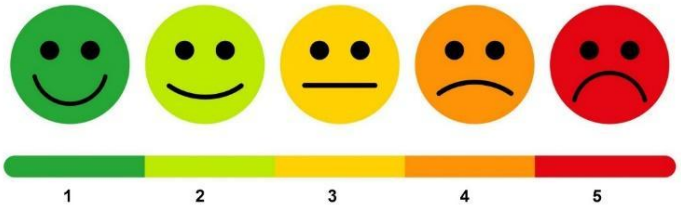
6. Ik heb een duidelijk beeld van wat ik kan verwachten van het spel bij het omgaan met psychische problemen.



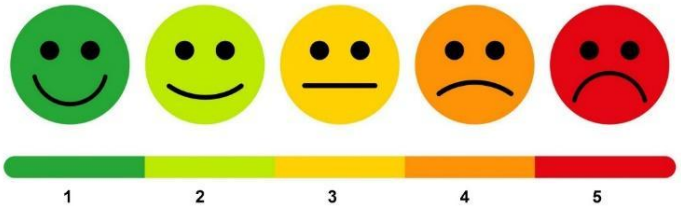
7. Gebruikmaken van het spel zou goed voor mij zijn



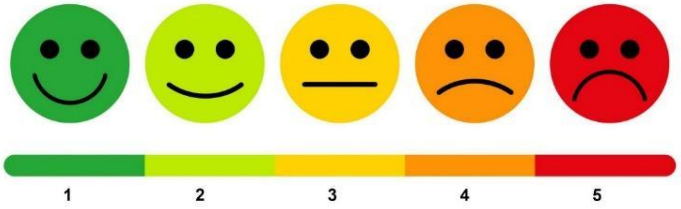
8. Gebruikmaken van het spel zou makkelijk zijn voor mij.



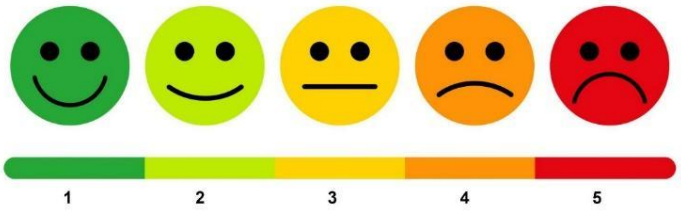
9. Mijn huisarts zou me aanraden om het spel voor psychische problemen te gebruiken.



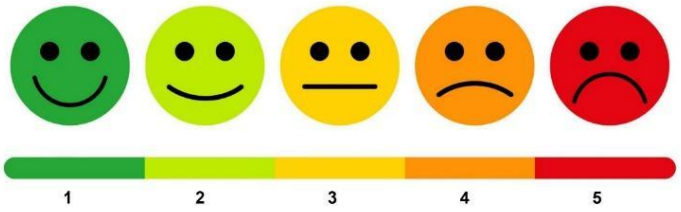
10. Bij technische problemen met het spel, zou iemand me technische ondersteuning kunnen bieden.



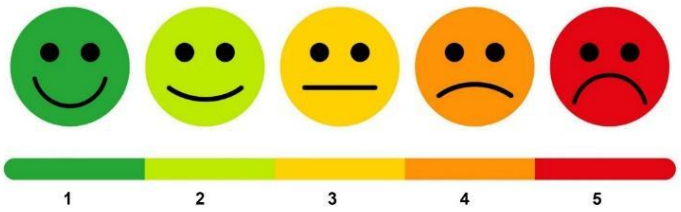
11. Ik ben bang om een grote fout te maken wanneer ik gebruikmaak van het internet.



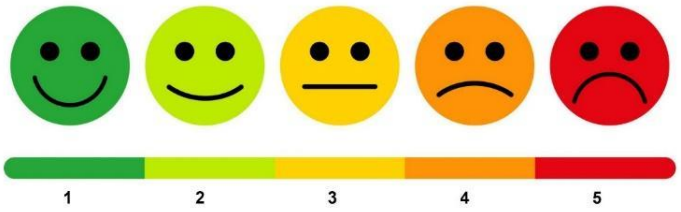
12. Ik heb al enige kennis rond het spel.



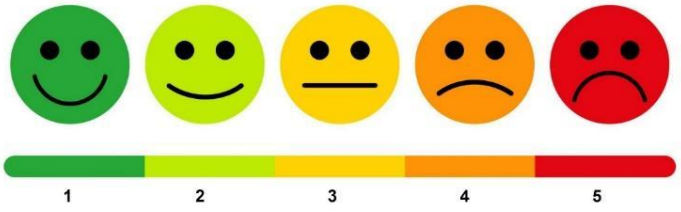
13. Het spel kan me helpen om mijn problemen te verminderen.



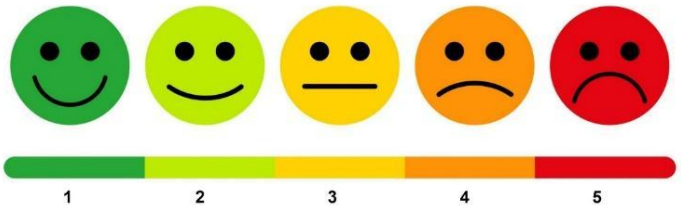
14. Het spel zou helder en gemakkelijk te begrijpen zijn voor mij.



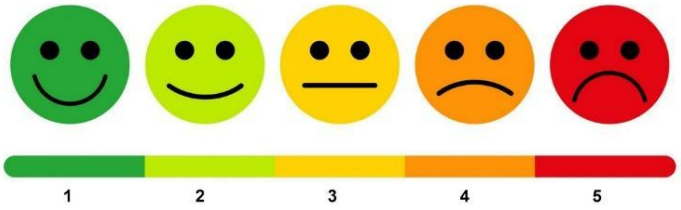
15. Mensen in mijn omgeving zouden gebruikmaken van het spel indien ze zouden lijden.



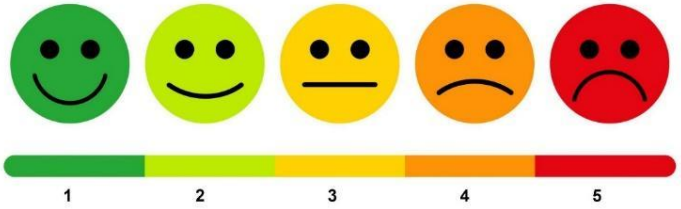
16. Ik heb genoeg technische kennis om gebruik te maken van het spel.



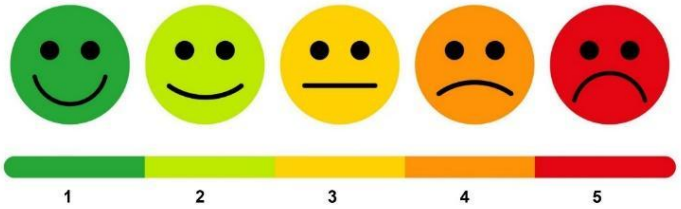
17. Wanneer ik gebruikmaak van het spel, zou ik erop vertrouwen dat alle informatie die ik geef in strikt vertrouwen wordt behandeld.



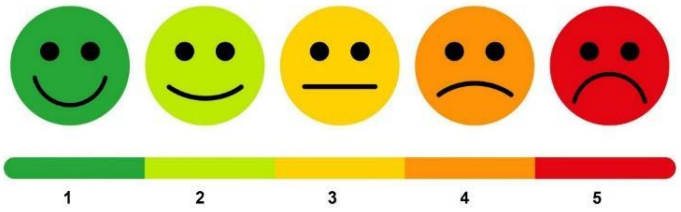
18. Gebruikmaken van het spel zou me helpen om met mijn problemen om te gaan.



19. Andere mensen zouden slecht over me denken als ik het spel zou gebruiken.



20. Wanneer ik denk aan het spel, ben ik bang dat vertrouwelijke informatie in de verkeerde handen zou belanden.



E.2.4 Outro

Thank you for attending to our study!
You really were a big help!

You can contact me at any point if you have any questions about the study.

This is my email:
a.chrysanthou@student.utwente.nl

Thank you again for attending! Have a nice day!

Bedankt voor het meedoen aan onze studie!
Je hebt mij echt enorm geholpen!

Als je vragen hebt over het onderzoek, kan je mij mailen

Dit is mijn email:
a.chrysanthou@student.utwente.nl

Nogmaals bedankt voor het bijwonen! Fijne dag!